

TRILLIUM LAKELANDS DISTRICT SCHOOL BOARD
RFT B25-03 - WASHROOM UPGRADES SUMMER 2025
PROJECT MANUAL

SPECIFICATIONS
ISSUED FOR TENDER MARCH 24, 2025



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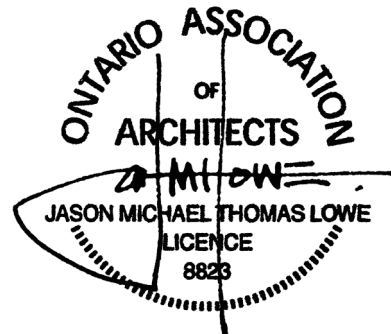
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END OF SECTION

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- .1 The seal and signature below represents that this document issued for Building Permit so sealed was prepared in its entirety under the personal supervision and direction of a member of the Ontario Association of Architects or the Professional Engineers of Ontario for the sections indicated.

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END OF SECTION

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1.01 SPECIFICATIONS Contents (con't)

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END OF SECTION

1 GENERAL

1.01 Appendix A:

- .1 APPENDIX A: Details contains Architectural details that are common and apply to all projects. Appendix A: Details is an 11x17 package of drawings.

1.02 Specifications:

- .1 The specifications contain Architectural, Structural, Mechanical and Electrical specifications and are common and apply to all projects. The "Project Manual" containing the specifications is an 8-1/2" x 11" document.

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1.03 FENELON TOWNSHIP PUBLIC SCHOOL – 24"x36" Drawings**Architectural**

A000	Cover Sheet
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Structural

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Electrical

E-01	LEGEND, KEY PLAN AND DETAILS -ELECTRICAL
E-11	ELECTRICAL LAYOUTS, PANEL SCHEDULE & DETAILS

1.04 LADY MACKENZIE PUBLIC SCHOOL – 24"x36" Drawings**Architectural**

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A010	CODE COMPLIANCE
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Appendix A:	DETAILS

Structural

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S1	RM 134 AND 135
S2	SLAB TRENCHING, THICKENING AND BACKFILL DETAILS AND MASONRY INFILL
S3	LATERAL SUPPORT OF MASONRY WALLS AND LINTEL DETAILS

Mechanical

M-01	LEGEND, DRAWING LIST, SCHEDULES AND SPECIFICATIONS - MECHANICAL
M-11	HVAC, PLUMBING AND DRAINAGE LAYOUTS - MECHANICAL

Electrical

E-01	LEGEND, LUMINAIRE SCHEDULE AND DETAILS - ELECTRICAL
E-02	ELECTRICAL LAYOUTS

1.05 BOBCAYGEON PUBLIC SCHOOL– 24"x36" Drawings**Architectural**

A000	Cover Sheet
A010	CODE COMPLIANCE and DEMOLITION
A200	NEW WORK
A900	FINISHES
APPENDIX A	DETAILS

Structural

G1	STRUCTURAL UPGRADES AND REPAIRS - GENERAL NOTES
S1	STRUCTURAL UPGRADES AND REPAIRS - RM 104 & 104A
S2	STRUCTURAL UPGRADES AND REPAIRS – CONSTRUCTION DETAILS

Mechanical

M-01	LEGEND, DRAWING LIST, DETAILS & SCHEDULES - MECHANICAL
M-11	HVAC, PLUMBING & DRAINAGE LAYOUTS - MECHANICAL

Electrical

E-01	LEGEND, LUMINAIRE SCHEDULE AND KEY PLAN - ELECTRICAL
E-02	ELECTRICAL LAYOUTS

1.06 IE WELDON SECONDARY SCHOOL – 24"x36" Drawings

Architectural

A000	Cover Sheet
A010	CODE COMPLIANCE and DEMOLITION
A020	DEMOLITION
A200	NEW WORK Rm 210-211
A900	FINISHES Rm 210-211
APPENDIX A	DETAILS

Mechanical

M-01	MECHANICAL LEGEND, DRAWING LIST, KEY PLAN, SCHEDULES AND PLUMBING FIXTURE SPECIFICATIONS
M-11	HVAC, PLUMBING & DRAINAGE LAYOUTS - MECHANICAL

Electrical

E-01	LEGEND, DETAILS & LAYOUTS – ELECTRICAL
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END OF SECTION

1 GENERAL

1.0 SUMMARY

- .1 This section and all subsequent Division 01 sections shall be read in conjunction with the requirements of the CCDC2 – 2020 *Contract*, related Supplementary Conditions and the technical specifications in Divisions 02 through 28.
- .2 Division 01 – General Requirements provide detailed administrative and procedural requirements for the project to the *Contractor*.
- .3 *Consultant* has prepared these documents; any questions arising from their use shall be directed to the *Consultant* using the *Request for Information* (RFI) process.
- .4 No claims for extra work arising from the *Contractor's* failure to read, understand and incorporate the requirements of Division 01 into their work will be accepted.
- .5 These *Specifications* are written as a set of common requirements that apply to all of the projects listed below in paragraph 1.2.2, as such some information will not apply to all of the projects. The *Contractor* is responsible for familiarizing themselves with the entire scope of work for the specific project and the related requirements that apply within each section.
- .6 Definitions. Definitions for words included in the *Specifications* will have the meanings as defined in the *Contract* – Definitions unless otherwise noted.

1.1 RELATED REQUIREMENTS

- .1 Section 01 14 00 Work Restrictions
- .2 Section 01 32 00 Construction Progress Documentation

1.2 WORK OF THE CONTRACT

- 1.2.1 Attaining *Ready-for-Takeover* within the *Contract Time* specified in paragraph 1.3 of Article A-1 of the Agreement – THE WORK is of the essence of the *Contract*.
- 1.2.2 *Work* of this *Contract* comprises renovations to existing spaces, existing washrooms and other rooms at various TLDSB schools, located and as described below. Each location below relates to a separate project for bidding purposes. Refer to the *Specifications* and *Drawings* for complete information.
 - 1.2.2.1 **Fenelon Township Public School.** Renovation of room 119A and 122 to create a new Universal Washroom in Rm 119A and to upgrade the existing custodial room in Rm 122.

Municipal Address: 50 Cameron Road
Cameron, ON
K0M 1G0

Legal Description: Concession 6,
Part Lot 9

- 1.2.2.2 **Lady Mackenzie Public School.** Renovation of the existing Girl's Washroom Rm 134 and existing Boy's Washroom 135 including the addition of two new windows in the exterior wall.

Municipal Address: 1746 Kirkfield Rd.
Kirkfield, ON K0M 2B0

Legal Description: PLAN 106, 57R5977 - 1746 KIRKFIELD RD.

- 1.2.2.3 **Bobcaygeon Public School.** Renovation to create a new staff washroom Rm 104A and related renovations to the adjacent office Rm 104.

Municipal Address: 30 Balaclava St.
Kawartha Lakes, ON
K0M 1A0

Legal Description: PLAN 70, PT BLK N WEST AND BLK O

- 1.2.2.4 **IE Weldon Secondary School.** Renovation of Staff washrooms Rm 210 and 211 on the second floor.

Municipal Address: 24 Weldon Road
Lindsay, ON
K9V 4R4

Legal Description: Concession 7, Pt Lot 20

1.3 DIVISION OF WORK

- 1.3.1 Division of the *Work* among *Subcontractors* and *Suppliers* is solely the *Contractor's* responsibility. *Consultant* and *Owner* assume no responsibility to act as an arbiter to establish subcontract limits between Sections or Divisions of the *Work*.

1.4 SPECIFICATIONS LANGUAGE AND STYLE

- 1.4.1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to the *Contractor*, unless stated otherwise.
- 1.4.2 Complete sentences by reading "shall", " *Contractor* shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.
- 1.4.3 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.
- 1.4.4 When used in the context of a *Product*, read the word "*Provide*" to mean "supply and install to result in a complete installation ready for its intended use".

1.5 CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES

- 1.5.1 *Owner* through the *Consultant* will supply *Contractor* with a complete set of *Contract Documents* in electronic form (PDF) before commencement of the *Work*. *Contractor* may print hard copies for construction purposes as required at the *Contractor's* expense.

1.6 DOCUMENTS AT THE SITE

- 1.6.1 Keep the following documents at *Place of the Work*, stored securely and in good order and available to *Owner* and *Consultant* in hard copy form:
 - 1.6.1.1 Current *Contract Documents*, including *Drawings*, *Specifications*, and addenda.
 - 1.6.1.2 *Change Orders*, *Change Directives*, and *Supplementary Instructions*.
 - 1.6.1.3 Reviewed *Shop Drawings* and *Submittals*, *Product* data and samples.
 - 1.6.1.4 Field test reports and records.
 - 1.6.1.5 Current *Construction Schedule*.
 - 1.6.1.6 Meeting minutes.
 - 1.6.1.7 Consultants' field reports.
 - 1.6.1.8 Manufacturer's certifications.
 - 1.6.1.9 Permits, inspection certificates, and other documents required by authorities having jurisdiction.
 - 1.6.1.10 Current as-built drawings.
 - 1.6.1.11 Material Safety Data Sheets (MSDS) for all controlled *Products*.

1.7 SUBMITTALS

- 1.7.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- 1.7.2 Submit *Project Construction Schedule* in accordance with Section 01 32 00 Construction

Progress Documentation.

1.8 WORK BY OTHERS

- 1.8.1 Co-operate with *Other Contractors* in carrying out their respective works and carry out instructions from *Consultant*.
- 1.8.2 Co-ordinate work with *Other Contractors* and the *Owner's* own forces. If any part of *Work* under this *Contract* depends for its proper execution or result upon work of another contractor, report promptly to *Consultant* and *Owner*, in writing, any defects which may interfere with proper execution of *Work*.

1.9 WORK SEQUENCE

- 1.9.1 Perform *Work* continuously to completion. Time is of the essence in this *Contract*.
- 1.9.2 Co-ordinate *Construction Schedule* and co-ordinate with *Owner* occupancy during construction.
- 1.9.3 Maintain fire access/control.
- 1.9.4 Protect workers and public safety.

1.10 CONTRACTOR USE OF PREMISES

- 1.10.1 Refer to Section 01 14 00 Work Restrictions for further requirements.
- 1.10.2 Limit use of premises for *Work*, for storage, and for access to allow:
 - .1 *Owner* occupancy.
 - .2 Partial *Owner* occupancy.
 - .3 Work by *Other Contractors*.
 - .4 Public usage.
- 1.10.3 Co-ordinate use of premises with the *Owner's* representative.
- 1.10.4 Obtain and pay for use of additional storage or work areas needed for operations under this *Contract*.
- 1.10.5 Remove or alter existing work to prevent injury or damage to portions of existing work which is to remain.
- 1.10.6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by *Consultant*.
- 1.10.7 Ensure that operations conditions of existing *Work* at completion are still the same, equal to or better than that which existed before new *Work* started.

1.11 OWNER OCCUPANCY

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

1.12 OWNER-SUPPLIED PRODUCTS**1.12.1 *Owner* Responsibilities:**

- 1.12.1.1 Order and pay for *Owner*-supplied *Products* not already in *Owner's* possession.
- 1.12.1.2 Arrange and pay for delivery of *Owner*-supplied *Products* F.O.B. the site, within time frames required by *Contractor's* progress schedule. If delivered sooner than required by *Contractor's* latest progress schedule submitted to *Owner*, arrange and pay for delivery to a temporary storage location and subsequent delivery to the site.
- 1.12.1.3 Advise *Contractor* in writing of the value of *Owner*-supplied *Products* for *Contractor's* insurance purposes.
- 1.12.1.4 Arrange and pay for delivery to *Contractor* of reviewed *Shop Drawings*, *Product* data, samples, and manufacturer's installation instructions.
- 1.12.1.5 Inspect deliveries jointly with *Contractor*.
- 1.12.1.6 Submit claims for transportation damage.
- 1.12.1.7 Arrange for replacement of damaged, defective or missing items identified at time of delivery.
- 1.12.1.8 Arrange for manufacturer's field services.
- 1.12.1.9 Arrange for delivery of manufacturer's warranties to *Contractor* for inclusion in operation and maintenance manual.

1.12.2 *Contractor* Responsibilities:

- 1.12.2.1 Designate in progress schedule, time frames for delivery of *Owner*-supplied *Products* to the site and for receipt of related submittals. If the site is not ready to receive delivery of *Owner*-supplied *Products* within the time frame indicated in the latest progress schedule submitted to *Owner*, arrange and pay for delivery to a temporary storage location and subsequent delivery to the site.

- 1.12.2.2 Review all required submittals and notify *Consultant* of any observed discrepancies or anticipated problems.
- 1.12.2.3 Ensure that course of construction insurance is adequate to cover *Owner*-supplied *Products*.
- 1.12.2.4 Receive and unload *Owner*-supplied *Products* at the site.
- 1.12.2.5 Inspect deliveries jointly with *Owner*. Record and notify *Owner* and *Consultant* of shortages and visibly damaged or defective items.
- 1.12.2.6 Handle *Owner*-supplied *Products* at site, including uncrating and storage. Dispose of waste materials and debris.
- 1.12.2.7 Take appropriate precautions to protect *Owner*-supplied *Products* from loss or damage.
- 1.12.2.8 Repair or replace items damaged on site.
- 1.12.2.9 Assemble, install, connect, adjust, and finish *Owner*-supplied *Products* as specified.
- 1.12.2.10 Arrange for inspections required by authorities having jurisdiction as specified.
- 1.12.2.11 Arrange for or perform testing as specified.
- 1.12.2.12 Workmanship warranty for installation.

1.12.3 Schedule of *Owner* furnished items:

- 1.12.3.1 Toilet paper dispensers (TP-1)
- 1.12.3.2 Soap Dispensers (SD-1)
- 1.12.3.3 Sanitary Napkin Disposal (SND-1)
- 1.12.3.4 Sanitary Napkin Dispenser (ND-1)
- 1.12.3.5 Eye wash stations (EW-1)
- 1.12.3.6 Chemical Mixing Stations (CS-1)

1.13 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- 1.13.1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with *Owner* to facilitate execution of work.
- 1.13.2 Existing barrier free lifts and/or LU/LA lifts are not to be used for construction purposes.

1.14 EXISTING SERVICES

- 1.14.1 Notify, *Owner* and utility companies of intended interruption of services and obtain required

permission.

- 1.14.2 Where *Work* involves breaking into or connecting to existing services, give *Owner* 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic and *Owner* operations.
- 1.14.3 Provide alternative routes for staff, pedestrian and vehicular traffic.
- 1.14.4 Establish location and extent of service lines in area of work before starting *Work*. Notify *Consultant* of findings.
- 1.14.5 Submit schedule for approval by *Consultant* and *Owner* for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- 1.14.6 Provide temporary services when directed by *Consultant* to maintain critical building and tenant services.
- 1.14.7 Where unknown services are encountered, immediately advise *Consultant* and confirm findings in writing.
- 1.14.8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- 1.14.9 Record locations of maintained, re-routed and abandoned service lines.
- 1.14.10 Construct barriers, as required, in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.15 SPECIFICATION FORMATS AND CONVENTIONS

- 1.15.1 *Specification* Format: The specifications are based on MasterFormat jointly published by Construction Specifications Canada (CSC) and Construction Specifications Institute (CSI) using the 2018 updated master list of numbers and titles that classify work results or construction practices:
 - 1.15.1.1 Section Identification: The *Specifications* use section numbers and titles to help cross-referencing in the *Contract Documents*.
 - 1.15.1.2 Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete and not intended to be read as a continuous and sequential page-by-page requirement.
 - 1.15.1.3 Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the *Contract Documents*.

1.15.1.4 The section numbers do not and cannot indicate the scope of work for individual *Subcontractors*, they are used to establish the total work required for the *Project*.

1.15.2 MasterFormat is primarily used to organize project manuals, organize detailed cost information and relate drawing notations to the specifications.

1.15.3 The 6 Number, 50 Division format replaces the previous 5 Number, 16 Division format used before 2004.

1.15.4 *Specification Content*: The *Specifications* use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1.15.4.1 Related Requirements: Related requirements listed in the specifications indicating specification sections that are related to work of the section do not create a trade scope of work:

1.15.4.1.1 Related requirements are provided to indicate closely coordinated requirements during preparation of the documents and that may aid the *Contractor* in fully incorporating components relating to their scope of work.

1.15.4.1.2 *Contractor* is expected to coordinate all sections of the *Work* and ensure that scope of *Work* is fully accounted for, including requirements of Division 00 and 01 and other sections that may not be listed in the listings associated with related requirements.

1.15.4.2 Laws, Statutes, Codes and Reference Standards: Dated reference standards listed in the Specifications generally reflect the version used to establish the performance requirements for the *Work* described:

1.15.4.2.1 Reference to any provincial or national statutes and codes includes the full content of the code or statute including any amendment, revision or consolidation published by the Authority Having Jurisdiction.

1.15.4.3 Abbreviated Language: Language used in the *Specifications* and other *Contract Documents* is abbreviated to aid interpretation of the documents:

1.15.4.3.1 Words and meanings shall be interpreted as appropriate and are intended to be read as a whole, not extracted and read individually.

1.15.4.3.2 Words implied but not stated, shall be inferred as the sense requires.

1.15.4.4 Imperative Mood and Streamlined Language: Generally used in the *Specifications* to avoid assigning specific responsibilities to the Contractor or the Subcontractor that affect trade scopes of work:

1.15.4.4.1 Requirements expressed in the imperative mood are to be performed by the *Contractor*. Examples of verbs used: "Install", "Paint", "Clean" and "Protect".

1.15.4.4.2 Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by the *Contractor* or by others when so noted.

1.15.4.5 Use of Shall and Will: Use of the words shall and will is minimized throughout the specification, but are used to indicate preferred directives to the *Contractor* where greater clarity to the documentation is achieved using those words:

1.15.4.5.1 For the purposes of this *Contract*, the word "shall" is a directive requiring that the *Contractor* undertake a specific task or assignment.

1.15.4.5.2 For the purposes of this *Contract*, the word "will" is a directive indicating an action or task required by the *Owner* and *Consultant*.

1.15.4.6 Use of Singular and Plural Words: The language of the *Specifications* is essentially plural, and usage of singular and plural words is governed as follows:

1.15.4.6.1 Every attempt has been made to apply singular and plural word usage based on numbers of components required by the project; however, it is expected that use of singular and plural words will be interpreted in context to what the *Contract Documents* indicate.

1.15.4.6.2 The use of plural words when ascribed to a singular requirement shall be reasonably interpreted as relating to a singular requirement when a count of components described by the plural word indicates a single occurrence.

1.15.4.6.3 The use of a singular word version when ascribed to multiple requirements shall be reasonably interpreted as relating to multiple requirements when a count of components described by the singular word indicates multiple occurrences.

1.16 ARCHITECTURAL DRAWINGS

- 1.16.1 Organization. Architectural drawings are organized in numbered series as follows:

A000 Cover Sheet/General Information
A010 Code Compliance
A020 Demolition
A100 General Information
A200 New Work
A300 Building Elevations
A400 Sections/Wall Sections
A500 Details (Project specific)
A600 Architectural Woodwork/Millwork
A700 Building Envelope Details
A800 Openings – Windows and Doors
A900 Finishes
Appendix A – Details (Standard details common to all projects)

- 16.1.2 Appendix A. Appendix A contains information and details that apply to similar conditions across multiple project locations and acts as a design standard.

1.17 STRUCTURAL DRAWINGS

- 1.17.1 Appendix B: Reference Booklet. The structural drawings are comprised of the large format 24" x 36" drawings and an accompanying 11" x 17" Reference Booklet containing general information and details referenced from the large format sheets.

1.18 MECHANICAL AND ELECTRICAL DRAWINGS

- 1.18 Mechanical and Electrical drawings are comprised of large format 24" x 36" drawings containing drawings, details, schedules and some specification information directly on the sheets.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 TLDSB RFT Document
- .2 CCDC2 – 2020 and TLDSB Supplementary Conditions

1.02 ACCESS AND EGRESS

- .1 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.
- .2 The *Contractor* shall make arrangements with the *Owner* a minimum of one (1) week in advance of requirement for loading or unloading of *Product* and materials that may affect access to the site or operations of the *Owner*.
- .3 At all times during construction, maintain safe and minimum clearances to existing exits and throughout access to exits.
- .4 Do not store materials or *Products* in stairwells or exit vestibules at any time.

1.03 USE OF SITE AND FACILITIES

- .1 Execute work with the least possible interference or disturbance to normal use of premises. Make arrangements with *Owner's* representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Owner's Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.
- .6 Do not use barrier free lifts or LU/LA lifts at any time for construction use.

1.04 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.05 EXISTING SERVICES

- .1 Notify, *Owner's* Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where *Work* involves breaking into or connecting to existing services, give *Owner's* Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.06 SPECIAL REQUIREMENTS

- .1 Ensure *Contractor's* personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2 Coordinate noise generating Work with the Owner and the Owner's on-site representative.
- .3 Coordinate "hot" Work with the Owner and the Owner's on-site representative. Provide minimum 48 hours notice in advance.
- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Refer to TLDSB's RFT document for working hours and related restrictions. In general the Contractor will have full access to the premises during the summer months when school is not in session. Once school resumes in September the Contractor's access to the premises will be restricted to evenings and/or weekends to complete any outstanding Work unless otherwise agreed with the Owner.

1.07 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

1.08 BUILDING SMOKING ENVIRONMENT

- .1 Comply with TLDSB smoking restrictions refer to RFP Standard Conditions of Contract. Smoking or vaping is not permitted anywhere on school premises or on Board property.

END OF SECTION

1 GENERAL

1.01 DEFINITION

- .1 In this Section "Substitution" means a *Product*, a manufacturer, or both, not originally specified in the *Contract Documents* by proprietary name but proposed for use by the *Contractor* in place of a *Product*, a manufacturer, or both, specified by proprietary name.

1.02 SUBSTITUTION PROCEDURES

- .1 The *Contractor* may propose a Substitution wherever a *Product* or manufacturer is specified by proprietary name(s), unless there is accompanying language indicating that Substitutions will not be considered.
- .2 The *Contractor* may propose a Substitution wherever a *Product* or manufacturer is specified by proprietary name(s) and accompanied by language such as "or equal", "or approved equal", or other similar words. Do not construe such language as an invitation to unilaterally provide a Substitution without the *Consultant's* prior acceptance in writing. Do not order or install any Substitution without a *Supplemental Instruction* or *Change Order*.
- .3 Provided a proposed Substitution submission includes all of the information specified in this Section under Submission Requirements For Proposed Substitutions, the *Consultant* will promptly review and accept or reject the proposed Substitution.
- .4 The *Consultant* may accept a Substitution if satisfied that:
 - .1 the proposed substitute *Product* is the same type as, is capable of performing the same functions as, interfaces with adjacent work the same as, and meets or exceeds the standard of quality, performance and, if applicable, appearance and maintenance considerations, of the specified *Product*,
 - .2 the proposed substitute manufacturer has capabilities comparable to the specified manufacturer, and
 - .3 the Substitution provides a benefit and is acceptable to the *Owner*.
- .5 If the *Contractor* fails to order a specified *Product* or order a *Product* by a specified manufacturer in adequate time to meet the *Contractor's* construction schedule, the *Consultant* will not consider that a valid reason to accept a Substitution.
- .6 If the *Consultant* accepts a Substitution and subject to the *Owner's* agreement, the change in the *Work* will be documented in the form of either a *Supplemental Instruction* or *Change Order* as specified in Section 01 26 00 – Contract Modification Procedures.

- .7 If a Substitution is accepted in the form of a *Supplemental Instruction* or *Change Order*, the *Contractor* shall not revert to an originally specified *Product* or manufacturer without the *Consultant's* prior written acceptance.

1.03 SUBMISSION REQUIREMENTS FOR PROPOSED SUBSTITUTIONS

- .1 Include with each proposed Substitution the following information:
- .1 Identification of the Substitution, including product name and manufacturer's name, address, telephone numbers, and web site.
 - .2 Reason(s) for proposing the Substitution.
 - .3 A statement verifying that the Substitution will not affect the *Contract Price* and *Contract Time* or, if applicable, the amount and extent of a proposed increase or decrease in *Contract Price* and *Contract Time* on account of the Substitution.
 - .4 A statement verifying that the Substitution will not affect the performance [or warranty] of other parts of the *Work*.
 - .5 Manufacturer's *Product* literature for the Substitution, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.
 - .6 Product samples as applicable.
 - .7 A summarized comparison of the physical properties and performance characteristics of the specified *Product* and the Substitution, with any significant variations clearly highlighted.
 - .8 Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.
 - .9 If applicable, estimated life cycle cost savings resulting from the Substitution.
 - .10 Details of other projects and applications where the Substitution has been used.
 - .11 Identification of any consequential changes in the *Work* to accommodate the Substitution and any consequential effects on the performance of the *Work* as a whole. A later claim for an increase to the *Contract Price* or *Contract Time* for other changes in the *Work* attributable to the Substitution will not be considered.

END OF SECTION

1.0 RELATED REQUIREMENTS

- .1 Refer to CCDC2-2020 and related TLDSB Supplementary Conditions for requirements for the following:
 - .1 GC4.1 CASH ALLOWANCES
 - .2 GC4.2 CONTINGENCY ALLOWANCES
 - .3 GC5.2 APPLICATIONS FOR PAYMENT
 - .4 GC5.3 PAYMENT
 - .5 GC5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK
 - .6 GC5.5 FINAL PAYMENT
 - .7 PART 6 CHANGES IN THE WORK
 - .8 PART 12 OWNER TAKEOVER

1.1 SCHEDULE OF VALUES

- .1 Prior to the first application for payment, submit for *Consultant's* review an initial schedule of values. Modify the initial schedule of values if and as requested by *Consultant*. Obtain *Consultant's* written acceptance of the initial schedule of values prior to the first application for payment.
- .2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and *Products* delivered to *Place of the Work*.
- .3 Provide the schedule of values in an electronic spreadsheet format based on the format accepted by the *Owner* and the *Consultant*.
- .4 Include in the schedule of values:
 - .1 Identifying information including *Owner's* name, *Project* title and location of the *Work*, name, address and telephone number of *Contractor*, number and date of application for payment, period covered by the application for payment, and purchase order numbering provided by the *Owner*.
 - .2 For Divisions 01 through 14, 31, 32 and 33 a work breakdown structure based on *Specification* sections that is sufficiently detailed and comprehensive to facilitate *Consultant's* evaluation of applications for payment at an appropriate level of detail.
 - .3 Separate line items for the following:
 - .1 General Conditions – Insurance and Bonding
 - .2 General Conditions – Mobilization
 - .3 General Conditions – Site Superintendent

- .4 General Conditions – General Expenses
 - .5 Closeout Documentation
 - .6 Demonstration and training
 - .7 Testing and commissioning (Pre and post construction inspections (drainage, air), fire alarm verifications etc.)
 - .8 Approved Change Orders
 - .9 Contingency allowance
 - .10 Cash allowance(s)
 - .11 Subtotals at bottom of the spreadsheet totaling the headings described in paragraph 1.1.5 below.
- .4 For Divisions 21, 22, 23, 25, 26, 27 and 28 provide a separate schedule of values, supplied by each Subcontractor that is sufficiently detailed and comprehensive to facilitate *Consultant's* evaluation of applications for payment at an appropriate level of detail.
- .5 Provisions for approved *Change Orders*, allowances, so that the breakdown amounts indicated in the schedule of values aggregate to the current total *Contract Price*.
- .5 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:
- .1 Division/Section Number – identifying *Specification* section or division.
 - .2 Description of scope. Provide a brief description of the scope included for each line.
 - .3 Contract Amount: A dollar amount, breakdown per line including an appropriate pro rata portion of *Contractor's* overhead and profit totaling to the current *Contract Price* at the bottom.
 - .4 Performed to Date: The value of *Work* performed and *Products* delivered to *Place of the Work* up to the date of the application for payment, stated as a percentage of the *Contract Price* and in dollars.
 - .5 Previously Performed: The value of *Work* performed and *Products* delivered to the *Place of the Work* for which payment has been previously certified, stated as a percentage of the Contract Breakdown Amount and in dollars.
 - .6 Current Period: The value of *Work* performed and *Products* delivered to *Place of the Work* for which *Contractor* is currently applying for payment, stated as a percentage of the Contract Breakdown Amount and in dollars.
 - .7 Balance to Complete: The value of *Work* not yet performed and *Products* not yet delivered to *Place of the Work*, stated in dollars.

- .8 Overall Percentage Complete/Remaining. At the bottom of the spreadsheet include aggregate percentages of complete and remaining to complete.
- .9 Holdback amounts. At the bottom of the spreadsheet include holdback amounts for both the current application for payment and the total holdback to date (=current +previous).

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 32 00 - Construction Progress Documentation

1.02 ADMINISTRATIVE

- .1 Schedule. Coordinate with the *Consultant* and *Owner* the schedule for project meetings throughout the progress of the work. Generally, project meetings will occur weekly throughout the course of the project. More frequent meetings may be required to accommodate certain activities on site.
- .2 Prepare agenda items for meetings. Prepare the following items and distribute to the *Consultant* and *Owner* a minimum of 48 hrs before the scheduled meeting time:
 - .1 Latest *Construction Schedule* with updates (if any)
 - .2 Change Order log with status updates and outstanding/in-progress *Change Order* documentation for review
 - .3 Request for Information (RFI) Log
 - .4 *Submittals* Log including status of outstanding/in progress submittals
- .3 *Provide* physical space and make arrangements for meetings.
- .4 Attend meetings prepared to discuss relevant agenda items and pertinent issues and resolutions to past issues on site.
- .5 The *Consultant* will prepare a record of the meeting in the form of a Field Report which will include significant proceedings and decisions and will identify actions by parties.
- .6 Representative of *Contractor*, *Subcontractor* and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.03 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of *Contract* the *Consultant* and *Owner* will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 The *Owner*, the *Contractor* and the *Consultant* will be in attendance.
- .3 Coordinate and establish time and location of meeting with the *Consultant* and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to *Contract Documents* into Agreement, prior to signing.

- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Communications protocols for the project.
 - .3 Review of status of Construction *Contract* and related submittals.
 - .4 Mobilization
 - .5 Special requirements/*Owner* policies
 - .6 Permits and Licenses
 - .7 Testing and Inspections
 - .8 *Contractor* to provide at time of meeting:
 - .1 Schedule of Work: in accordance with Section 01 32 00 - Construction Progress Documentation.
 - .2 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .3 Delivery schedule of specified equipment.
 - .4 List of *Contractor's subcontractors*.
 - .5 Close out document checklist for review by *Consultant*.
 - .9 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences etc.
 - .10 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .11 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .12 *Owner* provided products.
 - .13 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .14 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
 - .15 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
 - .16 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .17 Appointment of inspection and testing agencies or firms.
 - .18 Insurances, transcript of policies.
 - .19 Cash allowances/contingencies and procedures.

1.04 PROGRESS MEETINGS

- .1 During course of Work and 2 weeks prior to project completion, schedule progress meetings monthly to coincide with progress payment applications.
- .2 *Contractor*, major *Subcontractors* involved in *Work* and *Consultant* and *Owner* are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Minutes of meetings will be recorded in the form of a Field Report by the *Consultant*.
- .5 Agenda to include the following:
 - .1 Review of minutes of previous meeting.

- .2 Review of *Work* progress since previous meeting.
- .3 Field observations, problems, conflicts.
- .4 Problems which impede construction schedule.
- .5 Review of off-site fabrication delivery schedules.
- .6 Corrective measures and procedures to regain projected schedule.
- .7 Revision to construction schedule.
- .8 Progress schedule, during succeeding work period – 3 week look ahead.
- .9 Review submittal schedules: expedite as required.
- .10 Maintenance of quality standards.
- .11 Review proposed changes for effect on construction schedule and on completion date.
- .12 Other business.

1.05 PRE-INSTALLATION MEETINGS

- .1 The *Contractor* is to schedule with the *Consultant* and the Owner the following Pre-Installation Meetings:
 - .1 TILE Pre-Installation Meeting. Meeting to include the Tradespersons, *Contractor*, *Owner* and *Consultant* and is to occur a minimum of 1 week prior to installation of any floor or wall tile.

1.06 DEMOLITION COMPLETION REVIEW

- .1 The *Contractor* is to coordinate and schedule with the *Consultant* a review of the work area(s) exposed after demolition is complete or at a point of progress to review the exposed condition of any areas concealed from view prior to demolition. Architectural, Structural, Mechanical and Electrical existing conditions will be reviewed at this meeting to determine if any Changes to the work are required that were not considered in the designs due to concealed/inaccessible areas during design.

1.07 MECHANICAL AND ELECTRICAL ROUGH-IN REVIEW

- .1 The *Contractor* is to coordinate and schedule with the *Consultant(s)* a review of the work area(s) after rough-in of the mechanical and electrical scopes is complete or at a point of progress to review major systems prior to close-in. The Contractor is to review with the *Consultant*.

1.08 STRUCTURAL REVIEW(S)/CHECKPOINTS

- .1 The *Contractor* is to contact the *Consultant* prior to the structural progress points identified in subparagraph .3 below, to determine the requirement for one of the following two procedures:
 - .1 Site Meeting. Coordinate and schedule with the *Consultant* an on site review of the work area(s)
 - .2 Photographic documentation. Provide photographs of the full scope and detail of the scope of work;

.3 Structural progress points:

- .1 Under slab, upon slab removal
- .2 Reinforcing and pipe placement/cover, prior to pour of slab
- .3 Shoring for new/widened openings
- .4 Lintel/beam installation
- .5 Lateral support of masonry, where applicable

1.09 SUBSTANTIAL PERFORMANCE OF THE WORK REVIEW

- .1 Refer to CCDC2 – 2020 and related Supplementary Conditions for Substantial Performance of the Work procedures and requirements.

1.10 READY-FOR-TAKEOVER REVIEW

- .1 When the *Contractor* considers that the *Work* has achieved *Ready-for-Takeover*, has submitted the list of prerequisites identified in CCDC2 – 2020 GC 12.1 and as amended by the Supplementary Conditions, and provided a written application for a review by the *Consultant* the *Contractor* is to coordinate and schedule with the *Consultant*(s) a review of the *Work*.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 This Section specifies *Contractor's* responsibilities for preparation and submission of schedules and other documentation related to tracking construction progress.
 - .1 The purpose of submitting progress schedules is to:
 - .1 inform *Owner* and *Consultant* of actual progress versus planned progress, and
 - .2 provide assurance that scheduling issues are being proactively identified and addressed in a timely manner, and that planned progress is being maintained as closely as possible.

1.02 CONSTRUCTION SCHEDULE

- .1 Format and Content:
 - .1 Prepare construction schedule demonstrating the following:
 - .1 timing of the activities of the Work with sufficient detail of the critical events and their interrelationship to demonstrate the Work will be performed in conformity with the Contract Time and in accordance with the Contract Documents.
 - .2 Include the following milestones and product deliveries at a minimum and at a sufficient level of detail to effectively manage and communicate construction progress:
 - .1 *Project* start date.
 - .2 Pre-construction activities:
 - .1 *Shop Drawings* and *Submittals* review periods
 - .2 Pre-construction drainage inspection and report
 - .3 Pre-construction air testing and report
 - .3 *Product* deliveries and lead times
 - .4 Authority Having Jurisdiction inspections and approvals
 - .5 *Consultant* reviews
 - .6 Shut-down or closure activities and/or service interruption events
 - .6 Demolition phase activities
 - .7 Plumbing rough-in
 - .8 Structural works (slabs, masonry, beams, lintels, metal fabrications)
 - .9 HVAC rough-in
 - .10 Electrical rough-in
 - .11 Close-in dates (floor, walls, ceiling)
 - .12 Architectural finishes (tile, paint, ACT etc.)

- .13 Finishing
 - .1 Accessories
 - .2 Plumbing fixtures
 - .3 Electrical fixtures
 - .14 Post-construction activities:
 - .1 Post-construction drainage inspection
 - .2 Post-construction air testing and report
 - .3 ESA inspection
 - .4 Fire alarm verification
 - .5 Occupancy inspection
 - .13 Milestone: *Substantial Performance of the Work*
 - .14 Milestone: *Ready-for-Takeover*
 - .15 Demonstration and training activities
- .2 Submission:
- .1 Submit initial construction schedule to *Owner* and *Consultant* for their review and acceptance, within 5 calendar days after *Contract* award.
 - .2 Submit schedule via e-mail as .pdf files. Where requested provide original electronic files in Microsoft Project (.mpp) format.
 - .3 *Consultant* will review format and content of initial schedule and request necessary changes, if any, within 10 *Working Days* after receipt.
 - .4 If changes are required, resubmit finalized initial schedule within 5 *Working Days* after return of review copy.
 - .5 Submit updated progress schedule monthly with applications for payment to the *Owner* and the *Consultant*, indicating actual and projected start and finish dates with report date line and progress, activity relationships, critical path, and baseline comparison to current progress.
 - .6 Include a written report with each updated progress schedule. Indicate work status to date comparing baseline to actual progress, current forecasts, identifying problem areas, anticipated delays and impact on schedule, and planned corrective actions.

1.03 SHOP DRAWINGS AND OTHER SUBMITTALS SCHEDULE

- .1 Format and Content:
 - .1 Prepare schedule identifying all required *Shop Drawing* and other *Submittals*, *Product* data, and sample submissions, including samples required for testing and including those for *Owner* supplied *Products*.

- .2 Prepare schedule in electronic format and coordinate and incorporate into primary construction schedule.
 - .3 Provide a separate line for each required submittal, organized by *Specifications* section names and numbers, and further broken down by individual *Products* and systems as required.
 - .4 For each required submittal, show planned earliest date for initial submittal and earliest date for return of reviewed submittal by the *Consultant*. Refer to 01 33 00 Submittal Procedures for submittal review timeframes and include in the schedule.
 - .5 Allow time in schedule for resubmission of *Shop Drawings* and *Submittals*, should resubmission be necessary.
- .2 Submission:
- .1 Submit initial schedule to the *Consultant* within 15 *Working Days* after *Contract* award.
 - .2 Submit schedule via e-mail as .pdf files.
 - .3 *Consultant* will review format and content of initial schedule and request necessary changes, if any, within 10 *Working Days* after receipt.
 - .4 If changes are required, resubmit finalized schedule within 5 *Working Days* after return of review copy.
 - .5 Submit updated submittals schedule to *Owner* and *Consultant*.

1.04 SCHEDULE MANAGEMENT

- .1 A schedule submitted as specified and accepted by *Consultant* shall become the baseline schedule and shall be used as the baseline for updates.
- .2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with *Consultant* and *Owner*, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.
- .3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

1.05 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

- .1 Obtain from *Consultant* an electronic copy of the construction *Drawings* for the purpose of creating as-built drawings. Record information in electronic form, clearly identifying as-built deviations from the originally obtained construction *Drawings*.
- .2 Clearly label each drawing as "AS-BUILT DRAWING". Record information concurrently with construction progress. Do not conceal *Work* until required information is recorded.
- .3 Record actual construction including:
 - .1 Measured depths of elements in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by *Change Orders* and *Supplemental Instructions*
 - .6 References to *Shop Drawings*, where *Shop Drawings* show more detail.
- .3 Do not use as-built drawings for construction purposes.
- .4 Submit two (2) colour hardcopies as specified in 01 78 00 Closeout Submittals.

1.06 PROGRESS PHOTOGRAPHS

- .1 Arrange for periodic digital photography to document and provide a photographic record of the progress of the *Work* and before concealment of any work.
- .2 Identify each photograph by project name and date taken.
- .3 Submission: Submit .jpg format files in fine resolution with close out submittals on a flash drive memory device.
- .4 Do not use progress or any other *Project* photographs for promotional purposes without *Owner's* written consent.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 32 00 Construction Progress Documentation
- .2 Section 01 45 00 Quality Control
- .3 Section 01 61 00 Common Product Requirements
- .4 Section 01 77 00 Closeout Procedures
- .5 Section 01 78 00 Closeout Submittals

1.02 ADMINISTRATIVE

- .1 Prepare a *Shop Drawings* and *Submittals* schedule as required in GC 3.8 of the *Contract* as amended by TLDSB Supplementary Conditions.
- .2 Submit to *Consultant Shop Drawings* and *Submittals* required in the *Specifications* for review. Submit according to the accepted *Shop Drawing* and *Submittals* schedule, promptly and in orderly sequence to not cause delay in *Work*. Failure to submit in ample time is not considered sufficient reason for extension of *Contract Time* and no claim for extension by reason of such default will be allowed.
- .3 Do not proceed with *Work* affected by submittal until review is complete.
- .4 Present *Shop Drawings*, *Product* data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable.
- .6 Review *Shop Drawings* and *Submittals* prior to submission to *Consultant*. *Contractor's* review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of *Work* and *Contract Documents*. *Shop Drawings* and *Submittals* not stamped, signed, dated and identified as to specific project will be returned without being reviewed and considered rejected.
- .7 Notify *Consultant*, in writing at time of submission, identifying deviations from requirements of *Contract Documents* stating reasons for deviations.
- .8 Verify field measurements and affected adjacent *Work* are coordinated.
- .9 *Contractor's* responsibility for errors and omissions in submission is not relieved by *Consultant's* review of *Shop Drawings* and *Submittals*.
- .10 *Contractor's* responsibility for deviations in submission from requirements of *Contract Documents* is not relieved by *Consultant* review.
- .11 Keep one reviewed copy of each submission on site.

1.03 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to CCDC 2 GC 3.8 and related Supplementary Conditions.
- .2 *Shop Drawings* and *Submittals* are as defined in CCDC2 – 2020 and as amended by TLDSB Supplementary Conditions.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 10 *Working Days* for *Consultant's* review of each submission.
- .6 Adjustments made on *Shop Drawings* and *Submittals* by *Consultant* are not intended to change *Contract Price*. If adjustments affect value of *Work*, state such in writing to *Consultant* prior to proceeding with Work.
- .7 Make changes in shop drawings as *Consultant* may require, consistent with *Contract Documents*. When resubmitting, notify *Consultant* in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .9 Submissions to include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Sufficient space on the *Contractor's* cover for *Consultant's* and subconsultant's review stamp(s).

- .6 Details of appropriate portions of *Work* as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .10 After *Consultant's* review, distribute copies.
- .11 Submit electronic copy of *Shop Drawings* and *Submittals* for each requirement requested in specification Sections and as *Consultant* may reasonably request.
- .12 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by *Consultant* where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by *Consultant*.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by *Consultant*.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by *Consultant*.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by *Consultant*.

- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by *Consultant*.
- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by *Consultant*, no errors or omissions are discovered or if only minor corrections are made, electronic reviewed copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.04 SAMPLES

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

1.05 MOCK-UPS

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

1.06 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copies of colour digital photography in .jpg format on a memory stick, fine resolution as required in Section 01 78 00 Closeout Submittals, and as directed by Consultant.
- .2 Project identification: name and number of project and date of exposure indicated.

- .3 Frequency of photographic documentation:
 - .1 As necessary to document conditions before concealment of Work, and as directed by Consultant.

1.07 INSPECTION REPORTS, CERTIFICATES, TRANSCRIPTS

- .1 Immediately after award of *Contract*, submit Workers' Compensation Board status.
- .2 Submit inspection reports from Authorities Having Jurisdiction promptly after receipt to the *Owner* and *Consultant*.
- .3 Submit inspection reports, verifications and certificates from *Contractor's* and third party inspection agencies promptly after receipt to the *Owner* and *Consultant*.
- .4 Refer to Section 01 78 00 Closeout Submittals for further requirements.

1.08 INSURANCE AND CONTRACT SECURITY

- .1 **Insurance.** Submit transcription of insurance as required by CCDC2-2020 and TLDSB Supplementary Conditions, immediately after award of *Contract* to the *Owner* and *Consultant*.
- .2 **Bonds.** Submit bonds as required in the Owner's RFT, CCDC2-2020 and Supplementary General Conditions, immediately after award of *Contract* to the *Owner* and *Consultant*.

END OF SECTION

1 GENERAL**1.01 SUMMARY**

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

1.02 RELATED REQUIREMENTS

- .1 Section 02 40 00 – Demolition – Minor Works
- .2 Section 02 41 19.16 - Selective Interior Demolition

1.03 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with 2012 Ontario Building Code including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.04 HAZARDOUS MATERIAL DISCOVERY

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

1.05 BUILDING SMOKING ENVIRONMENT

- .1 Comply with Owner's smoking restrictions and municipal by-laws.

1.06 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and

pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:

- .1 Regulatory requirements and fees in force on date of Bid submission, and
- .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

2 PRODUCTS

2.01 PERMITS

.1 Building Permit:

- .1 Owner has applied for and will be paying for building permit. Contractor is responsible for obtaining or coordinating other permits required for Work and its various parts.
- .3 Contractor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits including
- .4 Contractor shall display building permit and other permits in a conspicuous location at Place of Work.

.2 Occupancy Permits:

- .1 Contractor shall apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.
- .2 Consultant will issue appropriate instructions to Contractor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
- .3 Contractor shall correct deficiencies in accordance with Consultant's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Contractor for costs incurred.
- .4 Contractor shall turn occupancy permits over to Owner.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 32 00 Construction Progress Documentation. Include in the *Construction Schedule* required tests, inspections required in the specifications.
- .2 Section 01 33 00 Submittal Procedures
- .3 Divisions 21, 22, 23 and 25: Specific test and inspection requirements for fire suppression, plumbing and HVAC systems.
- .4 Divisions 26 and 28: Specific test and inspection requirements for electrical and fire alarm systems.

1.02 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract and TLDSB Supplementary Instructions

1.03 DEFINITIONS

- .1 **Quality Assurance:** Activities, actions, and procedures performed before and during execution of the *Work* by the *Contractor* to protect against defects and deficiencies and confirming that construction is consistent with regulatory requirements, qualification statements and certification requirements listed within the *Contract Documents*.
- .2 **Quality Control (Testing by Contractor):** Tests, inspections, procedures, and related actions performed by the *Contractor* during and after execution of the *Work* using third party Inspection and Testing Agency to verify that completed construction complies with specified standards and technical requirements within the *Contract Documents*; these services do not include contract administration and reporting performed by *Consultant*, or Quality Auditing activities performed by *Owner*.
- .3 **Mock-ups:** Full size, physical example assemblies to illustrate finishes and materials. Mock-ups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples; mock-ups establish the standard by which the *Work* will be judged.
- .4 **Quality Audit (Testing by Owner):** Tests, inspections, procedures and related actions performed by the *Owner* during and after execution of the *Work* using third party Inspection and Testing Agency to establish that work complies with *Contract Documents* and are additional to the Quality Control and Assurance provided by the *Subcontractor*, or contract administration and reporting performed by *Consultant*.

- .5 **Inspection and Testing Agency:** An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as Inspection and Testing Agency.

1.04 GENERAL REVIEW

- .1 Allow *Consultant* 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 if *Work* is designated for special tests, inspections or approvals by instructions, or law of *Place of the Work*.
- .3 If *Contractor* covers or permits to be covered *Work* that has been designated for special tests, inspections or approvals before such is made, uncover such *Work*, have inspections or tests satisfactorily completed and make good such *Work*.
- .4 *Consultant* 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* *Owner* will pay cost of examination and replacement.

1.05 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by *Owner* for purpose of inspecting and/or testing portions of *Work*. Cost of such services will be borne by *Owner*.
- .2 Allocated costs: to Section 01 21 00 - Allowances
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform *Work* in accordance with *Contract Documents*.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by *Consultant* at no cost to *Owner* or *Consultant*. Pay costs for retesting and reinspection.

1.06 ACCESS TO WORK

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

1.07 PROCEDURES

- .1 Notify appropriate agency and *Owner* and *Consultant* a minimum of 5 working days in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in *Work*.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.08 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 *Consultant* as failing to conform to *Contract Documents*. Replace or re-execute in accordance with *Contract Documents*.
- .3 Make good other *Contractor's* work damaged by such removals or replacements promptly.
- .4 If in opinion of *Consultant* it is not expedient to correct defective *Work* or *Work* not performed in accordance with *Contract Documents*, *Owner* will deduct from *Contract Price* difference in value between *Work* performed and that called for by *Contract Documents*, amount of which will be determined by *Consultant*.

1.09 REPORTS

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

1.10 TESTS AND MIX DESIGNS

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

1.13 MOCK-UPS

- .1 Prepare mock-ups for *Work* specifically requested in *Specifications*. Include for *Work* of Sections required to provide mock-ups.
- .2 Construct in locations *Consultant* as specified in specific Section.

- .3 Prepare mock-ups for *Consultant's* review with reasonable promptness and in orderly sequence, to not cause delays in *Work*.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of *Contract Time* and no claim for extension by reason of such default will be allowed.
- .5 If requested, *Consultant* will assist in preparing schedule fixing dates for preparation.
- .6 *Specification* section identifies whether mock-up may remain as part of *Work* or if it is to be removed and when.

1.14 MILL TESTS

- .1 Submit mill test certificates as required of *Specification* Sections.

1.15 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical systems.
- .2 Refer to Mechanical and Electrical drawings and specifications for definitive requirements.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 74 00 Cleaning
- .2 Section 01 74 19 Waste Management and Disposal
- .3 Section 02 41 00.08 Demolition – Minor Works
- .4 Section 02 41 19 Selective Interior Demolition
- .5 06 08 99 Rough Carpentry for Minor Works

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 [CSA-0121-\[M1978\(R2003\)\]](#), Douglas Fir Plywood.

1.03 INSTALLATION AND REMOVAL

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

1.04 HOARDING

- .1 Refer to the Appendix A: Details for further information and hoarding requirements.
- .2 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to [CSA 0121](#).
- .2 Apply plywood panels vertically as indicated flush and butt jointed.
- .3 *Provide* at least one access door as directed. Equip door with locks and keys ensuring that Owner is provided with a key for access.
- .4 *Provide* barriers around trees and plants designated to remain where in proximity to exterior garbage bins or temporary enclosures. Protect from damage by equipment and construction procedures.

1.05 GUARD RAILS AND BARRICADES

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

1.06 DUST TIGHT SCREENS

- .1 *Provide* dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of *Work*, existing spaces adjacent the area of *Work* to limit dust to the area of work and to protect the public.
- .2 Maintain and relocate protection until such work is complete.

1.07 FLOOR PROTECTION

- .1 *Provide* "Ram Board" floor protection for entire duration of construction to existing finishes to remain and to installed finishes during the course of construction until *Ready-For-Takeover*.
- .2 Maintain and relocate protection until such work is complete.

1.08 EDGE/CORNER PROTECTION

- .1 *Provide* plywood or pre-fabricated foam protection to all edges and corners of existing finishes to remain that may be damaged by construction activities during construction.
- .2 Maintain and relocate protection until such work is complete.

1.09 ACCESS TO SITE

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

1.10 PUBLIC TRAFFIC FLOW

- .1 *Provide* and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform *Work* and protect public.

1.11 FIRE ROUTES

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

1.12 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

1.13 PROTECTION OF BUILDING FINISHES

- .1 *Provide* protection for finished and partially finished building finishes and equipment during performance of *Work*.
- .2 *Provide* necessary screens, covers, and hoardings.

- .3 Confirm with *Consultant* locations and installation schedule prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

1 GENERAL**1.00 SUMMARY**

- .1 This Section includes common requirements for *Product* quality, availability, storage, handling, protection, and transportation; manufacturer's instructions; quality of the *Work*; and coordination and fastenings.

1.01 GENERAL

- .1 Provide *Products*, materials, equipment and articles incorporated in *Work* shall be new, not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by *Consultant*, furnish evidence as to type, source and quality of *Products* provided.
- .2 Unless otherwise specified, maintain uniformity of manufacture for like items throughout.
- .3 Permanent manufacturer's markings, labels, trademarks, and nameplates on *Products* are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

1.02 REFERENCE STANDARDS

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, *Consultant* reserves right to have such *Products* or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by *Owner* in event of conformance with *Contract Documents* or by *Contractor* in event of non-conformance.

1.03 QUALITY

- .1 *Products*, materials, equipment and articles incorporated in *Work* shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of *Products* provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in

otherwise utilizing recycled and recovered materials in execution of *Work*.

- .3 Defective *Products*, whenever identified prior to completion of *Work*, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with *Consultant* based upon requirements of *Contract Documents*.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.04 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 *Consultant* of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of *Work*.
- .2 Order *Products* in sufficient time to meet the construction progress schedule and the *Contract Time*.
- .3 If a specified *Product* is no longer available, promptly notify *Consultant*. *Consultant* will take action as required.
- .4 If delivery delays are foreseeable, for any reason, promptly notify *Consultant*.
 - .1 If a delivery delay is beyond *Contractor's* control, *Consultant* will provide direction.
 - .2 If a delivery delay is caused by something that was or is within *Contractor's* control, *Contractor* shall propose actions to maintain the construction progress schedule for *Consultant's* review and acceptance.
- .5 In event of failure to notify *Consultant* at commencement of *Work* and should it subsequently appear that *Work* may be delayed for such reason *Consultant* reserves right to substitute more readily available products of similar character, at no increase in *Contract Price* or *Contract Time*.

1.05 STORAGE, HANDLING AND PROTECTION

- .1 Store, handle, and protect *Products* during transportation to *Place of the Work* and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.
- .2 Comply with manufacturer's instructions for storage, handling and protection.
- .3 Store packaged or bundled products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in Work.
- .4 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, including requirements for labeling and the provision of material safety data sheets (MSDS).
- .5 Store products subject to damage from weather in weatherproof enclosures.
- .6 Store cementitious products clear of earth or concrete floors, and away from walls.
- .7 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .8 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .9 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .10 Remove and replace damaged products at own expense and to satisfaction of *Consultant*.
- .11 Touch-up damaged factory finished surfaces *Consultant's* satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.06 TRANSPORTATION

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

1.07 MANUFACTURER'S INSTRUCTIONS

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

- .2 Notify *Consultant* in writing, of conflicts between specifications and manufacturer's instructions, so that *Consultant* will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes *Consultant* to require removal and re-installation at no increase in *Contract Price* or *Contract Time*.

1.08 QUALITY OF WORK

- .1 Ensure quality of *Work* is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately *Consultant* if required *Work* is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. *Consultant* and/or *Owner* reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of quality of *Work* in cases of dispute rest solely with *Consultant*, whose decision is final.

1.09 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out *Work*. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform *Consultant* if there is interference. Install as directed by *Consultant*.

1.11 REMEDIAL WORK

- .1 Refer to CCDC 2 and Section 01 73 00 - Execution Requirements.
- .2 Perform remedial work required to repair or replace parts or portions of *Work* identified as defective or unacceptable. Co-ordinate adjacent affected *Work* as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of *Work*.

1.12 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

- .2 Inform *Consultant* of conflicting installation. Install as directed.

1.13 FASTENINGS

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

1.14 FASTENINGS - EQUIPMENT

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

1.15 PROTECTION OF WORK IN PROGRESS

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

1.16 EXISTING UTILITIES

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 33 00 Submittal Procedures

1.02 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract as amended by TLDSB Supplementary Conditions.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Refer to 01 78 00 Closeout Submittals.

1.04 EXISTING SERVICES

- .1 Before commencing excavation, drilling or other earthwork, establish or confirm location and extent of all existing underground utilities and structures in work area.
- .2 Promptly notify *Consultant* if underground utilities, structures, or their locations differ from those indicated in *Contract Documents* or in available project information. *Consultant* will provide appropriate direction.
- .3 Record locations of maintained, re-routed and abandoned utility lines.

1.05 VERIFICATION OF EXISTING CONDITIONS

- .1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.
- .2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of *Products* used.
- .3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants. Notify *Consultant* in writing of unacceptable conditions.

1.06 SUBSURFACE CONDITIONS

- .1 Promptly notify *Consultant* in writing if subsurface conditions at *Place of the Work* differ

materially from those indicated in *Contract Documents*, or a reasonable assumption of probable conditions based thereon.

- .2 After prompt investigation, should *Consultant* determine that conditions do differ materially, instructions will be issued for changes in *Work* as provided in the *Contract*.

1.07 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Maintain code required clearances at all times. Notify *Consultant* promptly where minimum clearances cannot be maintained for review and direction before proceeding with the *Work*.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by *Consultant*.

1.08 RECORDS

- .1 Record locations of maintained, re-routed and abandoned service lines in project as-builts.

END OF SECTION

1.01 SUMMARY

- .1 Except where otherwise specified in technical *Specifications* or otherwise indicated on *Drawings*, comply with requirements of this Section.

1.02 MANUFACTURER'S INSTRUCTIONS

- .1 Install, erect, or apply *Products* in strict accordance with manufacturer's instructions. Notify *Consultant*, in writing, of conflicts between *Contract Documents* and manufacturer's instructions where, in *Contractor's* opinion, conformance with *Contract Documents* instead of the manufacturer's instructions may be detrimental to the *Work* or may jeopardize the manufacturer's warranty.
- .2 Do not rely on labels or enclosures provided with *Products*. Obtain written instructions directly from manufacturers.
- .3 *Provide* manufacturer's representatives with access to the *Work* at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

1.03 CONCEALMENT

- .1 Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:
 - .1 after review by *Consultant* and Authority Having Jurisdiction, and
 - .2 where locations differ from those shown on *Drawings*, after recording actual locations on as-built drawings.
 - .3 Arrange and install fixtures and equipment in such a way as to conserve as much headroom and space as possible in ceiling spaces.
- .2 *Provide* incidental furring or other enclosures as required.
- .3 Notify *Consultant* in writing of interferences before installation.

1.04 FASTENINGS - GENERAL

- .1 *Provide* metal fastenings and accessories in same texture, colour and finish as adjacent materials.
- .2 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.

- .3 Use non-corrosive fasteners and anchors for securing exterior work and in spaces where high humidity levels are anticipated.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

1.05 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Bolts shall not project more than one diameter beyond nuts.

1.06 FIRE RATED ASSEMBLIES

- .1 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.07 LOCATION OF FIXTURES, OUTLETS AND DEVICES

- .1 Consider location of fixtures, outlets, and devices indicated on *Drawings* as approximate.
- .2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.
- .3 Promptly notify *Consultant* in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

1.08 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete *Work*.
- .2 Fit several parts together, to integrate with other *Work*.
- .3 Uncover *Work* to install ill-timed *Work*.
- .4 Remove and replace defective and non-conforming *Work*.

- .5 Remove samples of installed *Work* for testing.
- .6 *Provide* openings in non-structural elements of *Work* for penetrations of mechanical and electrical *Work*.
- .7 Execute *Work* by methods to avoid damage to other *Work*, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore *Work* with new products in accordance with requirements of *Contract Documents*.
- .11 Fit *Work* to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 *Provide* firestopping in accordance with Section 07 84 00 - Firestopping to maintain the integrity of fire separations, including:
 - .1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.
 - .2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.09 PROTECTION OF COMPLETED WORK AND WORK IN PROGRESS

- .1 Adequately protect parts of the *Work* completed and in progress from any kind of damage.
- .2 Promptly remove, replace, clean, or repair, as directed by *Consultant*, work damaged as a result of inadequate protection.
- .3 Do not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety or integrity of the *Work*.

1.10 REMEDIAL WORK

- .1 Notify *Consultant* of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.

END OF SECTION

1 GENERAL

1.1 REQUEST FOR CUTTING, PATCHING AND REMEDIAL WORK

- .1 Submit written request in advance of cutting, coring, or alteration which affects or is likely to affect:

- .1 Structural integrity of any element of the *Work*.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of any operational element.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of *Owner* or other contractors.
- .6 Warranty of *Products* affected.

- .2 Include in request:

- .1 Identification of *Project*.
- .2 Location and description of affected work, including drawings or sketches as required.
- .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 other contractors.
- .7 Written permission of affected other contractors.
- .8 Date and time work will be executed.

1.2 PRODUCTS

- .1 Unless otherwise specified, when replacing existing or previously installed *Products* in the course of cutting and patching work, use replacement *Products* of the same character and quality as those being replaced.
- .2 If an existing or previously installed *Product* must be replaced with a different *Product*, submit request for substitution in accordance with Section 01 25 00 - Substitution Procedures.

1.3 PREPARATION

- .1 Inspect existing conditions in accordance with Section 01 71 00 - Examination and Preparation.
- .2 *Provide* supports to ensure structural integrity of surroundings; provide devices and methods to protect other portions of the *Work* from damage.
- .3 *Provide* protection from elements for areas that may be exposed by uncovering work.

1.4 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services' utilities, execute the *Work* at times directed by local governing authorities, with a minimum of disturbance to the *Work*, pedestrian and vehicular traffic, and ongoing *Owner* operations.
- .2 Where the *Work* involves breaking into or connecting to existing services, give *Owner* 48 hours notice for necessary interruption of mechanical or electrical services.
- .3 Maintain excavations free of water.
- .4 Keep duration of interruptions to a minimum.
- .5 Carry out interruptions after regular working hours of occupants, preferably on weekends, unless *Owner's* prior written approval is obtained.
- .6 Protect and maintain existing active services. Record location of services, including depth, on as-built drawings.
- .7 Construct or erect barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures as required to protect pedestrian and vehicular traffic.

1.5 CUTTING, PATCHING, AND REMEDIAL WORK

- .1 Coordinate and perform the *Work* to ensure that cutting and patching work is kept to a minimum.
- .2 Perform cutting, fitting, patching, and remedial work including excavation and fill, to make the affected parts of the *Work* come together properly and complete the *Work*.
- .3 Provide openings in non-structural elements of the *Work* for penetrations of mechanical and electrical work.
- .4 Perform cutting by methods to avoid damage to other work.
- .5 Do not use internal combustion or other noxious gas producing powered tools or equipment at any time inside the *Place of the Work*.
- .6 Provide proper surfaces to receive patching, remedial work, and finishing.
- .7 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the *Products* affected, in a manner that neither damages nor endangers the *Work*.
- .8 Do not use pneumatic or impact tools without *Owner's* prior approval.
- .9 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.

- .10 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.
- .11 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.
- .12 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 77 00 Closeout Procedures
- .2 Section 01 56 00 Temporary Barriers and Enclosures
- .3 Section 01 45 00 Quality Control
- .4 Section 01 71 00 Examination and Preparation

1.02 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract as amended by TLDSB Supplementary Conditions.

1.03 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from Authorities Having Jurisdiction for disposal of waste and debris.
- .4 *Provide* on-site containers for collection of waste materials and debris. Coordinate location with drawings and *Owner's* representative.
- .5 Dispose of waste materials and debris off site.
- .6 Clean interior areas prior to start of finishing *Work*, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 *Provide* adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

- .11 *Provide* floor protection – “RAM Board” over full extent of *Project* area to protect new and existing finished floor surfaces for the full duration of construction. Tape all seams and perimeter to prevent debris from affecting finished surfaces. Reinstall damaged floor protection as required during the course of construction.

1.04 FINAL CLEANING

- .1 When *Work* is *Ready-For-Takeover* remove surplus products, tools, construction machinery and equipment not required for performance of remaining *Work*.
- .2 Remove waste products and debris other than that caused by others, and leave the *Work* and the *Place of the Work* clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris.
- .5 Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fittings, walls, floors and ceilings.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvers and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fittings and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells where impacted by *Work*.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical

equipment.

- .18 Clean roofs, downspouts, and drainage systems in areas included in the scope of *Work*.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 78 00 Closeout Submittals
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.
- .3 TLDSB Supplementary Conditions to the CCDC2 - 2020

1.02 READY-FOR-TAKEOVER

- .1 The prerequisites to attaining *Ready-for-Takeover* of the *Work* are described in the General Conditions of the *Contract*.

1.03 INSPECTION AND REVIEW BEFORE READY-FOR-TAKEOVER

- .1 *Contractor's Inspection*: Before applying for the *Consultant's* review to establish *Ready-for-Takeover* of the *Work* the *Contractor* shall:
 - .1 Ensure that the specified prerequisites to *Ready-for-Takeover* of the *Work* are completed.
 - .2 Conduct an inspection of the *Work* to identify defective, deficient, or incomplete work.
 - .3 Prepare a comprehensive and detailed list of items to be completed or corrected.
 - .4 Provide an anticipated schedule and costs for items to be completed or corrected.
- .2 *Consultant's Review*: Upon receipt of the *Contractor's* application for review, together with the *Contractor's* list of items to be completed or corrected, the *Consultant* and the *Contractor* shall arrange a mutually satisfactory agreed date and time to jointly review the *Work*. The *Consultant* will advise the *Contractor* whether or not the *Work* is *Ready-for-Takeover*. Add additional items, if any, to the *Contractor's* list of items to be completed or corrected. Provide the *Consultant* with a copy of the revised list.
- .3 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The *Contractor's* inspection and *Consultant's* review procedures specified above shall be repeated until the *Work* is *Ready-for-Takeover* and no items remain on the *Contractor's* list of items to be completed or corrected.

- .4 When the *Consultant* determines that the *Work* is *Ready-for-Takeover*, the *Consultant* will notify the *Contractor* and the *Owner* in writing to that effect.

1.04 PREREQUISITES TO FINAL PAYMENT

- .1 After *Ready-for-Takeover* of the *Work* and before submitting an application for final payment in accordance with the General Conditions of *Contract*: Correct or complete all remaining defective, deficient, and incomplete work.
- .2 Remove from the *Place of the Work* all remaining surplus *Products*, *Construction Equipment*, and *Temporary Work*.
- .3 Perform final cleaning and waste removal necessitated by the *Contractor's* work performed after *Ready-for-Takeover*, as specified in Section 01 74 00 – Cleaning.

1.05 PARTIAL USER OCCUPANCY

- .1 If partial *Owner* occupancy of a part of the *Work* is required before the date of *Ready-for-Takeover* of the entire *Work* of the *Contract*, the provisions of this Section shall apply, to the extent applicable, to that part of the *Work* that the *Owner* intends to occupy.

1.06 SUBSTANTIAL PERFORMANCE OF THE WORK

- .1 The prerequisites to, and the procedures for, attaining substantial performance of the *Work*, or similar such milestone as provided for in the lien legislation applicable to the *Place of the Work*, shall be:
 - .1 independent of those for attaining *Ready-for-Takeover* of the *Work*, and
 - .2 in accordance with the lien legislation applicable to the *Place of the Work*.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 01 32 00 Construction Progress Documentation
- .2 Section 01 33 00 Submittal Procedures

1.02 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with contractor's representative and *Consultant* and *Owner*, in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify *Project* requirements.
 - .2 Review manufacturer's installation instructions and warranty requirements.
 - .2 *Consultant* to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Within 30 days of award of the *Contract*, submit to the *Consultant* checklists including itemized documentation and material required at project closeout.
- .3 Two weeks prior to *Ready-For-Takeover*, submit to the *Consultant*, two final draft copies of operating and maintenance manuals in English.
- .4 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in *Work*.
- .5 Provide evidence, if requested, for type, source and quality of products supplied.

1.05 OPERATION AND MAINTENANCE MANUAL

- .1 Prepare a comprehensive operation and maintenance manual, in the language of the *Contract*, using personnel qualified and experienced for this task.
- .2 Submit an initial draft of the operation and maintenance manual for *Consultant's* review. If required by *Consultant's* review comments, revise manual contents and resubmit for *Consultant's* review. If required, repeat this process until *Consultant* accepts the draft manual in writing.
- .3 Submit final version to *Owner* in hard copy and electronic format. Provide two (2) hard copies in the format prescribed below.

1.06 OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: Two (2) vinyl, hard covered, three 'D' rings, loose leaf 216 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Refer to 1.07 Contents below for cover requirements.
- .5 Arrange content structured as indicated in paragraph 1.07 Contents below.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of *Product* and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide electronic copy of manual in PDF format on USB memory stick.
- .10 Two (2) weeks prior to request for substantial completion, submit digital copies of the Project Record Documents for review to the Consultant in accordance with 01 33 00 Submittal Procedures. Contractor to arrange for Cloud based or USB stick storage for delivery to Consultant.
- .11 Submit two identical copies of the final documents including Consultant's comments/corrections/updates.
- .10 Provide full contents of Project Record Documents in digital format on a USB stick with the

submission of the final hardcopy submission to the Consultant.

1.07 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 **Binder Cover:**
 - .1 Title of project; include: *Owner Name, Project, RFT # and PO#*
 - .2 Volume/Binder title: "Operating & Maintenance Manual: *Discipline*"
 - .3 Date of submission;
- .2 **Cover Page:**
 - .1 Title of project; include: *Owner Name, Project, RFT # and PO#*
 - .2 Volume/Binder title: "Operating & Maintenance Manual: *Discipline*"
 - .3 Date of submission;
 - .4 Date of Substantial Completion;
- .3 **Project Information: (Page 2)**
 - .1 Project Location: *Project Address*
 - .2 Owner: *Owner Name, Address, Contact name, telephone, email*
 - .3 Contractor: *Contractor Name, Address, Contact name, Telephone, email*
 - .4 Consultants: List each discipline separately and include: *Business Name, Address, Contact Name, Telephone, email.*
- .4 **Table of Contents** (Page 3 and edited for each volume if required): Use the structure indicated below as the table of contents and to organize the various sections as follows:
 - .1 **SECTION 1: Administration**
 - .1 Project Directory
 - .1 List in spreadsheet format contact list; for each *Product* or system, include complete contact information for *Subcontractors, Suppliers* and manufacturers, including local sources for supplies and replacement parts.
 - .2 Include: Name of business, address, contact name, telephone number(s), email address and website.
 - .2 Warranties
 - .1 General Contractor: Letter of Warranty/Guarantee
 - .2 Subtrades: Letters of Warranty/Guarantee (organize in order by Specification section)
 - .3 Product/Manufacturer's Warranties (organize in order by Specification section)

- .3 Permits, Reports, Certificates, Testing
 - .1 Preconstruction
 - .1 Building Permit (copy of)
 - .2 Notice of Project (copy of)
 - .3 Preconstruction drainage inspection (if required)
 - .4 Preconstruction Air Audit and Report
 - .2 Construction
 - .1 Plumbing Rough-in Inspection
 - .2 Backfill compaction test results
 - .3 Concrete Testing Results (7 day/28 day)
 - .4 Electrical Inspection/ESA Certificate
 - .5 Building Inspection Report(s)
 - .6 Consultant General Review Reports – organize by discipline in the following order: Architectural, Structural, Mechanical, Electrical
 - .7 Interim ESA Inspection Reports
 - .3 Substantial Completion/Ready-for-Takeover
 - .1 Final ESA Certificate of Acceptance
 - .2 Fire Alarm Verification Test and Inspection Report
 - .3 Post-Construction Drainage Inspection and Report
 - .4 Post-Construction Air Audit and Report
 - .5 Final Building Inspection Report

.2 **SECTION 2: Product Data, Shop Drawings, Operating, Maintenance and Training Instructions**

- .1 Organize in order by Specification section in volumes as follows:
 - .1 **VOLUME 1 – ARCHITECTURAL and STRUCTURAL**
 - 02 Demolition
 - 03 Concrete
 - 04 Masonry
 - 05 Steel
 - .1 Structural Steel
 - .2 Metal Fabrications
 - 06 Wood and Plastics
 - .1 Architectural Woodwork
 - 07 Thermal and Moisture Protection
 - .1 Insulation
 - .2 Membranes
 - .3 Sheet metal flashings and trim

- .4 Applied Fireproofing
- .5 Fire Stopping
- .6 Joint Sealants
- .7 Expansion Joint Cover Assemblies
- 08 Openings
 - .1 Doors and Hardware
 - .2 Curtain Wall, Glazing and Windows
- 09 Finishes
 - .1 Gypsum Board Assemblies
 - .2 Non-Structural Metal Framing
 - .3 Tile
 - .4 Acoustic Panel Ceilings
 - .5 Resilient Flooring
 - .6 Terrazzo Flooring
 - .7 Painting
- 10 Accessories
 - .1 Toilet Compartments
 - .2 Toilet and Bath Accessories
- 14 Elevating Devices

.2 VOLUME 2 – MECHANICAL AND ELECTRICAL

- .1 Refer to mechanical and electrical specifications for specific operation and maintenance manual requirements.
- 21 Mechanical General
- 22 Plumbing
- 23 HVAC
- 25 Testing, Adjusting, Balancing and Commissioning
- 26 Electrical
- 27 Communications
- 28 Fire Alarm
- .2 For each section include:
 - .1 **Product Data:** mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.
 - .2 **Drawings:** supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

- .3 **Submittals.** Provide final reviewed, stamped and where applicable engineered stamped and sealed shop drawings and submittals. Refer to 01 33 00 Submittal Procedures for requirements.
- .4 **Operating and maintenance procedures,**
 - .1 Incorporate manufacturer's operating and maintenance instructions, in a logical sequence.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .5 **Training materials.**

.3 **CONTRACTOR'S AS-BUILT DRAWINGS**

- .1 Submit two hardcopies of full size 610 x 915 mm (24" x 36") as-built redline markups rolled and wrapped in protective paper wrap and labelled by project name and RFT # on the outside wrapping.
- .2 Submit one hardcopy in each binder of as-built redline markups in reduced 279 x 432 mm (11x17) format tri-folded to fit the binder(s).
- .3 Organize by discipline in the following order:
 - .1 Architectural
 - .2 Structural
 - .3 Mechanical
 - .4 Electrical
- .4 Refer to requirements in paragraphs 1.07 through 1.08

1.08 SPARE PARTS, MAINTENANCE MATERIALS AND SPECIAL TOOLS

- .1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical *Specifications* sections.
- .2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed *Products*.
- .3 Provide tags for special tools identifying their function and associated *Product*.

- .4 Deliver to and store items at location directed by *Owner* at *Place of the Work*. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.
- .5 Catalogue all items and submit to *Consultant* an inventory listing organized by *Specifications* section. Include *Consultant* reviewed inventory listing in operation and maintenance manual.

1.09 WARRANTIES AND BONDS

- .1 Collect and retain information relevant to Warranties during Construction.
- .2 Assemble approved information in Project Record Document binder, submit upon acceptance of work and organize binder as follows:
 - .1 Group warranty documents in Project Record Documents Manual as specified above.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number and email of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .3 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Ready-for-Takeover is determined.
- .4 Conduct joint 12 month warranty inspection, measured from time of acceptance, by Consultant.
- .5 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .6 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Owner to proceed with action against Contractor.

END OF SECTION

1.01 SUMMARY

- .1 Demonstrate and provide training to *Owner's* personnel on operation and maintenance of equipment, building envelope and systems prior to scheduled date of *Ready-for-Takeover of the Work*.
- .2 *Owner* will provide list of personnel to receive training and will coordinate their attendance at agreed upon times.
- .3 Coordinate and schedule demonstration and training provided by *Subcontractors* and *Suppliers*.

1.02 SUBMITTALS

- .1 Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical *Specifications*.
- .2 *Consultant* and *Owner* will review submittal and advise *Contractor* of any necessary revisions.
- .3 Submit report(s) within 5 *Working Days* after completion of demonstration and training:
 - .1 identifying time and date of each demonstration and training session,
 - .2 summarizing the demonstration and training performed, and including a list of attendees.

1.03 PREREQUISITES TO DEMONSTRATION AND TRAINING

- .1 Testing, adjusting, and balancing has been performed in accordance with *Contract Documents*. Equipment and systems are fully operational.
- .2 Copy of completed operation and maintenance manual is available for use in demonstration and training.
- .3 Conditions for demonstration and training comply with requirements specified in technical *Specifications*.

1.04 DEMONSTRATION AND TRAINING

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment and system.
- .2 Review operation and maintenance manual in detail to explain all aspects of operation and maintenance.

- .3 Prepare and insert additional information in operation and maintenance manual if required.
- .4 Equipment and systems for demonstration and training include:
 - .1 Automatic door operators, related controls and fire alarm integration.
 - .2 Sentronic hold open life safety closers and fire alarm integration.
 - .3 Emergency call systems.
 - .4 Adult change tables.
 - .5 Plumbing fixtures including washfountains, drinking fountains, flush valves, faucets.
 - .6 Light fixtures and controls.
 - .7 Radiant panel systems.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 This Section includes the following:
 - .1 Demolition and removal of buildings and structures
 - .2 Abandoning in place, and or removing below grade construction

1.02 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures

1.03 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 [CSA S350-\[M1980\(R2003\)\]](#), Code of Practice for Safety in Demolition of Structures.

1.04 DEFINITIONS

- .1 **Demolition:** rapid destruction of building following removal of hazardous materials.
- .2 **Hazardous Materials:** dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.

1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Owner for the material ownership including but not limited to:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- .2 Scheduling:
 - .1 Employ necessary means to meet project timelines.
 - .2 In event of unforeseen delay notify Consultant in writing.

1.06 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Shop Drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario as follows:
 - .2 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .3 Schedule of Demolition Activities: Coordinate with Section 01 32 16.16 - Construction Progress Schedule.

1.07 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial and Municipal regulations.
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.
- .3 Standards: Comply with Ontario Health and Safety requirements.

1.08 SITE CONDITIONS

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

1.09 EXISTING CONDITIONS

- .1 Hazardous Materials: Hazardous materials may be encountered in the Work.
 - .1 Refer to Owner's requirements when hazardous materials are discovered on site.
 - .2 Hazardous materials will be removed by Owner.

2 PRODUCTS**2.01 EQUIPMENT**

- 1. Not used.

3 EXECUTION**3.01 EXAMINATION**

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- .2 Review Project Record Documents of existing construction provided by Owner.
- .3 Owner/Consultant does not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .4 Inventory and record the condition of items being removed and salvaged.

- .5 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element.
- .6 Promptly submit a written report to Consultant.
- .7 Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during demolition operations.
- .8 Verify that hazardous materials have been remediated before proceeding with demolition operations.

3.02 PREPARATION

- .2 Protection of In-Place Conditions:
 - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring required.
 - .2 Keep noise, dust, and inconvenience to occupants to minimum.
 - .3 Protect building systems, services and equipment.
 - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
 - .5 Provide floor protection "RAM board" over existing adjacent finished flooring to remain and to areas that will be travelled during construction. Tape all seams and perimeters to prevent dust and debris below floor protection.
- .3 Demolition/Removal:
 - .1 Demolish parts of structure as indicated.
 - .2 Remove parts of existing building to permit new construction.
 - .4 Trim edges of partially demolished building elements to tolerances as defined by Consultant to suit future use.
 - .5 At end of each day's work, leave Work in safe and stable condition.
 - .6 Protect interiors of parts not to be demolished from exterior elements at all times.
 - .7 Demolish to minimize dusting.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 This Section includes the following:
 - .1 Demolition and removal of selected portions of interior building components and finishes.
 - .2 Repair procedures for selective demolition operations.
- .2 This section does not include the following:
 - .1 Removal of hazardous materials or asbestos abatement.
 - .2 Demolition of exterior building components or structural elements.
 - .3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.
- .3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

1.02 RELATED REQUIREMENTS

- .1 Section 02 41 00.08 – Demolition – Minor Works
- .2 Section 09 21 16 - Gypsum Board Assemblies
- .3 Section 09 30 13 - Ceramic Tiling
- .4 Section 09 51 13 - Acoustical Panel Ceilings

1.03 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 [CSA S350](#) M1980 (R2003), Code of Practice for Safety in Demolition of Structures

1.04 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not

otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

- .9 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Owner for the material ownership as follows:
- .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - .2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.
- .2 Pre Demolition Meeting: Convene pre-installation meeting to:
- .1 Confirm extent of salvaged and demolished materials
 - .2 Review Contractor's demolition plan
 - .1 Verify existing site conditions adjacent to demolition work
 - .2 Coordination with other construction sub trades

1.06 ACTION AND INFORMATION SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
- .1 Schedule of Selective Demolition Activities: Coordinate with Section 01 32 16.19 - Construction Progress Schedule – Bar (GANTT) Chart, and indicate the following:
 - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - .2 Coordinate with Owner's building manager ongoing site operations.
 - .3 Interruption of utility services.
 - .4 Coordination for shutoff, capping, and continuation of utility services.
 - .5 Use of building entrances, corridors and stairs.
 - .6 Locations of temporary partitions and means of egress, including for others affected by selective demolition operations.
 - .7 Coordination with Owner's continuing occupancy of portions of existing building.
 - .2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:
 - .1 Proposed Dust Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations,

and proposed time frame for their operation. Consultant reserves the right to make modifications where proposed methods interfere with the Owner's ongoing operation

- .2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.
 - .3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - .4 Pre and post demolition Photographs: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.
- .2 Informational Submittals: Provide the following submittals when requested by the Consultant:
- .1 Landfill Records
 - .2 Pre and post demolition photographs.

1.07 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
 - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.
 - .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.

1.08 SITE CONDITIONS

- .1 Owner will occupy portions of building immediately adjacent to selective demolition area:
 - .1 Conduct selective demolition so that Owner's operations will not be disrupted.
 - .2 Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.
- .2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities:
 - .1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.
- .3 Consultant and Owner assume no responsibility for condition of areas to be selectively demolished:
 - .1 Conditions existing at time of Pre Bid Site Review will be maintained by Owner as far as practical.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Consultant if materials suspected of containing hazardous substances are encountered and perform the following activities:

- .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
- .2 Hazardous materials will be as defined in the Hazardous Materials Act.
- .3 Hazardous materials will be removed by Owner before start of the Work.
- .4 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Consultant. Hazardous materials will be removed by Owner under a separate contract or as a change to the Work.
- .5 Hazardous Substances: Hazardous Substances are present in building to be selectively demolished. A report on the presence of Hazardous Substances is attached as an information document to this Section for review and use:
 - .1 Examine report to become aware of locations where hazardous materials are present.
 - .2 Do not disturb Hazardous Substances or items suspected of containing Hazardous Substances.

2 PRODUCTS

2.01 TEMPORARY SUPPORT STRUCTURES

- .1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.02 DESCRIPTION

- .1 This section of the Work includes, but is not necessarily limited to, the following:
 - .1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris
 - .2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated
 - .3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site
 - .4 Retain items indicated on drawings for re use in new construction

2.03 DEBRIS

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

2.04 EQUIPMENT

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

2.05 REPAIR MATERIALS

- .1 Use repair materials identical to existing materials:

- .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - .2 Use a material whose installed performance equals or surpasses that of existing material.
 - .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.
- .3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.
- .4 Prefinished Sheet Steel: Prefinished sheet steel, colour to match existing radiation cabinets, bent and profiled to match existing radiation cabinets.
- .5 Gypsum Board Patching Compounds: Joint compound to [ASTM C 475/C 475M](#), bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 - Gypsum Board Assemblies.
- .6 Hoarding and Dust Screens: Refer to Section 01 56 00 - Temporary Barriers and Enclosures for stud framing and gypsum board sheathing materials.

2.06 EXISTING MATERIALS

- .1 Items to be retained for re use in new construction include, but are not limited to the following:
 - .1 Ceiling components.
 - .2 Washroom accessories and other miscellaneous items identified on drawings.
 - .3 Confirm with Consultant any materials that appear to be in re usable condition prior to disposal.
 - .6 Confirm with Consultant any materials scheduled for re use that are not in re usable condition prior to installation.

3 EXECUTION

3.01 EXAMINATION

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be

removed and salvaged.

- .4 Notify the Consultant where existing mechanical, electrical, or structural elements conflict with intended function or design:
 - .1 Investigate and measure the nature and extent of conflict and submit a written report to Consultant.
 - .2 Consultant will issue additional instructions or revise drawings as required to correct conflict.
- .5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

- .1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.
- .2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - .1 Arrange to shut off affected utilities with utility companies.
 - .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - .4 Cut off pipe or conduit to a minimum of 25 mm below slab, and remove concrete mound. Patch concrete using cementitious grout.
- .3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.
- .4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

- .1 Identify and mark all equipment and materials identified to be retained by Consultant or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.
- .2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.
- .4 Do not disrupt active or energized utilities crossing the demolition site.

- .5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.
- .6 Mark all materials required to be re used, store in a safe place until ready for re installation.
- .7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.
- .8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

3.04 CONCRETE SLAB REINFORCING

- .1 Locate location of reinforcing steel in concrete slabs prior to cutting or coring using non destructive, non ionizing radio frequency locators.
- .2 Core concrete slabs to avoid reinforcing steel, electrical conduit or water pipes; adjust core location and coordinate with Engineer where slab features interfere with core drilling.
- .3 Notify the Engineer immediately for further instructions where coring or cutting will damage existing slab features.

3.05 SELECTIVE DEMOLITION

- .1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.
- .2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.
- .3 Demolish in a manner to minimize dusting and to prevent migration of dust.
- .4 Selling or burning of materials on the site is not permitted.
- .5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self levelling grout.
- .6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.
 - .1 Provide bond beams in new openings cut into existing concrete masonry unit walls.
 - .2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.
- .7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

- .8 Demolish existing carpet, resilient flooring and adhesive remnants as follows:
 - .1 Vacuum existing carpet thoroughly, prior to removal, using vacuum equipped with power head/sweeper.
 - .2 Apply fine mist water spray to carpet as required to minimize dust generation during removal. Avoid spraying near electrical outlets.
 - .3 Demolish existing carpet and resilient floor finishes, remove and dispose of off site.
 - .4 Remove adhesive to the greatest extent possible using scraping tools and as follows:
 - .1 Do not use solvent based cleaners to remove adhesive remnants.
 - .2 Lightly shot blast or grind floor using machine designed for purpose to remove adhesive remnants.
 - .3 Vacuum floor ready for application of skim coating.
 - .4 Repair all slab depressions and damage with cementitious patching compound.
 - .5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.
 - .5 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.
- .9 Demolish existing ceramic tile finishes. Remove setting bed or adhesive to the greatest extent possible using mechanical scraping tools and as follows:
 - .1 Saw cut edge of tile for clean and even transition joint between existing tile to remain and new flooring materials
 - .2 Lightly shot blast or grind floor to remove remnants of setting materials
 - .3 Vacuum floor ready for application of skim coating
 - .4 Repair all slab depressions and damage with cementitious patching compound. Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials
- .10 Demolish completely all ceiling panels and grid as indicated.
- .11 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.
- .12 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
- .13 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.06 PATCHING AND REPAIRING

- .1 Floors and Walls:
 - .1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
 - .2 Provide a level and smooth surface having uniform finish colour, texture, and

appearance.

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

3.07 PROTECTION

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

3.08 CLEANING

- .1 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.
- .2 Maintain access to exits clean and free of obstruction during removal of debris.
- .3 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.
- .4 Dispose of materials in accordance with applicable regulations.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Work Included:
 - .1 All reinforcement for cast-in-place concrete.
- .2 Related Work:
 - Section 03 30 00 – Cast in Place Concrete
 - Section 03 35 00 – Concrete Finishing

1.2 REFERENCE

- .1 All referenced standards shall be the current edition, or the edition referenced by the Ontario Building Code in effect at the time of building the permit application and noted on general notes of structural drawings.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 – Submittal Procedures. This applies to all reinforcements.
- .2 Submit to the Consultant for review before the start of Work 4 white prints of shop drawings. Leave room on the drawings for stamps of the Consultant and the Structural Engineer. Check and sign the drawings before submission. Only 2 copies of the drawings will be returned to the General Contractor.
- .3 Allow a minimum of 10 working days for review of each submission of shop drawings by the Structural Engineer's office. Shop drawings received after noon will be date-stamped as received the following working day.
- .4 Submit plans including elevations, sections, and bar lists necessary to show the reinforcing layout and placement subject to the review by the Structural Engineer's office. Show location of construction joints and detail reinforcement at joints. Show concrete cover on the diagrams. Draw to scale not smaller than 1:50 (1/4" = 1'-0").
- .5 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and splices with identifying code marks to permit correct placement without reference to Structural Drawings.
- .6 Conform to CSA A23.1 and the Reinforcing Steel Manual of Standard Practice, unless the Contract Documents contain a more stringent requirement, in which case, the latter shall govern. Provide accessories as required in accordance with CSA A23.1:24/CSA A23.2:24. Conform to ACI, SP 66 Detailing Manual whenever a detail condition is not covered by any of the above but is covered by the ACI Manual.
- .7 Lap lengths and bar development lengths shall be in accordance with CSA A23.3, unless otherwise indicated. Provide standard hooks at ends of

hooked bars in accordance with CSA A23.3.

- .8 Do not release for fabrication reinforcing bars whose lengths may be affected by field conditions, such as the final elevation of footings, until the governing field dimensions have been ascertained.
- .9 Review of shop drawings by the Consultant is on a sampling basis for general conformity with contract documents. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the work accurate and in conformity with the Contract Documents.
- .10 After review, drawings will be returned to the Contractor stamped to show one of the following: Reviewed – Released for fabrication.
 - 1. Noted – Released for fabrication after revisions notes are made. Submit revised drawings for Consultant's records.
 - 2. Resubmit – Correct and resubmit for review.
 - 3. Conforms to the requirements of each authority that has reviewed the drawings.
- .11 Keep on site at all times a set of reviewed shop drawings and use only these drawings and the Structural Drawings to place reinforcing steel. Neatly mark on the Structural Drawings changes issued during the course of construction.

1.4 TOLERANCE

- .1 Conform to CSA A23.1

1.5 SUBSTITUTES

- .1 Substitute different size bars only if permitted in writing by the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Reinforcing steel: billet steel, grade 400R, deformed bars to CSA G30.18, unless otherwise indicated
- .2 Welded reinforcing steel: weldable steel, grade 400W, deformed bars to CSA G30.18. Required only where welding is indicated.
- .3 Cold-drawn annealed steel wire ties: to ASTM A 82
- .4 Welded wire fabric: to ASTM A185. Provide in flat sheets only
- .5 Bar supports and side form spacers: to CSA-A23.1. For exposed concrete surfaces and for floor and roof slabs with directly applied ceiling finish:

use either plastic bar supports, or plastic tipped bar supports for at least the bottom 25mm; use plastic slide form spacers; and use plastic colour to match concrete.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Consultant's approval for locations of reinforcement splices other than shown on the contract drawings.
- .3 Where indicated, weld reinforcement in accordance with CSA W186. Use weldable reinforcing steel.
- .4 Ship bundles of bar reinforcement clearly identified in accordance with the bar lists.

PART 3 - EXECUTION

3.1 QUALITY CONTROL

- .1 Quality control procedures and implementation are the responsibilities of the General Contractor, and submission of a quality control plan for work executed under this section is required.
 - .1 The plan shall include: the names of personnel responsible for execution of the plan.
 - .2 Means and methods for confirming material compliance with specifications, and associated documentation procedures.
 - .3 Program for confirming and documenting compliance of sub-trade qualifications and their individual employees, sub-contractors, and engineers.
 - .4 Procedures for reviewing compliance in the field with construction documents including documentation of locations reviewed, photographs taken, and timing for review. The contractor's review must be completed prior to review of the Consultant.
 - .5 Procedures for rectifying deficiencies noted by the contractor/consultant of independent inspection agencies.

3.2 FIELD BUILDING

- .1 Do not field bend reinforcement except where indicated or authorized by the Consultant.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure. Replace bars that develop cracks or splits.

3.3 FIELD WELDING

- .1 Do not field weld reinforcement except where indicated or authorized by the Consultant.
- .2 Conform to CSA A23.1 and CSA W186.

3.4 REVIEW OF
CONSTRUCTION

- .1 Provide written notification to the Consultant and the Independent Inspection and Testing Agency at least 48 hours prior to intended concrete pour to allow for a reinforcing placement review.
- .2 Review of construction by the Consultant and the Independent Inspection and Testing Agency is to ascertain general conformity with contract documents. It does not relieve the Contractor of his contractual responsibilities. The review is based on representative samples of the work and does not relieve the Contractor from carrying out their own quality control and making the work in conformance with the contract drawings and specifications.
- .3 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found.
- .4 Bring to the attention of the Consultant, any defects, or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Consultant will decide what corrective action may be taken and will issue the necessary instructions.

3.5 PITS, CURBS, BASES

1. NOT USED.

3.6 MECHANICAL AND
ELECTRICAL WORK

1. NOT USED.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Work Included:
 - .1 All reinforcement for cast-in-place concrete.
 - .2 All formwork/falsework and placement of concrete
 - .3 All concrete finishing
- .2 Related Work:
 - Section 03 20 00 – Concrete Reinforcing
 - Section 03 30 00 – Cast in Place Concrete
 - Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

- .1 All referenced standards shall be the current edition or the edition referenced by the Ontario Building Code in effect at the time of the building permit application and noted on general notes of structural drawings.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C 309-03, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C 330-04, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .4 ASTM C 494/C 494M-05, Standard Specification for Chemical Admixtures for Concrete.
 - .5 ASTM C 1017/C 1017M-03, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .6 ASTM D 412-98a (2002) e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .7 ASTM D 624-00e1, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .8 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
 - .9 ASTM D 1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Damp proofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

- .4 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283, Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001, Cementitious Materials for Use in Concrete.

1.3 ACRONYMS AND TYPES

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
 - .1 Type GU or GUb - General use cement
 - .2 Type MS or MSb - Moderate sulphate-resistant cement
 - .3 Type MH or MHb - Moderate heat of hydration cement
 - .4 Type HE or Heb - High early-strength cement
 - .5 Type LH or LHb - Low heat of hydration cement
 - .6 Type HS or HSb - High sulphate-resistant cement
- .2 Fly ash:
 - .1 Type F - with CaO content less than 8%
 - .2 Type CI - with CaO content ranging from 8 to 20.
 - .3 Type CH - with CaO greater than 20%
- .3 GGBFS - Ground, granulated blast-furnace slag.

1.4 DESIGN REQUIREMENT

- .1 Alternative 1 - Performance in accordance with CSA-A23.1/A23.2 and as described in MIXES of PART 2 – PRODUCTS.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 At least 2 weeks prior to beginning Work, submit to the Consultant certification that the plant delivering the concrete, the equipment, and the materials to be used in the concrete works comply with the requirements of CSA-A23.1.
- .4 At least 2 weeks prior to starting concrete work, submit all concrete mix designs, including pump mixes and indicate where each concrete mix is to be used. Where Class C1, C2 or F1 mix designs are required, submit test data to confirm that air-void system conforms to CSA A23.1 for each mix design.
- .5 Minimum submission requirements for each concrete mix design shall include CSA exposure class, minimum specified compressive strength at 28 days, maximum aggregate size, maximum water/cement ratio, assumed method of concrete placement, slump range, air content range, percentage and type of supplementary cementing materials, admixtures, certificate of compatibility of admixtures (unless all admixtures are supplied by same supplier), architectural requirements.
- .6 Concrete hauling time: submit for review by the Consultant deviations

exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control and General Requirements.
- .2 Submit to the Consultant a minimum 2 weeks prior to starting the concrete work a valid and recognized certificate from the plant delivering concrete.
 - .1 When the plant does not hold a valid certification, provide test data and a certification by a qualified independent inspection and testing laboratory that the materials used in the concrete mixture meet the specified requirements.
- .3 Minimum 2 weeks prior to starting the concrete work, submit the proposed quality control procedures for review by the Consultant on the following items:
 - .1 Falsework erection
 - .2 Hot weather concrete
 - .3 Cold weather concrete
 - .4 Curing
 - .5 Finishes
 - .6 Formwork removal
 - .7 Joints
- .4 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to the Consultant verifying compliance that the concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 DELIVERY, STORAGE
AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to by the Consultant and the concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to concrete hauling time shall be submitted for review by the Consultant.
- .2 Concrete delivery: ensure continuous concrete delivery from the concrete plant meets CSA A23.1/A23.2.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse or recycling.
 - .2 Divert unused concrete materials from landfill to local facility approved by the Consultant.
 - .3 Provide an appropriate area on the job site where concrete trucks can be safely washed.
 - .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Consultant.

- .5 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazards.
- .6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial, and National regulations.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and resources shall be selected to be as sustainable as possible for use indicated.

2.2 MATERIALS

- .1 Cement: to CAN/CSA-A3001, Type GU.
- .2 Blended hydraulic cement: Type GU to CAN/CSA-A3001.
- .3 Supplementary cementing materials: with minimum 20% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA-A3001.
- .4 Water: to CSA-A23.1.
- .5 Aggregates: to CAN/CSA-A23.1/A23.2. Do not use recycled concrete as aggregate.
- .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C 260.
 - .2 Chemical admixture: to ASTM C 494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA-A23.1/A23.2.
 - .1 Compressive strength: 40 MPa at 28 days.
- .8 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 30 MPa at 28 days.
- .9 Curing compound: to CSA-A23.1/A23.2 white, Type 1-chlorinated rubber.
- .10 Pre-moulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D 1751.
 - .2 Sponge rubber: to ASTM D 1752, Type I, firm grade.
- .11 Weep hole tubes: plastic.
- .12 Dampproof membrane:
 - .1 Polyethylene membrane:

2.3 MIXES

- .1 Plain: 15 mil thick polyethylene film.
 - .2 Membrane adhesive: as recommended by membrane Manufacturer.
- .1 Alternative 1 - Performance Method for specifying concrete: to meet Consultant performance criteria in accordance with CAN/CSA-A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below.
 - .2 Provide concrete mix to meet the following hard state requirements:
 - .1 Durability and class of exposure or as indicated on the contract drawings.
 - .2 Minimum compressive strength at 28 days: 30 MPa or as indicated on the contract drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Obtain Consultant's approval before placing concrete.
 - .1 Provide 48hours notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with CSA A23 and pre-agreed placing procedures, and as detailed in the contract drawings.
- .3 During concrete operations:
 - .1 Development of cold joints is not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum amount of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of the equipment and the concrete mix design.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to the placing of concrete, obtain the Consultant's approval of the proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
- .11 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout specified to anchor and hold dowels in positions as indicated.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes, or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by the Consultant.
 - .2 Sleeves and openings greater than 100 x 100 mm that are not indicated in the contract documents must be reviewed by the Consultant.
 - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications by the Consultant before the placing of concrete.
 - .4 Check locations and sizes of sleeves and openings shown on the contract drawings.
- .3 Anchor bolts:
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 With approval of the Consultant, grout anchor bolts in preformed holes or holes drilled after the concrete has set. Formed holes to be a minimum of 100 mm diameter. Drilled holes to be a minimum of 25 mm or larger in diameter than the bolts used.
 - .3 Protect anchor bolt holes from water accumulations, snow, and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout.
- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with general conditions and details on the contract drawings.
 - .2 Install weep hole tubes and drains as indicated in the contract drawings.
- .5 Dovetail anchor slots: in accordance with Section 04 00 00 Masonry.
 - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - .2 Install continuous vertical anchor slots at 800 mm on centre where concrete walls are masonry faced.
- .6 Grout under base plates using procedures in accordance with the manufacturer's recommendations which result in 100 % contact over grouted area.
- .7 Finishing and curing:
 - .1 Finish concrete in accordance with CSA-A23.1/A23.2.
 - .2 Use curing compounds compatible with applied finish on concrete surfaces. Provide a written declaration that compounds used are compatible.
 - .3 Rub exposed sharp edges of concrete with carborundum to produce a minimum 3 mm radius edges unless otherwise indicated.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance in accordance with CSA-A23.1/A23.2 straightedge method to tolerance schedule as required for floor finishes.

3.4 FIELD QUALITY
CONTROL

- .1 Site tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and CSA A23 and submit report as described in PART 1 - SUBMITTALS.
- .2 Inspection and testing of concrete and concrete materials will be carried out by a testing laboratory designated by the Consultant for review in accordance with CSA-A23.1/A23.2.
- .1 Ensure testing laboratory is certified in accordance with CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between the testing laboratory and the Consultant.
- .4 Contractor will pay for costs of tests.
- .5 Consultant will require additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Inspection or testing by the Consultant will not augment or replace the Contractor's quality control nor relieve the Contractor of their contractual responsibility.

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Work Included:
 - .1 Formwork/falsework and placement of concrete
 - .2 All concrete finishing.
- .3 Related Work:
Section 03 30 00 – Cast in Place Concrete

1.2 REFERENCE

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-[95], Surface Sealer for Floors.
- .2 CSA International
 - .1 CAN/CSA-A23.1-[09]/A23.2-[09], Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.

1.3 ACTION AND
INFORMATIONAL
SUBMITTALS

- .1 Submit submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Provide two copies of WHMIS MSDS in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures].

1.4 ENVIRONMENTAL
REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make work area watertight protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than [10] degrees C from [7] days before installation to a minimum 48 hours after completion of work. Maintain relative humidity at a maximum 40% during the same period.
- .5 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

1.5 DELIVERY, STORAGE
AND HANDLING

- .1 Deliver and store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, and with the manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in the original factory packaging labelled with the manufacturer's name and address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SUSTAINABLE
REQUIREMENTS

- .1 Materials and products shall be in accordance with Section 01 47 15 - Sustainable Requirements: Construction, and with Section 01 35 21 - LEED Requirements.

2.2 PREFORMANCE
REQUIREMENTS

- .1 Product quality and quality of work shall be in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit a written declaration that the components used are compatible and will not adversely affect the finished flooring products and their installation adhesives.

2.3 CHEMICAL HARDENERS

- .1 Liquid-hard Concrete Densifier and Chemical Hardener Compound, to be installed as per manufacturer requirements.
- .2 Water: potable.

2.4 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20.

2.5 CURING COMPOUNDS

- .1 Select low VOC, water-based, organic-solvent free curing compounds.

2.6 CONCRETE STAINS

- .1 Select low VOC, water-based concrete stains.

2.7 MIXES

- .1 Mixing ratios shall be in accordance with the manufacture's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verify that slabs, substrates, and site condition surfaces are ready to receive concrete finishing work, and that elevations are as indicated on contract drawings. All concrete finishing work shall be in accordance with the manufacturer's written instructions.

3.2 PREPARATION OF
EXISTING SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce a minimum 3 mm radius edges unless otherwise indicated.
- .2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.
- .3 Use strong solvent or mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .4 Use protective clothing, eye protection, and respiratory equipment during the stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

- .1 Apply concrete finishing floor hardener in accordance with the manufacturer's written instructions.
- .2 After floor treatment is dry, seal control joints and joints at junctions with vertical surfaces with sealant.
- .3 Apply floor treatment in accordance with the sealer manufacturer's written instructions.
- .4 Clean over spray. Clean sealant from adjacent surfaces.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion of concrete finishing work, remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 – Cleaning.
- .3 Waste Management: separate waste materials for reuse, recycling, and disposal in accordance with Section 01 74 19 - Waste Management and Disposal and 01 35 21 - LEED Requirements.

3.5 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Related Works
Section 04 05 19 – Masonry Anchorage and Reinforcing

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN3 A165 SERIES-14, CSA Standards on Concrete Masonry Units, covers: A165.1, A165.2, A165.3.
 - .2 CSA A179-14, Mortar and Grout for Unit Masonry.
 - .3 CSA-A370-14, Connectors for Masonry.
 - .4 CSA-A371-14, Masonry Construction for Buildings.
 - .5 CSA-S304.1-14, Masonry Design for Buildings.

1.3 SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures
 - .1 Submit duplicate full-size samples of each type of masonry unit, mortar, connector, anchorage and reinforcing, and accessory for review and acceptance by the Consultant.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications, and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Sections 01 33 00 - Submittal Procedures, 01 35 29.06 – Health and Safety Requirements, and 01 35 43 – Environmental Procedures.
 - .1 Indicate VOCs for epoxy coatings and galvanized protective coatings and touch-up products.
 - .2 Indicate VOCs for mortar, grout, parging, colour additives and admixtures.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Shop drawings consist of bar bending details, bar lists and placing drawings.
 - .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

1.4 STORAGE AND
HANDLING

- .1 Protect on site stored or installed material from moisture damage in accordance with the manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

- .1 Standard concrete block units: to CAN3-A165 Series (CAN3-A165.1).
 - .2 Classification: Sc / 15Mpa / 50% / M.
 - .3 Size: modular.
 - .4 Special shapes: provide square or bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
- .2 Special fire-resistant concrete block units: To CAN3-A165 Series (specifically CSA A165.1) as modified below.
 - .1 classification: See Architecture.
 - .2 Fire resistant characteristics: aggregate used in units and equivalent thickness of units to the National Building Code of Canada (NBC) 2020, for fire-resistance ratings indicated.
 - .3 Size: modular.
 - .4 Special shapes: provide square or bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams and provide additional shapes as indicated.

2.2 REINFORCEMENTS AND CONNECTORS

- .1 Bar reinforcement: To CSA-A371 and CAN/CSA G30.18, Grade 400.
- .2 Wire reinforcement: To CSA-A371 and CSA G30.14.
- .3 Connectors shall be corrosion resistant: To CSA-A370 and CSA-S304.

2.3 MORTAR AND GROUT

- .1 Mortar: To CSA A179.
 - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
 - .2 Colour: ground-coloured natural aggregates or metallic oxide pigments.
- .2 Mortar Type: Mortar to be type 'S' unless otherwise indicated.
- .3 Following applies regardless of mortar types and uses specified above:
 - .1 Mortar for grouted reinforced masonry: Shall conform to CA/CSA A170-04 and shall be fine type grout with a minimum 28-day compressive strength of 10 Mpa.
- .5 Grout: to CSA A179, Table 3.
- .6 Parging mortar: type 'S' to CSA A179.

2.4 ACCESSORIES

- .1 Weep hole vents: purpose-made PVC, galvanized steel, or polypropylene fiber filter, with colour chosen by the owner.
- .2 Nailing Inserts: 0.5 mm minimum thickness, galvanized.
- .3 Bolts: 12 mm diameter x 150 mm long with ends bent 50 mm at 90

degrees.

- .4 Flashings: As indicated by the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .1 Bond: Running stretcher bond with vertical joints in perpendicular alignment and centered on adjacent stretchers above and below.
 - .2 Coursing height: 200 mm for one block and one joint.
 - .3 Jointing: Tool where exposed or where paint or other finish coating is specified to provide smooth compressed concave surface.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 CONSTRUCTION

- .1 Exposed masonry:
- .1 Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.
 - .2 Perform cut outs for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Building-In:
- .1 Install masonry connectors and reinforcement where indicated on drawings.
 - .2 Build-in items required to be built into masonry.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
 - .5 Install loose steel lintels over openings where indicated.
- .3 Concrete block lintels:
- .1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .2 End bearing: Shall be indicated in the contract drawings.
- .4 Support of loads:
- .1 Refer to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
 - .2 Use grout to CSA A179 where grout is used in lieu of solid units.
 - .3 Install building paper below voids to be filled with grout; keep paper 25 mm back from faces of units.

- .5 Provision for movement: Refer to Contract Drawings.
- .6 Interface with other work:
 - .1 Cut openings in existing work as indicated.
 - .2 Openings in walls: To be approved by the Consultant.
 - .3 Make good existing work. Use materials to match existing.
- .7 Build in flashings in masonry in accordance with CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 For masonry backing, embed flashing 25 mm in joint.
 - .2 For concrete backing, insert flashing into reglets.
 - .3 For wood frame backing, staple flashing to walls behind sheathing paper.
 - .4 For gypsum board backing, bond to wall using the manufacturer's recommended adhesive.
 - .3 Lap joints 150 mm and seal with adhesive.
- .8 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 610 mm on center.

3.3 REINFORCING AND CONNECTING

- .1 Install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371 and CSA-S304.1 unless indicated otherwise.
- .2 Prior to placing concrete, mortar, or grout, obtain the Consultant's approval of placement of reinforcement and connectors.

3.4 BONDING AND TYING

- .1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304, CSA-A371 and as indicated.
- .2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CSA-A371 and as indicated.

3.5 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.6 GROUTING

- .1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.7 ANCHORS

- .2 Supply and install metal anchors as indicated.

<u>3.8 LATERAL SUPPORT AND ANCHORAGE</u>	.3	Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.
<u>3.9 SITE TOLERANCES</u>	.4	Tolerances in notes of Clause 5.3 of CSA-A371 apply.
<u>3.10 FIELD QUALITY CONTROL</u>	.5	Inspection and testing will be carried out by a Testing Laboratory designated by the Consultant.
<u>3.11 CLEANING</u>	.1	Perform cleaning after installation to remove construction and accumulated environmental dirt.
	.2	Upon completion of installation, remove surplus materials, rubbish, tools, and equipment barriers.
<u>3.12 PROTECTION</u>	.6	Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Related Works
Section 04 20 00.08 – Masonry for Minor Works
Section 04 05 19 – Masonry Anchorage and Reinforcing

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete
 - .2 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA A371-14, Masonry Construction for Buildings.
 - .4 CAN/CSA-A3000-18, Cementitious Materials Compendium; CAN/CSA-A3002-18, Masonry and Mortar Cement.

1.3 ACTION AND
INFORMATIONAL

- .1 Product Data:
 - .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Provide the manufacturer's printed product literature, specifications, and datasheets. Include product characteristics, performance criteria, and limitations.
 - .3 Provide 2 Paper and one PDF copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Sections 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures. Indicate VOC's mortar, grout, parging, colour additives and admixtures. Expressed as grams per litre (g/L).
- .2 Manufacturer's Instructions:
 - .1 Provide the manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Certificates: Product certificates signed by the manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Pre-Installation Meetings: Conduct pre-installation meetings to verify project requirements, the manufacturer's installation instructions and the manufacturer's warranty requirements

1.5 DELIVERY, STORAGE
AND HANDLING

- .1 Deliver, store and handle masonry mortar and grout materials in accordance with Section 01 61 00 - Common Product Requirements and with the manufacturer's written instructions. Supplemented as follows:
 - .1 Deliver prepackaged, dry-blended mortar mix to project site in labelled plastic-lined bags each bearing name and address of the manufacturer, production codes or batch numbers, and colour or formula numbers.
 - .2 Maintain mortar, grout and packaged materials in a clean and dry location with protection against dampness, freezing, traffic and contamination by foreign materials.

- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, paddling, and packaging materials in accordance with Sections 01 74 19 – Waste Management and Disposal and 01 35 21 – LEED Requirements.

1.6 SITE CONDITIONS

- .1 Ambient Conditions: maintain materials and surrounding air temperature to:
 - .1 Minimum 18 degrees C prior to, during, and 48 hours after completion of masonry work.
 - .2 Maximum 32 degrees C prior to, during, and 48 hours after completion of masonry work.
- .2 Weather Requirements: CAN/CSA A371.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Cement:
 - .1 To CAN/CSA-A3001, Type GU – General use hydraulic cement (Type 10) gray colour.
 - .2 Use low VOC products in compliance with SCAQMD Rule 1168.
 - .3 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type 'S'.
 - .4 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type 'S' integral water repellents.
 - .5 Packaged Dry Combined Materials for mortar: to CAN/CSA-A179, Type 'S', using gray colour cement.
- .3 Aggregate: supplied by one supplier.
 - .1 Fine Aggregate: to CAN/CSA-A179, manufactured sand.
 - .2 Course Aggregate: to CAN/CSA-A179.
- .4 Water: clean and potable.
- .5 Lime:
 - .1 Quick Lime: to CAN/CSA-A179, Type 'S'
 - .2 Hydrated Lime: to CAN/CSA-A179, Type 'S'
- .6 Bonding Agent: epoxy type.
- .7 Polymer Latex: organic polymer latex admixture of butadiene-styrene type non-emulsifiable bonding admixture.

2.2 COLOUR ADDITIVES

- .1 Use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample. Admixtures to be approved prior to use. Use in accordance with the specific manufacturer's recommendations

2.3 ADMIXTURES

- .1 Admixtures:
 - .1 Air entraining admixture: To ASTM C 260.
 - .2 Chemical admixture: To ASTM C 494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.

2.4 MORTAR MIXES

- .1 Mortar for interior masonry:
 - .1 Loadbearing: Type 'S' unless otherwise indicated.
 - .2 Non-Loadbearing: Type 'S' unless otherwise indicated.
- .1 Following applies regardless of mortar types and uses specified above:
- .2 Mortar for calcium silicate brick and concrete brick: type 'O' based on proportion specifications.
 - .1 Mortar for grouted reinforced masonry: Type 'S' unless otherwise indicated.

2.5 MORTAR MIXING

- .1 Use pre-blended, pre-coloured mortar prepackaged under controlled factory conditions. Ingredients batching limitations to be within 1% accuracy.
- .2 Mix mortar ingredients in accordance with CAN/CSA A179 in quantities needed for immediate use.
- .3 Maintain sand uniformly damp immediately before mixing process.
- .4 Add mortar colour and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and colouration.
- .5 Do not use anti-freeze compounds including calcium chloride or chloride-based compounds.
- .6 Do not add air entraining admixture to mortar mix.
- .7 Use a batch type mixer in accordance with CAN/CSA A179.
- .8 Pointing mortar: Pre-hydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour no more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .9 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.
- 10 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under 10] degrees C.

2.6 GROUT MIXES

- .1 Lintels: grout mix 10 to 17.5 MPa strength at 28 days; 200-250 mm slump; mixed in accordance with CAN/CSA A179 fine grout.
- .2 Grout: Minimum compressive strength of 12.5 MPa at 28 days. Maximum aggregate size and grout slump: CAN/CSA A179.

2.7 GROUT MIXING

- .1 Mix batched and delivered grout in accordance with CAN/CSA-A23.1 transit mixed.

- .2 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA A179 fine grout.
- .3 Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- .4 Do not use calcium chloride or chloride-based admixtures.

2.8 MIX TESTS

- .1 Testing Mortar Mix:
 - .1 Test mortar to requirements of Section 01 45 00 - Quality Control, and in accordance with CAN/CSA A179, for mortar based on property specification. Test prior to construction and during construction for:
 - .1 Compressive strength.
 - .2 Consistency.
 - .3 Mortar aggregate ratio.
 - .4 Sand/cement ratio.
 - .5 Water content and water/cement ratio.
 - .6 Air content.
 - .7 Splitting tensile strength.
- .2 Testing Grout Mix:
 - .1 Test grout to requirements of Section 01 45 00 - Quality Control, and in accordance with CAN/CSA A179, for grout based on property specification. Test prior to construction and during construction for:
 - .1 Compressive strength.
 - .2 Sand/cement ratio.
 - .3 Water content and water/cement ratio.
 - .4 Slump.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Request inspection of spaces to be grouted.

3.2 PREPARATION

- .1 Apply bonding agent to existing concrete surfaces.
- .2 Plug clean-out holes with block masonry units. Brace masonry for wet grout pressure.

3.3 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.

3.4 CONSTRUCTION

- .1 Do masonry mortar and grout work in accordance with CAN/CSA A179 except where specified otherwise.
- .2 Apply parging in uniform coating not less than [total] [10] mm thick [, where indicated].

3.5 MIXING

- .1 All pointing mortar can be mixed using a regular paddle mixer. Only electric motor mixers are permissible. Mixers run on hydrocarbons are not permitted, due to fumes. Mixing by hand must be pre-approved by the Consultant.
- .2 Clean all mixing boards and mechanical mixing machines between batches.
- .3 Mortar must be weaker than the units it is binding.
- .4 Contractor to appoint one individual to mix mortar for the duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.

3.6 MORTAR PLACEMENT

- .1 Install mortar to the manufacturer's instructions.
- .2 Install mortar to requirements of CAN/CSA A179.
- .3 Install mortar and grout to requirements of Sections 04 20 00.08 – Masonry for Minor Works and 04 05 13 – Masonry Mortaring and Grouting.
- .4 Remove excess mortar from grout spaces.

3.7 GROUT PLACEMENT

- .1 Install grout in accordance with the manufacturer's instructions.
- .2 Install grout in accordance with CAN/CSA A179.
- .3 Work grout into masonry cores and cavities to eliminate voids.
- .4 Do not install grout in lifts greater than 400 mm, without consolidating grout by rodding.
- .5 Do not displace reinforcement while placing grout.

3.8 FIELD QUALITY
CONTROL

- .1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
 - .1 Test and evaluate mortar prior to construction and during construction in accordance with CAN/CSA A179.
 - .2 Test and evaluate grout prior to construction and during construction to CAN/CSA A179; test in conjunction with masonry unit sections specified.
- .2 Manufacturer's Field Services: in accordance with Section 04 05 00 - Common Work Results for Masonry.

3.9 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools, and equipment barriers.
- .2 Remove droppings and splashings using a clean sponge and water.
- .3 Clean masonry with low pressure clean water and soft natural bristle brush.
- .4 Waste Management: separate waste materials for reuse, recycling, and disposal in accordance with Section 01 74 19 – Waste Management and Disposal 01 35 21 - LEED Requirements.

3.10 PROTECTION OF
COMPLETED WORK

- .1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at the end of each workday. Anchor securely in position.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Related Works
Section 04 20 00.08 – Masonry for Minor Works
Section 04 05 13 – Masonry Mortaring and Grouting

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A82/A 82M-07(2017), Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .3 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - .4 ASTM A580/A580M-18, Standard Specification for Stainless Steel Wire.
 - .5 ASTM A641/A641M-09(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .6 ASTM-A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA A370-14, Connectors for Masonry.
 - .4 CAN/CSA A371-14, Masonry Construction for Buildings.
 - .5 CAN/CSA G30.18-21, Billet-Steel Bars for Concrete Reinforcement.
 - .6 CSA-S304.1-14 (R2019), Design of Masonry Structures.
 - .7 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 ACTION AND
INFORMATIONAL
SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide the manufacturer's printed product literature, specifications and datasheets illustrating products to be incorporated into project for specified products.
 - .2 Provide two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Sections 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario,

Canada.

- .2 Provide shop drawings detailing bar bending details, anchorage details, and lists and placing drawings.
- .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .4 Samples:
 - .1 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .5 Manufacturers' Instructions:
 - .1 Provide the manufacturer's installation instructions.
- .6 Sustainable Design Submittals:
 - .1 LEED Submittals: in accordance with Section 01 35 21 - LEED Requirements.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports including sand gradation test in accordance with CAN/CSA-A179 showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 – Common Work Results for Masonry.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meetings to verify project requirements, the manufacturer's installation instructions and the manufacturer's warranty requirements. Comply with Section 04 05 00 - Common Work Results for Masonry.
- .4 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 43 00 - Quality Control and requirements of Section 04 05 00 - Common Work Results for Masonry.

1.5 FIELD MEASUREMENTS

- .1 Make field measurements necessary to ensure proper fit of members.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle masonry anchorage and reinforcing materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Packaging Waste Management:
 - .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Bar reinforcement: Steel to CAN/CSA A371 and CAN/CSA G30.18, Grade 400 and stainless steel to ASTM A 167.

- .2 Connectors: to CAN/CSA A370 and CSA-S304.1.
- .3 Corrosion protection: to CSA-S304.1, galvanized to CSA-S304.1 and CAN/CSA A370.
- .4 Fasteners: installed post-construction:
 - .1 Screw Shields and Plugs: to be vibration-resistant, chemical-resistant, water-resistant, installed in mortar joints, and placed directly into solid masonry units.
 - .2 Bolts and Screws: size and type to suit application, locate where indicated.
 - .3 Nails: case-hardened cut or spiral nails, size, and type to suit fastening application.
 - .4 Powder-Driven Fasteners: pin styles and lengths to suit fastening application in accordance with the manufacturers use, load, and hold recommendations.
 - .5 Adhesives: epoxies, mastics and contact cements for fastening applications, use in accordance with the manufacturers' recommendations.
- .5 Ties: hot dip galvanized to CAN/CSA A370 Table 5.2 steel finish.
 - .1 Corrugated to CAN/CSA A370.
 - .2 Unit ties, to CAN/CSA A370: rectangular, fabricated from cold-drawn steel, size to suit application.
 - .3 Adjustable Unit Ties: to CAN/CSA A370: proprietary type ties, type, style, and size to suit application in accordance with the manufacturer's recommendations.
 - .4 Joint Reinforcement Ties: to CAN/CSA A370:
 - .1 Single Wythe Joint Reinforcement: As shown on the Contract Drawings.
- .6 Anchors: to CAN/CSA A370:
 - .1 Conventional Anchors: As shown on the Contract Drawings.
- .7 Conventional Bolts: As shown on the Contract Drawings.
- .8 Adhesive Anchors: proprietary systems, measure and mix system where epoxy materials are hand-measured and mixed in accordance with the manufacturers' written instructions.

2.2 FABRICATION

- .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Fabricate connectors in accordance with CAN/CSA A370.
- .3 Obtain the Consultant's approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of the Consultant, weld reinforcement in accordance with

CSA W186.

- .5 Ship reinforcement and connectors clearly identified in accordance with the contract drawings.

2.3 SOURCE QUALITY CONTROL

- .1 Provide the Consultant with a certified copy of a mill test report of reinforcement steel and connectors, showing physical and chemical analysis, a minimum of 5 weeks prior to commencing reinforcement work.
- .2 Upon request, inform the Consultant of the proposed source of material to be supplied.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

3.3 INSTALLATION

- .1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA A370, CAN/CSA A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.
- .2 Prior to placing concrete, mortar, or grout, obtain the Consultant's approval of placement of reinforcement and connectors.
- .3 Supply and install additional reinforcement to masonry as indicated.

3.4 BONDING AND TYING

- .1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304.1, CAN/CSA A371 and as indicated.
- .2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CAN/CSA A371 and as indicated.
- .3 Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with CAN/CSA A370 and CAN/CSA A371 as well as the manufacturer's instructions.

3.5 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry beams, masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CSA-S304.1, CAN/CSA A371, and CAN/CSA A179.
- .3 Support and position reinforcing bars in accordance with CAN/CSA A371.

3.6 GROUTING

- .1 Grout masonry in accordance with CSA-S304.1, CAN/CSA A371 and

CAN/CSA A179 and as indicated.

3.7 ANCHORS

- .1 Supply and install metal anchors in accordance with CAN/CSA A370 and CAN/CSA A371 and as indicated.

3.8 LATERAL SUPPORT AND ANCHORAGE

- .1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.9 MOVEMENT JOINTS

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.10 FIELD BENDING

- .1 Do not field bend reinforcement and connectors except where indicated or authorized by the Consultant.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars and connectors which develop cracks or splits.

3.11 FIELD QUALITY CONTROL

- .1 Site inspections in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Obtain the Consultant's approval of the placement of reinforcement and connectors, prior to placing mortar and grout.

3.12 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.13 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
- .1 Remove surplus materials, excess materials, rubbish, tools, and equipment.
- .2 Waste Management: separate waste materials for reuse, recycling, and disposal in accordance with Sections 01 74 19 – Waste Management and Disposal and 01 35 21 - LEED Requirements.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Related Works
Section 05 50 00 – Metal Fabrications
Section 09 91 23 – Interior Painting

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM A 36/A 36M-14, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A 193/A 193M-15, Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
 - .3 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 Handbook of the Canadian Institute of Steel Construction.
 - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92 (R2018), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16-19, Limit States Design of Steel Structures.
 - .4 CAN/CSA-S136-16, North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .5 CSA W47.1-09 (R2019), Certification of Companies for Fusion Welding of Steel.
 - .6 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .7 CSA W55.3-1965 (R2013), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59-18, Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
 - .1 MPI-INT 5.1, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
 - .1 NACE No. 3/SSPC SP-6, Commercial Blast Cleaning.

1.3 ACTION AND
INFORMATIONAL
SUBMITTALS

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

- .2 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- .3 Erection drawings:
 - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
 - .1 Description of methods.
 - .2 Sequence of erection.
 - .3 Type of equipment used in erection.
 - .4 Temporary bracings.
- .4 Fabrication drawings:
 - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada.
- .5 Samples:
 - .1 Prepare sample of typical exposed structural connections in accordance with AISC Specifications of Architecturally exposed structural steel and for approval by the Consultant. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness, and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance, and material acceptable for entire project.
- .6 Source Quality Control Submittals:
 - .1 Submit Two copies of mill test reports 4 weeks prior to fabrication of structural steel.
 - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
 - .2 Provide mill test reports certified by metallurgists qualified to practice in the Province of Ontario, Canada.
- .7 Fabricator Reports:
 - .1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

1.4 DELIVERY, STORAGE,
AD HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 with CSA-S136.1 to resist forces, moments, shears and allow for movements indicated.
- .2 Shear connections:
 - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
 - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
- .3 For composite construction select or design minimum end connection to resist reaction resulting from factored movement resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.
- .4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada for non-standard connections.

2.2 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 Grade as indicated and/or CAN/CSA-S136.
- .2 Anchor bolts: to CSA-G40.20/G40.21, Grade 300W, ASTM A 36/A 36M.
- .3 High strength anchor bolts: to ASTM A 193/A 193M, Grade 400.
- .4 Bolts, nuts, and washers: to ASTM A 307, ASTM A 325, ASTM A 325M, ASTM A 490/A 490M.
- .5 Welding materials: to CSA W48 Series, CSA W59, and certified by Canadian Welding Bureau.
- .6 Shop paint primer: to CISC/CPMA 2-75 solvent reducible alkyd, gray.
- .7 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m².
- .8 Shear studs: to CSA W59, Appendix H.

2.3 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136, and in accordance with approved and reviewed shop drawings.
- .2 Install shear studs in accordance with CSA W59.
- .3 Continuously seal members by continuous welds, intermittent welds, and plastic filler where indicated. Grind smooth.
- .4 Provide holes in top and bottom flanges where indicated. Weld threaded studs to top and bottom flanges for attachment of wood nailers where indicated.

2.4 PREPARATION

- .1 Clean and prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136, except where members to be encased in concrete.
- .2 Clean members and remove loose mill scale, rust, oil, dirt, and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .3 Apply one coat of primer in shop to steel surfaces to CAN/CSA-S16 except:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces to receive field installed stud shear connections.
 - .3 Surfaces and edges to be field welded.
 - .4 Faying surfaces of slip-critical connections.
 - .5 Below grade surfaces in contact with soil.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges, and corners before prime coat is dry.

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 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16, CAN/CSA-S136.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 CONNECTION TO
EXISTING WORK

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to the Consultant for direction before commencing fabrication.

3.4 MARKING

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16, CAN/CSA-S136, and in accordance with approved and reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Consultant.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by a testing laboratory designated by the Consultant.
- .2 Provide safe access and working areas for testing on site, as required by a testing agency and as authorized by the Consultant.
- .3 Submit test reports to the Consultant within 2 weeks of completion of inspection.
- .4 The Owner will pay costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .5 Test shear studs in accordance with CSA W59.

3.7 FIELD PAINTING

- .1 Paint in accordance with Section 09 91 23 - Interior Painting.
 - .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
- .2 Waste Management: separate waste materials for reuse, recycling, and disposal in accordance with Sections 01 74 19 – Waste Management and Disposal and 01 35 21 - LEED Requirements.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Related Works
 - Section 03 30 00 – Cast-in-Place Concrete
 - Section 04 22 00 – Unit Masonry
 - Section 05 12 23 – Structural Steel for Buildings

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40- 97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181- 99, Ready-Mixed, Organic Zinc-Rich Coating.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21- R2023, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92-R2003, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16:24 Limit States Design of Steel Structures.
 - .4 CSA W48:23, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59:24, Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .3 The Environmental Choice Program
 - .1 CCD-047a- 98, Paints, Surface Coatings.
 - .2 CCD-048- 98, Surface Coatings - Recycled Water-borne.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications, and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs for finishes, coatings, primers, and paints.
- .1 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE,
AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Storage and Protection:
 - .1 Cover exposed stainless-steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating before shipping to job site.
 - .2 Leave protective covering in place until the final cleaning of building. Provide instructions for removal of protective covering.

1.6 WASTE MANAGEMENT
AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by the Consultant.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 350W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to a minimum ASTM A325 unless noted otherwise.
- .5 Aluminum sheet: To ASTM B209/B209M.
- .6 Stainless steel tubing: Refer to architectural.

.7 Grout: See Contract Drawings.

2.2 FABRICATION

- .1 Fabricate work square, true, straight, and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof round-headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Chromium plating: Refer to Architectural.
- .3 Shop coat primer: to CAN/CGSB-1.40.
- .4 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 ISOLATION COATING

- .1 Isolate aluminum from following components, by means of bituminous paint:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar, and masonry.
 - .3 Wood.

2.5 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use unadulterated primer as prepared by the manufacturer. Paint on dry surfaces, free from rust, scale, and grease when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.6 ANGLE LINTELS

- .1 Steel angles: Refer to Contract Drawings.

PART 3 – EXECUTION

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to the Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.7 CLEANING

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

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 07 21 16 - Blanket Insulation: Insulation for wood framed cavities.
- .3 Section 07 26 00 - Vapour Retarders: Vapour retarder installation in wood framed assemblies.
- .4 Section 09 21 16 Gypsum Board Assemblies.

1.02 REFERENCE STANDARDS

- .1 Canadian Wood Council
 - .1 Wood Design Manual [2010 (R2014)] Edition
 - .2 Engineering Guide for Wood Frame Construction [2014]
- .5 CSA Group (CSA)
 - .1 [CSA B111-\[1974 \(R2003\)\]](#), Wire Nails, Spikes and Staples.
 - .2 [CSA 086-\[14\]](#) Engineered Design in Wood
 - .3 [CSA 0121-\[08\(R2013\)\]](#), Douglas Fir Plywood.
 - .4 [CSA 0141-\[05\(R2014\)\]](#), Softwood Lumber.
 - .5 [CSA 0151-\[09\(R2014\)\]](#), Canadian Softwood Plywood.
 - .6 [CSA 0153-\[13\]](#), Poplar Plywood.
 - .7 [CSA 0325-\[07\(R2012\)\]](#), Construction Sheathing.
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber [2010].
- .8 Ontario Building Code (OBC) 2012

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for[wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit manufacturer's installation instructions.
- .3 Shop Drawings:
 - .1 For structural applications submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
 - .2 Include on drawings:
 - .1 Design data in accordance with [CAN/CSA-086](#) and CWC Engineering Guide for Wood Frame Construction.

- .2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.
- .3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.
- .4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

1.05 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .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 or indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
 - .3 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.
 - .5 Store and protect from[nicks, scratches, and blemishes.
 - .6 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 STRUCTURAL FRAMING

- .1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 [CSA 0141](#).
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Structural Composite Lumber (SCL) in accordance with [ASTM D 5456](#), for following uses:
 - .1 Laminated veneer lumber (LVL): beams as indicated.

2.03 FURRING AND BLOCKING

- .1 Furring, blocking, nailing strips, grounds, rough bucks:
 - .1 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .4 Post and timbers sizes: "Standard" or better grade.

2.06 ACCESSORIES

- .1 General purpose adhesive: to [CSA 0112.9](#).
- .2 Nails, spikes and staples: to [ASTM F 1667](#).
- .3 Bolts: [12.5] mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, [explosive actuated fastening devices], recommended for purpose by manufacturer.
- .5 Joist hangers, connectors and fasteners: in accordance with accepted shop drawings, minimum 1 mm thick sheet steel, galvanized to minimum ZF001 coating designation.
- .6 Fastener Finishes:
 - .1 Plated finish: use cadmium plated fasteners for interior work.
- .7 Sill Plate Gasket: Closed cell polyethylene foam gasket in width to match sill plate width, 6 mm thick.

3 EXECUTION

3.01 EXAMINATION

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

3.02 SYSTEMS INTEGRATION

- .1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets where encountered in the renovation work at exterior envelope conditions.
- .2 Install insulation in exterior wall framing cavities that will not be accessible after completion of framing.
- .3 Install sill plate gasket in continuous lengths between concrete surfaces and wood framing.

3.03 FRAMING INSTALLATION

- .1 Install engineered framing and plant fabricated structural wood components, including all hangers, connectors and fasteners, in accordance with accepted shop drawings and manufacturers' instructions.
- .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 lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .7 Countersink bolts where necessary to provide clearance for other work.
- .8 Install specified panel product for each application.
- .9 Install plywood wall sheathing in accordance with manufacturer's printed instructions [and accepted shop drawings.
- .10 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.05 FURRING AND BLOCKING

- .1 Install furring and blocking as required to space-out and support wall and ceiling mounted work as required.

3.06 CLEANING

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

3.07 WASTE MANAGEMENT

- .1 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.
- .2 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.

3.08 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 04 04 99 - Masonry for Minor Works
- .2 Section 07 21 16 - Blanket Insulation
- .3 Section 072600 – Vapour Retarders
- .4 Section 072700 – Air Barriers
- .5 Section 076200 – Sheet Metal Flashings and Trim

1.02 REFERENCE STANDARDS

- .1 ASTM International
 - .1 **ASTM C 612-[14]**, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .2 **ASTM C 726-[12]**, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .3 **ASTM D1621-10**, Standard Test Methods for Compressive Properties of Rigid Cellular Plastics.
 - .4 **ASTM E 96/E 96M-[13]**, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 **CGSB 71-GP-24M-AMEND-[77(R1983)]**, Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 CSA Group (CSA)
 - .1 **CSA B149 PACKAGE-[10]**, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 **CAN/ULC-S102-10**, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 **CAN/ULC-S114-05**, Test for Determination of Non-Combustibility in Building Materials.
 - .3 **CAN/ULC-S701-[11]**, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .4 **CAN/ULC-S702-[2012]**, Standard for Mineral Fibre Insulation for Buildings.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for board insulation and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 017800 Closeout Submittals. Indicate VOC's during application and curing.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
- .4 Samples:
 - .1 None required.
- .5 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .7 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.04 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 INSULATION

- .1 **XPS-1** Extruded polystyrene (XPS): to [CAN/ULC-S701](#).
 - .1 Type: IV.
 - .2 Thermal Resistance: 5.6/25mm
 - .2 Compressive strength: 172 kPa.
 - .3 Thickness: as indicated.
 - .4 Size: 400 x 2400mm.
 - .5 Edges: square.
 - .6 Acceptable Manufacturers: Dow Canada, DuPont, Owens -Corning Canada
- .2 **MFB-1** Mineral fibre board: to [CAN/ULC-S702](#).
 - .1 Type: IVB.
 - .2 Density: 100kg/m³ outer layer, 100kg/m³.
 - .3 Surfaces: unsurfaced.
 - .4 Thickness: as indicated.
 - .5 Size: 610 x 2440mm.
 - .6 Acceptable Manufacturers: Rockwool, Owens-Corning Canada, Johns Manville

2.02 ADHESIVE

- .1 A trowel-consistency, synthetic rubber-based insulation adhesive compatible with polystyrene insulation to [CGSB 71-GP-24M](#) suitable for installation in temperatures down to -12° C.
 - .1 Basis of Design:
 - .1 230-21 or Airbloc 21 Rigid Insulation Adhesive, Bakor
 - .2 Alternatives will be considered for this material.

2.03 ACCESSORIES

- .1 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for board insulation application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied Consultant.

3.02 INSTALLATION

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures, and minimum 50mm from sidewalls of **CAN/ULC-S604** type A chimneys and [CSA B149.1](#) and [CSA B149.2](#) type B and L vents.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been reviewed by Consultant.

3.03 RIGID INSULATION INSTALLATION

- .1 Apply adhesive to polystyrene insulation board in accordance with manufacturer's recommendations.
- .2 Imbed insulation boards into vapour barrier type adhesive, applied in accordance with manufacturer's recommendations.
- .3 Seal all joints with compatible spray foam insulation for contiguous insulation installation. Strike all overspray flush with face of insulation board.

- .4 Install mineral fibre insulation boards with insulation clips and disk, 2 per 600 x 1200 mm board minimum, fit boards tight, cut off fastener spindle 3 mm beyond disk.

3.07 CLEANING

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 04 04 99 – Masonry for Minor Works
- .2 Section 07 21 13 – Board Insulation
- .3 Section 07 26 00 – Vapour Retarders
- .4 Section 07 27 00 – Air Barriers
- .5 Section 07 62 00 – Sheet Metal Flashings and Trim
- .6 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.02 REFERENCE STANDARDS

- .1 ASTM International
 - .1 **ASTM C 553-[13]**, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .3 CSA Group (CSA)
 - .1 **CSA B111-[1974(R2003)]**, Wire Nails, Spikes and Staples.
 - .2 **CSA B149** PACKAGE-[10], Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 **CAN/ULC-S102-10**, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 **CAN/ULC-S114-05**, Test for Determination of Non-Combustibility in Building Materials.
 - .3 **CAN/ULC-S702-[2012]**, Standard for Mineral Fibre Insulation for Buildings.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

- .4 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.04 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 INSULATION

- .1 **MFI-1** Batt and blanket mineral fibre insulation: Unfaced, preformed mineral slag fibrous insulation in accordance with **CAN/ULC-S702** and as follows:
 - .1 Type: 1.
 - .2 Thermal Resistance: nominal RSI of 0.67/25mm
 - .3 Combustion Characteristics: non-combustible in accordance with CAN/ULC S102.
 - .4 Density: 32 kg/m³
 - .5 Thickness: as required to fill insulated spaces.
 - .6 Acceptable Materials:
 - .1 Rockwool ComfortBatt

2.02 ACCESSORIES

- .1 Insulation clips:
 - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Nails: galvanized steel, length to suit insulation plus 25 mm, to [CSA B111](#).

- .3 Staples: [12] mm minimum leg.
- .4 Tape: as recommended by manufacturer.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for blanket insulation application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .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 code required minimum distances from heat emitting devices such as recessed light fixtures, chimneys vents.
- .5 Do not enclose insulation until it has been reviewed by Consultant.

3.03 CLEANING

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 07 21 13 - Board Insulation
- .2 Section 07 21 16 - Blanket Insulation
- .3 Section 07 92 00 - Joint Sealants

1.02 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee
 - .1 CCDC 2-[94], Stipulated Price Contract.
- .2 Canadian General Standards Board (CGSB)
 - .1 **CAN/CGSB-19.13M-[M87]**, Sealing Compound, One Component, Elastomeric Chemical Curing.
 - .2 **CAN/CGSB-19.24M-[M90]**, Multi-Component, Chemical Curing Sealing Compound.
 - .3 **CGSB 19-GP-14M-[84]**, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .3 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS SDS - Safety Data Sheets in accordance with Section [02 81 00 - Hazardous Materials].
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in [Province][Territory], Canada.
 - .1 Submit drawings of special joint conditions [and] [_____].
- .4 Quality Assurance Submittals: submit following in accordance with Section [01 45 00 - Quality Control].
 - .1 Existing Substrate Condition: report deviations, as described in PART 3 - EXAMINATION in writing to [Departmental Representative][DCC Representative][Consultant].

- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and [_____].
- .4 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.

1.04 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Applicator: company specializing in performing work of this section [with minimum [_____] years [documented] experience with installation of air/vapour barrier systems].
 - .1 Completed installation must be approved by the material manufacturer.
 - .2 Applicator: company:
 - .1 Currently licensed by [National Air Barrier Association][Canadian Urethane Foam Contractor's Association][or][certifying organization].
 - .2 Must maintain their licence throughout the duration of the project.
- .2 Mock-Up:
 - .1 Construct mock-up in accordance with Section [01 45 00 - Quality Control].
 - .2 Construct typical [exterior wall] panel, [_____] m long by [_____] m wide, incorporating [window][and] frame [and sill], insulation, [building corner condition,][junction with roof system][and] [_____]; illustrating materials interface and seals.
 - .3 Locate [where directed].
 - .4 Mock-up may [not] [_____] remain as part of finished work.
 - .5 Allow [24] hours for inspection of mock-up by [Departmental Representative][DCC Representative][Consultant] before proceeding with air/vapour barrier Work.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 [Twice] during progress of Work at [25%] and [60%] complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements].
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Avoid spillage: immediately notify [Departmental Representative][DCC Representative][Consultant] if spillage occurs and start clean up procedures.
- .4 Clean spills and leave area as it was prior to spill.

1.06 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for [reuse][and][recycling] in accordance with Section [01 74 19 - Waste Management and Disposal].
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.07 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Ventilate enclosed spaces in accordance with Section [01 51 00 - Temporary Utilities].
- .3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.08 SEQUENCING

- .1 Sequence work in accordance with [Section [01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM)]] [Section [01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Charts]].
- .2 Sequence work to permit installation of materials in conjunction with related materials and seals.

1.09 WARRANTY

- .1 For [sealant][and][sheet materials] the 12 months warranty period prescribed in

subsection [GC 32.1] of General Conditions "C" is extended to [24] months.

- .2 Provide [three] year warranty under provisions of Section [01 78 00 - Closeout Submittals][and in accordance with General Conditions (GC) [CCDC 2 GC 12.3]].
- .3 Warranty: include coverage of installed [sealant][and][sheet materials] which:
 - .1 Fail to achieve air tight and watertight seal.
 - .2 Exhibit loss of adhesion or cohesion.
 - .3 Do not cure.

2 PRODUCTS

2.01 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section [01 47 15 - Sustainable Requirements: Construction].
 - .1 [_____].
- .2 Do Verification requirements in accordance with Section [01 33 29 - Sustainable Design Reporting].

2.02 SHEET MATERIALS

- .1 Sheet Seal [Type [1]] [_____]: self-adhesive bitumen laminated to high-density polyethylene film, nominal total thickness of [_____] mm.
- .2 Sheet Seal [Type [2]] [_____]: thermofusable elastomeric bitumen membrane reinforced with a [non-woven polyester][glass mat].
- .3 Liquid Seal [Type [3]]: [elastomeric bitumen][synthetic rubber], [roller][trowel][spray] applied, nominal total thickness of [_____] mm.
- .4 Foam Seal [Type [4]] [_____]: spray-applied medium density spray polyurethane foam insulation/air/vapour barrier.
- .5 Sheet Seal [Type [5]] [_____]: galvanized steel, [Z275] zinc coating; [0.6][0.5] mm thick core steel.
- .6 Sheet Seal [Type [6]]: [butyl][neoprene], [black] colour, [_____] mm thick.

2.03 SEALANTS

- .1 Sealants in accordance with Section [07 92 00 - Joint Sealants].

- .2 [Butyl] Sealant [Type [A]]: [CGSB 19-GP-14M,] butyl rubber base, single component, solvent release, non-skinning, Shore "A" Hardness Range of [10 to 30]; [black] colour.
- .3 Sealant [Type [B]]: [CAN/CGSB-19.13M,] single component, chemical curing, capable of continuous water immersion, non-sagging type, Shore "A" Hardness Range of [20 to 35] to [____]; [black] colour.
- .4 [Polyurethane] Sealant [Type [C]]: [CAN/CGSB-19.24M,] multi- component, chemical curing, non-sagging, Shore 'A' Hardness Range of [20 to 35] to [____], [black] colour.
- .5 [Silicone] Sealant [Type [D]]: [____] single component, solvent curing, non-sagging, Shore 'A' Hardness Range of [35 to 45] to [____], [black] colour.
- .6 Primer: [recommended by sealant manufacturer][appropriate to application].
- .7 Substrate Cleaner: non-corrosive [type recommended by sealant manufacturer][compatible with adjacent materials].

2.04 ADHESIVES

- .1 Mastic Adhesive [Type [1]] [____]: compatible with sheet seal and substrate, thick mastic of uniform [knife grade] consistency.
- .2 Adhesive [Type [2]] [____]: compatible with sheet seal and substrate, permanently non-curing.

2.05 ACCESSORIES

- .1 Thinner and cleaner for [Butyl][Neoprene] Sheet: [as recommended by sheet material manufacturer].
- .2 Attachments: [galvanized steel] bars and anchors, [____] mm.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 GENERAL

- .1 Perform Work in accordance with [Sealant and Waterproofer's Institute - Sealant and

Caulking Guide Specification] requirements for [materials][and][installation].

- .2 Perform Work in accordance with [National Air Barrier Association - Professional Contractor Quality Assurance Program] and requirements for [materials][and][installation].
- .3 Perform Work in accordance with [Canadian Urethane Foam Contractor's Association - Professional Contractor Quality Assurance Program] and requirements for [materials][and][installation].

3.03 EXAMINATION

- .1 Verify that surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .3 Report unsatisfactory conditions to [Departmental Representative][DCC Representative][Consultant] in writing.
- .4 Do not start work until deficiencies have been corrected.
 - .1 Beginning of Work implies acceptance of conditions.

3.04 PREPARATION

- .1 Remove loose or foreign matter, which might impair adhesion of materials.
- .2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.
- .3 Ensure substrates are free of surface moisture prior to application of [self-adhesive] membrane and primer.
- .4 Ensure metal closures are free of sharp edges and burrs.
- .5 Prime substrate surfaces to receive [adhesive][and][sealants] in accordance with manufacturer's instructions.

3.05 INSTALLATION

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Secure sheet seal [Type [____]] [____] to [masonry][concrete][gypsum board] materials with [self-adhesive][heat bonding] continuous metal bar with anchors.

- .1 [Caulk with Type [_____] sealant to ensure complete seal].
- .2 [Position lap seal over firm bearing].
- .3 Place liquid seal [Type [_____] [_____] to [masonry][gypsum board] materials by [roller][spray][trowelling].
 - .1 [Caulk with Type [_____] sealant to ensure complete seal].
- .4 [Lap sheet][Place liquid] seal [Type [_____] [_____] onto roof vapour retarder [and seal] with [sealant Type [_____]][adhesive Type [_____]].
 - .1 [Caulk to ensure complete air seal].
 - .2 [Position lap seal over firm bearing].
- .5 Install sheet seal [Type [_____] [_____] between [window][and][door] frames and adjacent wall seal materials with [sealant Type [_____]][adhesive Type [_____]].
 - .1 [Caulk to ensure complete seal].
 - .2 [Position lap seal over firm bearing].
- .6 Apply sealant within recommended application temperature ranges.
 - .1 Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.06 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.07 CLEANING

- .1 Proceed in accordance with Section [01 74 00 - Cleaning].
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.08 PROTECTION OF WORK

- .1 Protect finished work in accordance with Section [01 61 00 - Common Product Requirements].

- .2 Do not permit adjacent work to damage work of this section.
- .3 Ensure finished work is protected from climatic conditions.

3.09 SCHEDULES

- .1 Wall Air/Vapour Barrier Over Outer Surface of Inner Wythe of Masonry:
 - .1 Trowel seal Type F over masonry unit surface to thickness of 6 mm
 - .2 Seal masonry anchor penetrations air tight.
- .2 Wall Air/Vapour Barrier Over Exterior Surface of Gypsum Sheathing:
 - .1 Place sheet seal Type G over sheathing surfaces with Adhesive Type E.
 - .2 Seal with Type Y sealant.
- .3 Window Frame Perimeter:
 - .1 Lap sheet seal Type H from wall air seal surface with 75 mm of full contact over firm bearing to window frame with 25 mm of full contact.
 - .2 Edge seal with Type Z sealant.
- .4 Wall and Roof Junction:
 - .1 Lap sheet seal Type J from wall seal material with 150 mm of contact over firm bearing to roof air seal membrane with 100 mm of full contact.
 - .2 Seal with Type X sealant.
- .5 Roof System Air/Vapour Barrier Over Steel Deck:
 - .1 Gypsum sheathing, taped joints, apply membrane air seal Type K over sheathing surfaces with Adhesive Type D
 - .2 Edge seal membrane with Type Y sealant.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 04 04 99 – Masonry for Minor Works
- .2 Section 07 21 13 - Board Insulation
- .2 Section 07 21 16 – Blanket Insulation
- .3 Section 07 62 00 – Sheet Metal Flashings and Trim
- .4 Section 07 92 00 – Joint Sealants
- .5 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.02 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials.
 - .2 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials.
 - .3 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
 - .4 ASTM F1249-13, Standard Test Method for Water Vapour Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
- .2 Canadian General Standards Board (CGSB)
 - .1 **CAN/CGSB 51.32-M77**, Sheathing, Membrane, Breather Type.
 - .2 **CAN/CGSB-51.34-2022**, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS SDS - Safety Data Sheets in accordance with Section 01 78 00 Closeout Submittals.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Clean spills and leave area as it was prior to spill.

1.06 WASTE MANAGEMENT AND DISPOSAL

- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.07 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Ventilate enclosed spaces.
- .3 Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

1.08 SEQUENCING

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

1.09 WARRANTY

- .1 Warranty: include coverage of installed sealant and sheet materials which:
 - .1 Fail to achieve airtight and watertight seal.
 - .2 Exhibit loss of adhesion or cohesion.
 - .3 Do not cure.

2 PRODUCTS

2.01 MATERIALS

- .1 **M1 - Self-Adhered Water Resistive Air Barrier and Vapour Control Membrane:**
consisting of an SBS rubberized asphalt compound, integrally laminated to an engineered thermoplastic film surface, providing an air, vapor and water resistive barrier in full wall applications or as penetration/flashing membrane with other air barrier systems. Tested to ASTM E2357 and as follows:
 - .1 Air Leakage: < 0.0011 L/s/m² @ 75 Pa in accordance with ASTM E2178.
 - .2 Vapour Permeance: 0.03 perms to ASTM E96, Dessicant method A.
 - .3 Acceptable Materials:
 - .1 Blueskin SA, Henry Bakor.
 - .2 Other materials may be acceptable subject to compliance with requirements, provided information is provided to Consultant for review and acceptance prior to Bid Closing.
- .2 **Primer:** rubber based adhesive primer for self-adhered air barrier as recommended by air barrier membrane manufacturer.
 - .1 Acceptable Materials:
 - .1 Blueskin Adhesive, Henry Bakor
 - .2 Blueskin LVC Spray Primer, Henry Bakor
 - .3 Aquatac Primer, Henry Bakor
- .3 **Termination sealants** as recommended by air barrier membrane manufacturer.
 - .1 Acceptable Materials:
 - .1 Henry 925 BES Sealant, Henry Bakor
 - .2 Other materials may be acceptable subject to compliance with requirements, provided information is provided to Consultant for review and acceptance prior to Bid Closing.

2.05 ACCESSORIES

- .1 Attachments: galvanized steel bars and anchors.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

and datasheets.

3.02 EXAMINATION

- .1 Verify that surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .3 Report unsatisfactory conditions to Consultant in writing.
- .4 Do not start work until deficiencies have been corrected.
 - .1 Beginning of Work implies acceptance of conditions.

3.03 PREPARATION

- .1 Remove loose or foreign matter, which might impair adhesion of materials.
- .2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.
- .3 Ensure substrates are free of surface moisture prior to application of primer and self-adhesive membrane.
- .4 Ensure metal closures are free of sharp edges and burrs.
- .5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.04 INSTALLATION

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Apply self adhering air barrier membrane to substrate in overlapping shingle fashion. Stagger all vertical joints.
- .3 Prime surfaces as per manufacturer's instructions and allow to dry.
- .4 Align self-adhering membrane to substrate, remove top panel of protective release film and press firmly into place.
- .5 Hold membrane in place to avoid wrinkles and remove remaining panels of protective film and press firmly into place.

- .6 Ensure minimum 75 mm overlap at all end and 50 mm side laps of membrane applications.
- .7 Pressure roll all membrane surfaces, laps and flashings with a counter top roller or J-roller to ensure surface adhesion.
- .8 Seal top edge of the membrane at the end of each day with termination sealant. Trowel apply a feathered edge to seal termination and shed water.
- .9 Application of termination sealant:
 - .1 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary air barrier membrane and around perimeter edge of membrane terminations at window and door frames with termination sealant.

3.05 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.08 PROTECTION OF WORK

- .1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Ensure finished work is protected from climatic conditions.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 04 04 99 - Masonry for Minor Works
- .2 Section 07 21 13 - Board Insulation
- .3 Section 07 21 16 - Blanket Insulation
- .4 Section 07 27 19 - Sheet Membrane Air and Vapour Control
- .5 Section 08 44 13 - Glazed Aluminum Curtain Walls

1.02 REFERENCE STANDARDS

- .1 The Aluminum Association Inc. (AAI)
 - .1 AA Aluminum Design Manual 2015 Part VIII Guidelines for Aluminum Sheet Metal Work in Building Construction.
 - .2 AAI DAF45-2003(R2009), Designation System for Aluminum Finishes.
- .2 ASTM International (ASTM)
 - .1 [ASTM A 606/A 606M-\[15\]](#), Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .2 [ASTM A 653/A 653M-\[15e1\]](#), Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 [ASTM A 792/A 792M-\[10\(2015\)\]](#), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .4 [ASTM B 32-\[08\(2014\)\]](#), Standard Specification for Solder Metal.
 - .5 [ASTM B 209-\[14\]](#) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .6 [ASTM F 1667-\[15\]](#) Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .3 Canadian General Standards Board (CGSB)
 - .1 [CAN/CGSB-51.32-\[M77\]](#), Sheathing, Membrane, Breather Type.
- .4 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual [2012].
- .5 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI S8-2008 Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.

- .2 CSSBI B17-2002 Barrier Series Prefinished Steel Sheet: Product Performance & Applications.
- .3 CSSBI Sheet Steel Facts #12 [2003] Fastener Guide for Sheet Steel Building Products.
- .6 CSA Group (CSA)
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .8 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual (2012)

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 **Coordination:**
 - .1 Coordinate work of this Section with interfacing and adjoining Work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 **Product Data:**
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies WHMIS SDS - Safety Data Sheets in accordance with Section 01 78 00 - Closeout Submittals.
- .3 **Shop Drawings:**
 - .1 Submit shop drawings only for sheet metal flashing and trim items that differ from those indicated in Contract Documents.
 - .2 Indicate sheet thickness, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement.
 - .3 Submit manufacturer's catalogue cut sheets for manufactured items.

1.05 PRE-INSTALLATION MEETING

- .1 Include sheet metal flashing and trim on agenda of pre-installation meetings of affected sections.

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Handle and store flashing materials to prevent creasing, buckling, scratching, or other damage.

2 PRODUCTS**2.01 METAL FLASHINGS**

- .1 Provide sheet metal in base metal thickness specified. Where no thickness specified, provide base sheet metal in thickness recommended in SMACNA Architectural Sheet Metal Manual for type of item being fabricated, but not less than the thickness required by the authority having jurisdiction.
- .2 **FLG-1** Zinc coated steel sheet: 0.45 mm thickness, commercial quality to [ASTM A 653/A 653M](#), with Z275 designation zinc coating.
- .3 **FLA-1** Formed aluminum flashings: Tension levelled, aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 5005-H14 and as follows:
 - .1 Thickness: minimum 1.20 mm.
 - .2 Finish: anodized aluminum sheet, colour to match existing adjacent flashing colour.

2.02 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Loose laid underlay for metal flashing: No. 15 perforated asphalt felt to [CSA A123.3](#).
- .3 Self-adhesive membrane underlay and tie-in membrane for metal flashings: To [CSA A123.22](#) or [ASTM D 1970](#), as indicated in Section 07 27 19 Sheet Membrane Air and Vapour Control

- .4 Sealants: as indicated in Section 07 92 00 - Joint Sealants, in colour to match flashing finish colour.
- .5 Fasteners: of same material as sheet metal, to ASTM F1667, as recommended by sheet metal manufacturer; non-corrosive. Finish of exposed parts to match material being fastened.
- .6 Touch-up paint: as recommended by prefinished material manufacturer.

2.03 FABRICATION

- .1 Fabricate sheet steel flashings and other sheet steel work as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
 - .1 For aluminum sheet metal flashing, trim and fabrications to be anodized, complete forming prior to anodizing.
- .3 Form pieces in 2400 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in or in contact with concrete or mortar.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Install sheet metal work as detailed.
- .2 Use concealed fastenings except where approved before installation.

- .3 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
 - .2 Provide self-adhesive membrane to tie into adjacent assemblies.
- .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 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing into reglets and under cap flashing to form weather tight junction.
- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Caulk flashing at reglet and cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.
- .11 Where flashing installed with mechanical fasteners, install fasteners in slots or oversize holes to allow expansion and contraction of flashings.
- .12 Provide isolation coating or impervious self-adhesive membrane to separate aluminum items from concrete and masonry.

3.03 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

1 GENERAL

1.01 SYSTEMS DESCRIPTION

- .1 This Section specifies fire stop systems and/or fire stop materials intended to fill gaps between fire separations, between fire separations and other construction assemblies, or used in or around items which fully or partially penetrate a fire separation, to restrict the spread of fire and smoke thus maintaining the integrity of a fire separation.
- .2 This Section includes requirements for:
 - .1 Through-penetration fire stops:
 - .1 For openings created to allow a penetrating item such as piping, conduits, raceways, ducts, cable trays, cables, tubing or structural components to pass completely through a fire separation or fire-resistance rated assembly.
 - .2 Membrane penetration fire stops:
 - .1 For openings where penetrating items such as piping, conduits, raceways, ducts, cable trays, cables, tubing, recessed components (e.g.: panels, electric boxes, devices) or structural components pass through only one membrane of a fire separation or fire-resistance rated assembly.
 - .3 Blank opening fire stops:
 - .1 For openings created in a fire separation where the penetrating item has not yet been installed or has been removed.
 - .4 Construction joint fire stops:
 - .1 For locations where adjacent fire separations or components of fire separations meet. These locations include: ceiling/wall and roof/wall joints, wall/wall joints at corners or in the same plane, wall/floor joints, floor/floor joints and ceiling/ceiling joints, and perimeters of rated door frames.
 - .2 Includes fire stops for seismic joints, vertical control joints, expansion joints, and joints which occur at the tops and bottoms of fire separation walls.
 - .3 Includes fire stops for head of wall to non-rated roof or floor assemblies.
- .3 This Section includes fire stopping work for entire Project including.

1.02 RELATED REQUIREMENTS

- .1 Section 04 22 00 Concrete Unit Masonry
- .2 Section 07 92 00 Joint Sealants
- .3 Section 09 21 16 Gypsum Board Assemblies
- .4 Section 09 91 23 Interior Painting

1.03 REFERENCE STANDARDS

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 [CAN/ULC-S115-\[11\(R2016\)\]](#), Standard Method of Fire Tests of Firestop Systems.
 - .2 ULC Qualified Firestop Contractor Program.

1.04 DEFINITIONS

- .1 Fire Blocking: materials, components or system installed in a concealed space in the building to restrict the spread of fire and smoke in that concealed space or from that concealed space to an adjacent space.
- .2 Fire Stop: a material, component or system, and its means of support, used to protect gaps between fire separations, between fire separations and other construction assemblies, or used in openings where penetrating items wholly or partially penetrate fire separations, to restrict the spread of fire and smoke thus maintaining the fire-resistance continuity of a fire separation.
- .3 Fire Stop System: the combination of specific materials and/or devices required with the penetrating item(s), the assembly and the opening to assemble the fire stop.
- .4 Intumescent: materials that expand with heat to prevent fire spread through fire separations.
- .5 Listed Fire Stop System: a specific field erected construction consisting of the assembly, fire stop materials, any penetrating items and their means of support which have met the requirements for an F, FT, FH, FTH and/or L rating when tested in a fire-resistance rated assembly in accordance with [CAN/ULC-S115](#) - Standard Method of Fire Tests of Firestop Systems.
 - .1 F-Rating: the amount of time a fire stop system can remain in place without the passage of flame through the opening or the occurrence of flaming on the unexposed face of the fire stop.
 - .2 FT-Rating: a fire stop system with an F-Rating for the required time period which can also resists the transmission of heat through the fire stop during the same period and limit the rise in temperature on the unexposed face and/or penetrating item of the fire stop.
 - .3 FH-Rating: a fire stop system with an F-Rating for the required time period which can also resists the force of a hose stream without developing openings for a prescribed period.
 - .4 FTH-Rating: a fire stop system with an FT-Rating for the required time period which also passed the hose stream test for a prescribed period.
 - .5 L-Rating: largest test sample leakage rate, determined in accordance with the optional air leakage test of [CAN/ULC-S115](#).
- .6 Multi-penetration: two or more service penetrations through an opening in the fire separation.
- .7 Non-rated Fire Separation: fire separation acting as a barrier to the spread of smoke until a response is initiated such as the activation of a fire suppression system.

- .8 Single-penetration: single service penetration through an opening in the fire separation.
- .9 System Design Listing: document providing proof of testing with technical details, specifications and requirements that leads to the application of a specific listed fire stop system.

1.05 PRE-INSTALLATION MEETINGS

- .1 Convene pre-installation meeting two weeks prior to beginning work of this Section, with Contractor's representative Consultant to:
 - .1 Verify Project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordinate with other building trades.
 - .4 Review system design listings, manufacturer's installation instructions and warranty requirements.
- .2 Convene pre-installation meetings with other trades to review:
 - .1 Installation procedures and precautions.
 - .2 Location, scheduling and sequencing of other work around fire stops that can affect the outcome of the installation.
 - .3 Requirements for annular opening sizes.
 - .4 Requirements and preparations for wall/floor single and multi-penetrations.
 - .5 Requirements for construction and perimeter joints.
 - .6 Mock-up requirements.
- .3 Submit copies of applicable listed fire stop system details to each trade for opening preparation. Include installation details required for the listed system.
- .4 Meeting minutes: Contractor to take minutes of pre-installation meetings and distribute to Consultant and each affected trades.

1.06 SEQUENCING

- .1 Proceed with installation only when submittals have been reviewed by Consultant.
- .2 Fire stops located in floor assemblies: install before interior partition erections.
- .3 Metal deck bonding: unless noted otherwise on system design listing and manufacturer's installation instructions, fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Pipe and duct insulation: certified fire stop system component.
 - .1 Ensure pipe and duct insulation installation precedes fire stopping.

1.07 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Qualification Statement
 - .1 Submit contractor qualification statements and certificates demonstrating compliance with the qualification requirements of this Section, as described in PART 1 - QUALITY ASSURANCE, within 10 working days after award of contract and before starting Work.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet. Submit complete product data for each individual component and include:
 - .1 Product name and product number.
 - .2 Product characteristics and performance criteria.
 - .3 Physical size, finish and limitations.
 - .4 Technical data on out-gassing, off-gassing and age testing.
 - .5 Curing time.
 - .6 Chemical compatibility to other construction materials.
 - .7 Shelf life.
 - .8 Life expectancy.
 - .9 Temperature range for installation.
 - .10 Humidity range for installation.
 - .11 Sound attenuation STC-Rating.
 - .2 Manufacture Product Certification:
 - .1 Submit certification by the manufacturer that products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOC's) and are non-toxic to building occupants.
 - .2 Submit test reports showing compliance to [ASTM E 595](#).
 - .3 For each individual component, Submit copies of WHMIS Safety Data Sheets (SDS)
 - .4 Submit a comprehensive list of all products and components included in submittal.
- .4 Shop Drawings:
 - .1 Submit shop drawings showing system design listings for Project including proposed materials, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details to accurately reflect actual job conditions for each product and assembly.
 - .3 Submit details for materials and prefabricated devices.
 - .4 Submit electronic copy of shop drawings and include:
 - .1 Title page, labelled "Fire and Smoke Stop System Listings". Include project name, date and the names of the installation company and the manufacturer of proposed products.
 - .2 List of each proposed listed fire stop system and corresponding service penetration type or joint type in a matrix spreadsheet schedule, indicating floor and wall system, including rating for each.
 - .3 Location of penetrations:
 - .1 Drawings showing the location of each penetration with a unique penetration identification number.
 - .2 Schedules listing each penetration with a unique identification

- number, their associated listing number, organized by floor, wall and ceiling area and indicating each room number.
- .5 System Design Listings:
 - .1 Submit [CAN/ULC-S115](#) design listings for each listed fire stop system and each application identified.
 - .2 When more than one product is specified for the listed fire stop system or more than one packing/damming material is indicated, identify the item that will be used on this Project.
 - .6 Certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
 - .6 Engineering Judgments:
 - .1 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stop configuration, review systems from other manufacturers to obtain a listed fire stop system.
 - .2 Submit an Engineering Judgment (EJ) from the system manufacturer if there are no listed systems available from other manufacturers.
 - .3 Prepare and submit an EJ in accordance with best practices established in the following documents:
 - .1 IFC Guidelines for Evaluating Engineering Judgments.
 - .2 IFC Guidelines for Evaluating Engineering Judgments - Perimeter Fire Barrier Systems.
 - .4 For each EJ submitted, include:
 - .1 Project name, number and location.
 - .2 A description of the proposed system with detailed drawing.
 - .3 Installation instructions.
 - .4 Complete descriptions of critical elements for the fire stop configuration.
 - .5 Copies of all referenced system design listings on which the EJ is based on.
 - .6 EJ issuer name and contact information.
 - .7 Date of issue of EJ with authorization signature of issuer.
 - .8 Manufacturer letter stating their opinion, with supporting justification, that the EJ will perform as a fire stop system were it to be subjected to the appropriate standard fire test method for the required fire rating duration.
 - .8 Once the EJ has been reviewed, submit the EJ to the authority having jurisdiction for final approval.
 - .9 EJ shall be issued only by fire stop manufacturer's qualified technical personnel or in concert with the manufacturer by a knowledgeable registered Professional Engineer, a Fire Protection Engineer or an independent testing agency that provides testing and listing services for fire stop systems similar to the EJ being contemplated.

- .10 EJ shall be based upon interpolations of previously tested fire stop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the Engineering Judgment is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g.: [ASTM E 2032](#)) may also be used as further support data.
- .11 EJ shall be based upon knowledge of the elements of the construction to be protected and understanding of the probable behaviour of that construction and the recommended fire stop system protecting it were they to be subjected to the adequate standard fire test method for the required fire rating duration.
- .12 EJ shall be limited to the specific conditions and configurations upon which EJ was rendered and should be based upon reasonable performance expectations for the recommended fire stop system under those conditions.
- .13 EJ shall be accepted only for a single specific job and location and should not be transferred to any other job or location without thorough and appropriate review of all aspects of the next job or location's circumstances.
- .14 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.

1.08 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Include:
 - .1 WHMIS Safety Data Sheets (SDS).
 - .2 Product data and manufacturer's installation and maintenance instructions for each product/system used on this project.
 - .3 Approved system design listings and Engineering Judgments.
 - .4 Matrix schedule listing all system design listings and Engineering Judgments with a description of their penetration or joint type.
 - .5 Certifications:
 - .1 Proof of training for each worker that performed installation on the Project.
 - .2 Proof of company as a FCIA - Member in Good Standing.
 - .3 Certification of company as a ULC Qualified [or FM 4991 Approved] Firestop Contractor, including the Designated Responsible Individual (DRI) certificate.
 - .4 Accreditation of third-party inspection firm.
 - .6 Manufacturer's field reports.
 - .7 Warranty information on fire stop installations.
 - .8 Life expectancy of each product installed as part of Project. For each system, list the installation date of products and the expected expiration date (month/year).
- .3 Record Documentation:

- .1 Maintain a daily log of all activities on site during the course of construction. Submit a copy of all daily logs after completion of fire stopping work.
- .2 As-built Drawings:
 - .1 Submit marked-up set of drawings to provide referencing system identifying the location of each fire stop.
 - .2 Identify each penetration type fire stop with their penetration identification number.
 - .3 Provide detailed drawings of system design listings for each type of fire stop (i.e.: through-penetration, membrane penetration, blank opening, construction joint, building perimeter).
- .3 Fire Stop Schedules:
 - .1 Submit complete fire stop schedules for floors, walls and ceilings.
 - .2 Indicate all penetration fire stops and joint fire stops through each reference wall, floor and ceiling in the schedules.
 - .3 Cross-reference fire stop schedules with as-built drawings and indicate design listing numbers associated to each penetration fire stop and joint fire stop.

1.09 QUALITY ASSURANCE

- .1 Provide systems selection and analysis, installation and inspection of fire stop systems in accordance with the recommended practices detailed in the following guides:
 - .1 FCIA Firestop Manual of Practice (MOP).
- .2 Qualifications:
 - .1 Certified Firestop Contractor: company certified with:
 - .1 ULC Qualified Firestop Contractor Program. Submit signed copy of ULC Qualified Firestop Contractor Program certificate.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings, manufacturing date, shelf life expiry date.
- .2 Storage and Protection:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective, expired or damaged materials with new.
 - .3 Coordinate delivery of materials with scheduled installation dates to allow minimum storage time on site.

- .4 Comply with recommended procedures, precautions and measures described in WHMIS Safety Data Sheets (SDS).

1.11 FIELD CONDITIONS

- .1 Ambient Conditions:
 - .1 Install fire stops when ambient and substrate temperatures are within the limits prescribed by the manufacturer and when the substrate is dry and without risk of condensation.
 - .2 Maintain manufacturer's recommended ambient and substrate temperatures for 48 hours before and 72 hours after installation.
- .2 Ventilate fire stops in accordance with manufacturers' instructions by natural means or where this is inadequate using forced air circulation.

1.12 WARRANTY

- .1 For the Work of this Section 07 84 00 – Fire Stopping, the 12 month warranty period is extended to 24 months.
- .2 Manufacturers shall warrant work of this section against defects and deficiencies in the product material for a period of 24 months. Promptly correct any defects or deficiencies, which become apparent within warranty period at no expense.
- .3 Contractor shall warrant workmanship on materials and installation for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

2 PRODUCTS

2.01 MANUFACTURERS

- .1 Provide products from a single manufacturer, to the greatest extent possible, to perform all fire stopping work. Materials of different manufacturers will not be permitted without written authorization from Consultant.
- .2 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stopping application, provide a listed system from an alternative manufacturer to avoid providing an Engineering Judgment.

2.02 DESIGN/PERFORMANCE CRITERIA

- .1 Fire stop and smoke stop systems and systems providing a barrier to smoke spread consisting of a material or combination of materials installed to maintain the integrity of the fire resistance rating of a fire separation in accordance with the requirements of OBC 2024.

- .2 Non-rated fire separations: provide L-Rated smoke protection fire stop system for application on both sides of separation.
- .3 Dynamic joints: where required, fire and smoke stop systems to be designed to accommodate a defined amount of movement to account for expansion or contraction in construction joints and mechanical piping, for movement in structural elements and to accommodate for movement and sound and vibration control in mechanical installations.
- .4 Insulated pipes and ducts: listed fire stop system designed and tested with actual insulation materials penetrating the fire separation, as indicated on the system design listing.
- .5 Use in wet areas: water based products are unacceptable in wet areas or areas that may be subject to occasional water exposure or flooding during and after construction.
- .6 Architectural considerations: when exposed to view, fire stop system to consider architectural finish, potential traffic, and exposure to moisture and heat.

2.04 MATERIALS

- .1 Fire stop and smoke stop systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against the passage of flame, smoke and water and the transmission of heat in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended, as indicated on System Design Listing.
 - .2 Fire stop system rating: to match fire resistance rating of fire separation as indicated on drawings.
 - .3 Service penetration assemblies and fire stop components: certified by test laboratory to [CAN/ULC-S115](#).
- .2 Fire and smoke stop systems at openings intended for re-entry such as cables: provide elastomeric seal or non-shrink foam cement mortar.
- .3 Fire and smoke stop systems at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: provide elastomeric protection.
- .4 Fire and smoke stops behind and around mechanical and electrical boxes within wall, floor and ceiling assemblies: provide elastomeric seal.
- .5 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .6 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .7 Packing/damming materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .8 Fire stop insulation: pre-formed, semi rigid, non-combustible mineral wool.

- .9 Junction box / outlet sealing putty: intumescent putty, pre-formed in pads.
- .10 Sealants: good adhesion without use of primer, high visibility safety colours.
 - .1 Flame spread rating: maximum [25].
 - .2 Smoke development classification: maximum [50].
 - .3 For vertical joints: non-sagging.
 - .4 For horizontal joints: single component, self-levelling.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 EXAMINATION

- .1 Verify substrate conditions are acceptable for product installation in accordance with manufacturer's instructions and approved system design listings for each condition.
- .2 Verify each opening/annular space to ensure it does not exceed the maximum and minimum dimensions indicated on the approved system design listing.
- .3 Verify that all joints, service penetrating elements and supporting devices/hangers have been properly installed as indicated on approved system design listings. All temporary lines and markings have been removed to meet the approved system design listings.
- .4 Verify that the proposed fire stop system is composed of components that are compatible with each other, the substrates forming the openings, and the items, if any, penetrating the fire stop under conditions of application and service, as demonstrated by the fire stop manufacturer based on testing and field experience.
- .5 Pipe and duct insulation: confirm that the proposed fire stop system has been tested with the actual insulation penetrating the fire separation on site, as indicated in the approved system design listing. Maintain insulation around pipes and ducts penetrating the fire separation.
- .6 Ensure no additional items have been installed through opening that does not appear on the approved system design listing.
- .7 Ensure areas that are to be fire stopped are accessible for proper application and conditions are suitable for installation of the fire stop system. Areas to remain accessible for inspection.
- .8 Report in writing to Consultant any defective surfaces or conditions affecting the fire stop system installation, immediately and prior to commencing any installations.
- .9 Proceed only once defected surfaces or conditions have been corrected.

- .10 Beginning of installation means acceptance of site conditions.

3.03 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
 - .2 Ensure substrates and surfaces are free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
- .2 Prepare surfaces in contact with fire stop and smoke stop materials to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.
- .5 Protect adjacent work areas and finish surfaces from damage during product installation.
- .6 Ensure multi-penetration openings have been framed and boarded out, all around the annular opening as indicated in the system design listing prior to prepping the opening.

3.04 INSTALLATION

- .1 Install fire stop and smoke stop materials and components in accordance with manufacturer's certified tested system listing.
- .2 Coordinate with other sub-trades to ensure that all pipes, conduits, cables, and other items, which penetrate fire separations, have been permanently installed before installation of fire stop systems.
- .3 Schedule work to ensure that fire separations and all other construction that conceals penetrations are not erected before installation of fire and smoke stop systems
- .4 Protect holes or gaps made by through penetrations, poke through termination devices, and un-penetrated openings or joints to ensure that both continuity and integrity of fire separation are maintained.
- .5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing per manufacturer's instructions.
- .6 Tool or trowel exposed surfaces to neat finish.
- .7 Remove excess compound promptly as work progresses and upon completion.
- .8 Protect gaps around recessed components (e.g.: panels, electrical boxes, outlets) with sealing

putty in accordance with manufacturer's instructions.

- .9 Do not use damaged or expired material.
- .10 Joint Fire Stops:
 - .1 For sealant applications, install joint fillers to support fire stop materials during application. Position joint fillers to ensure fire stop material cross-sectional shape and thickness relative to the joint width allows for optimum sealant movement, while developing the required fire-resistance rating.
 - .2 Install fire stops using techniques recommended by the manufacturer:
 - .1 Fully wetting joint substrates to optimize adhesion.
 - .2 Completely filling recesses provided for each joint configuration.
 - .3 Providing uniform, cross-sectional shapes and thickness relative to joint width that optimize movement capability.
 - .4 Tooling non-sag fire stop materials immediately after their application and prior to the time skinning begins. Form smooth, uniform beads of configuration indicated or required to:
 - .1 Provide required fire-resistance rating.
 - .2 Eliminate air pockets
 - .3 Ensure contact and adhesion with sides of joint..
 - .3 Joint Systems and Perimeter Fire Containment Systems:
 - .1 For systems with dynamic joints, ensure movement capabilities of the installation meet or exceed the movement expectations of the system design listing and manufacturer's installation instructions.

3.05 REPAIRS AND MODIFICATIONS

- .1 Identify damaged or re-entered seals requiring repair or modification.
- .2 Remove loose or damaged materials. If penetrating items are to be added, remove sufficient material to insert new elements and to avoid damaging the balance of the seal.
- .3 Ensure that surfaces to be sealed are clean and dry.
- .4 Use only materials that are suitable for repair of original seal, as approved by manufacturer. Do not mix products from different manufacturers.
- .5 Repair all damage resulting from fire stop destructive testing.

3.06 FIELD QUALITY CONTROL

- .1 Review: notify Consultant when ready for review and prior to concealing or enclosing fire stop materials and service penetration assemblies.

3.09 FIRE STOPPING LOCATIONS

- .1 Provide fire stop and L-Rated smoke-resistant fire stop systems at:

- .1 Penetrations through fire-resistance and smoke-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Penetrations through fire-resistance rated floor slabs/systems, ceilings and roof.
 - .3 Edge of floor slabs at curtain wall and precast concrete panels.
 - .4 Edge of fire-resistant floor or roof assemblies and exterior wall assemblies.
 - .5 Joints at top and bottom of fire-resistance rated masonry and gypsum board partitions. Joints to allow for independent movement.
 - .6 Joints at top and bottom of fire-resistance rated walls where they meet non-rated fire separation assemblies.
 - .7 Intersection of fire-resistance rated masonry, concrete and gypsum board partitions.
 - .8 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .9 Expansion joints in fire-resistance rated floors, walls, ceilings and roof assemblies.
 - .10 Openings and sleeves installed for future use through fire separations.
 - .11 Around mechanical and electrical assemblies/devices penetrating fire separations.
 - .12 Mechanical and electrical recessed boxes in walls and partitions.
 - .13 Rigid ducts: fire stopping to consist of bead of fire stop material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
 - .14 Joints at the perimeter of fire rated door frames.
- .2 Provide fire stop and L-Rated smoke-resistant fire stop systems at locations shown on drawings and details.

3.10 CLEANING

- .1 Proceed in accordance with Section [01 74 00 - Cleaning].
- .2 Remove equipment, excess materials and debris and clean adjacent surfaces immediately after application. Use methods and cleaning materials approved by manufacturer.
- .3 Protect fire stops during and after curing period from contact with contaminating substances. Repair all damage.
- .4 Remove temporary dams after initial set of fire stop and smoke stop materials.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 07 84 00 Fire Stopping
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 09 91 23 Interior Painting

1.02 REFERENCE STANDARDS

- .3 Canadian General Standards Board (CGSB)
 - .1 [CGSB 19-GP-5M-\[1984\]](#), Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 [CAN/CGSB-19.13-\[M87\]](#), Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 [CGSB 19-GP-14M-\[1984\]](#), Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 [CAN/CGSB-19.17-\[M90\]](#), One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 [CAN/CGSB-19.24-\[M90\]](#), Multi-component, Chemical Curing Sealing Compound.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Manufacturer's product to describe:
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Samples:
 - .1 Submit samples of each type of material and colour if and when requested for review.
 - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .4 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.

1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual include: Product data and MSDS Sheets.

1.05 DELIVERY, STORAGE AND HANDLING

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

1.06 SITE CONDITIONS

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

1.07 WARRANTY

- .1 Contractor hereby warrants that caulking work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces in accordance with General Conditions.
- .2 Provide Warranty for sealants to include in maintenance manuals as specified in Section 01 78 00 – Closeout Submittals.

2 PRODUCTS**2.01 SEALANT MATERIALS**

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

2.02 SEALANT MATERIAL DESIGNATIONS

- .1 Silicones one part: to [CAN/CGSB-19.13](#).
- .2 Acrylic latex one part: to [CAN/CGSB-19.17](#).
- .3 Acoustical sealant: to [ASTM C 919](#).
- .4 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene, urethane, neoprene or vinyl foam:
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30%.

2.03 SEALANT SELECTION

- .1 **JS-1** Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): sealant type: Tremco Dymeric 240, conforming to CAN 19.24
- .2 **JS-2** Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type: Tremco 100 Latex
- .3 **JS-3** Exposed interior control joints in drywall: sealant type: Tremco Acoustical Sealant to ASTM D-217

2.04 JOINT CLEANER

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

3 EXECUTION**3.01 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 SURFACE PREPARATION

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

3.03 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.

3.04 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.

3.05 MIXING

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

3.06 APPLICATION

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

3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 00 - Cleaning].
 - .1 Leave Work area clean at end of each day.
 - .2 Clean adjacent surfaces immediately.
 - .3 Remove excess and droppings, using recommended cleaners as work progresses.
 - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.08 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 04 05 00 Common Work Results for Masonry
- .2 Section 04 22 00 Concrete Unit Masonry
- .3 Section 05 50 00 Metal Fabrications
- .4 Section 07 84 00 Fire Stopping
- .5 Section 08 71 00 Door Hardware
- .6 09 21 16 Gypsum Board Assemblies
- .7 09 91 23 Interior Painting
- .8 Division 23 Mechanical (Door louvres) Div 26 Electrical and Div 28 Fire Alarm System

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 **CSA-G40.20-[04] /G40.21-[04]**, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 [CSA W59-\[03\]](#), Welded Steel Construction (Metal Arc Welding).
- .2 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, [2000].
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, [1990].
- .3 National Fire Protection Association (NFPA)
 - .1 [NFPA 80-\[99\]](#), Standard for Fire Doors and Fire Windows.
 - .2 [NFPA 252-\[03\]](#), Standard Methods of Fire Tests of Door Assemblies.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 **CAN4-S104-[M80]**, Standard Method for Fire Tests of Door Assemblies.
 - .2 **CAN4-S105-[M85]**, Standard Specification for Fire Door Frames Meeting the Performance Required by **CAN4-S104**.

1.03 SYSTEM DESCRIPTION

- .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. Test products in conformance with **CAN4-S104** and listed by nationally recognized agency having factory inspection services.
- .3 Installed door and frame assembly: Conform to NFPA 80 for fire rated class indicated or specified.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, louvred, arrangement of hardware and fire rating and finishes.
 - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .5 Submit test and engineering data, and installation instructions.
- .4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

1.05 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

- .1 Fleming Door Products, Steldor, Daley, Ambico, Macotta, Daybar Industries Ltd., Metal Door

Ltd., or approved alternate.

2.01 MATERIALS

- .1 Sheet steel: Galvanized steel sheet: to [ASTM A 653M](#), [ZF75], minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts. Commercial grade (CS), Type B, coating designation 40A(120ZF) for interior doors and frames.
- .3 Reinforcement [channel]: to [CSA G40.20/G40.21](#), Type 44W, coating designation to [ASTM A 653M](#), [ZF75].

2.02 DOOR CORE MATERIALS

- .1 Honeycomb construction:
 - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness.

2.03 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.04 PRIMER

- .1 Touch-up prime [CAN/CGSB-1.181](#).

2.05 PAINT

- .1 Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.06 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Interior top and bottom caps: steel.
- .3 Metallic paste filler: to manufacturer's standard.
- .4 Fire labels: metal riveted.
- .7 Weatherstripping: Refer to 08 71 00 Door Hardware.

2.07 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.

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

2.08 FRAME ANCHORAGE

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

2.09 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.12 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for louvre openings as indicated.
- .2 Interior doors: honeycomb construction.
- .3 Fabricate doors with longitudinal edges locked seamed, epoxy-sealed. Seams: fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 Reinforce doors where required, for surface mounted hardware. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with **CAN4-S104** 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.
- .10 Manufacturer's nameplates on doors are not permitted.

2.13 DOORS: HONEYCOMB CORE CONSTRUCTION

- .1 Form face sheets for interior doors from 1.2mm sheet steel with honeycomb core laminated under pressure to face sheets.

3 EXECUTION**3.01 MANUFACTURER'S INSTRUCTIONS**

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

3.02 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.

3.03 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.

3.04 DOOR INSTALLATION

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

3.05 FINISH REPAIRS

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 09 21 16 Gypsum Board Assemblies
- .2 Section 09 91 23 Interior Painting

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for access door components 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 Ontario, Canada.
 - .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

1.04 CLOSEOUT SUBMITTALS

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

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground or indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect access doors from [nicks, scratches, and blemishes.
 - .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
 - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
 - .2 Leave protective coating in place until final cleaning of building.
 - .4 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 ACCESS DOORS

- .1 Sizes: as follows unless indicated:
 - .1 For body entry: 600 x 600 mm minimum.
 - .2 For hand entry: 300 x 300 mm minimum.
- .2 Construction: rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180 degrees.
- .3 Materials:
 - .1 Other areas: prime coated steel.

2.02 EXCLUSIONS

- .1 Lay-in tile ceilings: use unobtrusive identification locators.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for access door installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

- .1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
- .2 Install masonry surfaces: in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .3 Install gypsum board surfaces: in accordance with Section 09 21 16 - Gypsum Board Assemblies.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.04 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 This section applies to RFT B25-03 for the Lady Mackenzie Public School project only.
- .2 This Section includes conventionally glazed aluminum curtain walls installed as stick built systems consisting of; but not limited to, the following:
 - .1 Fixed sealed insulating glass units.
 - .2 Full length pressure plate system.
 - .3 Dry glazed from exterior with screw on pressure plate, keyed-in neoprene gasket and thermally broken screw spline.
 - .4 Internal weep drainage and compartmentalization in accordance with established design principles for rain screen and pressure equalization in curtain wall systems.
 - .5 Snap-On covers.

1.01 RELATED REQUIREMENTS

- .1 Section 04 04 99 – Masonry for Minor Works
- .2 Section 06 10 53 – Miscellaneous Rough Carpentry
- .3 Section 07 21 13 – Board Insulation
- .4 Section 07 21 16 – Blanket Insulation
- .5 Section 07 27 19 – Sheet Membrane Air and Vapour Control
- .6 Section 07 26 00 – Sheet Metal Flashings and Trim
- .7 Section 07 92 00 – Joint Sealants
- .8 Section 09 22 16 – Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-2003(R2009), Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA CW-DG-1-96, Aluminum Curtain Wall Design Guide Manual.
 - .2 AAMA CW-10-04, Care and Handling of Architectural Aluminum From Shop to Site.
 - .3 AAMA CW-11-85, Design Wind Loads and Boundary Layer Wind Tunnel Testing.
 - .4 AAMA T1R-A1-04, Sound Control for Fenestration Products.
 - .5 AAMA 501-05, Methods of Test for Exterior Walls.
 - .6 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
 - .7 AAMA 612-02, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminum.
 - .8 AAMA 2603-02, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - .9 AAMA 2604-05, Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- .3 ASTM International
 - .1 ASTM A 36/A 36M-08, Specification for Carbon Structural Steel.
 - .2 ASTM A 123/A 123M-09, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A 167-99(2009), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .4 ASTM A 653/A 653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM B 209-07, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .6 ASTM B 221-08, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .7 ASTM E 283-04, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .8 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior

- Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.
- .9 ASTM E 331-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .10 ASTM E 413-04, Classification for Rating Sound Insulation.
 - .11 ASTM E 1105-00(2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.108-M89, Bituminous Solvent Type Paint.
 - .2 CAN/CGSB 12.1-M90, Tempered or Laminated Safety Glass.
 - .3 CAN/CGSB 12.3-M91, Flat, Clear Float Glass.
 - .4 CAN/CGSB 12.4-M91, Heat Absorbing Glass.
 - .5 CAN/CGSB 12.8-97 AMEND., Insulating Glass Units.
 - .6 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.
- .5 CSA Group (CSA)
- .1 CAN/CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.
 - .3 **CAN/CSA-S157/S157.1-05**, Strength Design in Aluminum/Commentary on **CAN/CSA-S157**, Strength Design in Aluminum.
 - .4 CSA W59.2-M1991(R2008), Welded Aluminum Construction.
 - .5 CAN/CSA A440/A440.1-00 (R2005), Windows / User Selection Guide to CSA Standard A440-00, Windows. Includes Update No. 1 (2000), Update No. 2 (2006), Update No. 3 (2006).
- .6 Society for Protective Coatings (SSPC)
- .1 SSPC - Paint 20-[02(R2004)], Zinc Rich Coating, Type I - Inorganic and Type II - Organic.
 - .2 SSPC - Paint 25 - [97(R2004)] BCS, Zinc Oxide, Alkyd, Linseed Oil and Primer for Use Over Hand Cleaned Steel Type 1 and Type 2.

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordination: co-ordinate work of this Section with installation of existing block masonry coursing, air barrier placement, vapour retarder placement and flashing placement.

- .2 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning with Contractor's Representative Consultant in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.
- .3 Arrange for site visit with Consultant prior to start of Work to examine existing site conditions adjacent to demolition Work.
- .4 Ensure site supervisor and trade representative attends.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for curtain wall components, anchorage and fasteners, glass and infill, and internal drainage details 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 Ontario, Canada.
 - .2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details.
 - .3 Indicate membrane connections and tie in with adjacent materials including insulation continuity and thermal breaks.

1.05 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazed aluminum curtain wall for incorporation into manual.

1.06 QUALITY ASSURANCE

- .1 Trade Contractor shall have a minimum of 5 years successful experience in the fabrication and erection of metal windows of similar sizes, shapes and finishes to the units required for this project and shall have ample facilities to produce, furnish and supply the units as required for installation without delay to the Work.

1.07 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Handle work of this Section in accordance with AAMA CW-10.
 - .2 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .3 Store units at site on raised wood pallets protected from the elements and corrosive materials. Do not remove from crates or other protective covering until ready for installation.
 - .4 Store all glass units vertically on end with solid bearing full thickness of insulating units.
 - .5 Store pre-fabricated frame assemblies blocked off the ground to prevent warping, twisting, undo strain on assembly or physical abuse and damage.
 - .6 Store and protect aluminum glazed curtain wall components from nicks, scratches, and blemishes.
 - .7 Protect prefinished aluminum surfaces with wrapping strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
 - .8 Replace defective or damaged materials with new.

1.08 SITE CONDITIONS

- .1 Site Measurements: Verify dimensions of other construction by site measurements before fabrication and indicate measurements on shop drawings where aluminum curtain wall systems are indicated to fit to other construction.
- .2 Established Dimensions: Establish dimensions and proceed with fabricating aluminum curtain wall without site measurements where site measurements cannot be made without delaying the Work, coordinated with other construction to ensure that actual dimensions correspond to established dimensions.
- .3 Ambient Conditions: Confirm installation requirements for ambient and surface temperatures of sealants with manufacturer and apply sealants when temperatures are greater than manufacturer's stated minimum from time of application until sealants have cured.

1.09 WARRANTY

- .1 Provide manufacturers written guarantee, signed and issued in the name of Owner, to replace the following items for defective material and workmanship for the time stated from date of Substantial Performance:
 - .1 Framing, panels and glazing: failure of performance requirements specified in Contract Documents; 5 years.
 - .2 Sealed glass units: misting, dusting and seal failure; 5 years.
 - .3 Sealants, caulking: failure to maintain seal; 5 years.
 - .4 Aluminum brake shapes: oil-canning and delamination; 5 years.
- .2 Provide Warranty for aluminum windows to include in maintenance manuals as specified in Section 01 78 00 – Operations and Maintenance Data Manuals.

2 PRODUCTS

2.01 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Kawneer Canada Ltd.
 - .2 Alumicor Limited.
 - .3 Engineered Aluminum Products Inc.

- .4 Windspec Inc.

2.02 SYSTEMS

- .1 Description:
 - .1 Vertical glazed aluminum curtain wall system includes thermally broken tubular aluminum sections with self supporting framing, shop fabricated, factory prefinished, vision glass, related flashings, anchorage and attachment devices.
 - .2 Assembled system to permit re-glazing of individual glass units from exterior without requiring removal of structural mullion sections.
- .2 Performance Requirements:
 - .1 Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with Climatic Data included in the Ontario Building Code and as measured in accordance with AAMA CW 11 and ASTM E 330.
 - .2 Limit mullion deflection to flexure limit of glass with full recovery of glazing materials.
 - .3 Size glass units and glass dimensions to limits established in CAN/CGSB-12.20.
 - .4 Ensure system is designed to accommodate the following without damage to components or deterioration of seals:
 - .1 Movement within system.
 - .2 Movement between system and perimeter framing components.
 - .3 Dynamic loading and release of loads.
 - .4 Deflection of structural support framing.
 - .5 Shortening of building concrete structural columns.
 - .6 Creep of concrete structural members.
 - .7 Confirm understanding of building component deflection values/criteria.
 - .5 Limit air infiltration through assembly to $0.0003 \text{ m}^3/\text{s}/\text{m}^2$ of wall area, measured at a reference differential pressure across assembly of 75 Pa as measured in accordance with AAMA 501 and ASTM E 283.
 - .6 Vapour seal with interior atmospheric pressure of 25 mm sp, 22 degrees C, 40% RH: no failure.
 - .7 Water leakage: none, when measured to AAMA 501, ASTM E 331 and ASTM E 1105.
 - .8 Ensure system allows for expansion and contraction within system components when temperature range is 95 degrees C over 12 hour period without causing detrimental affect to system components.
 - .9 Drain water entering joints, condensation occurring in glazing channels, or

migrating moisture occurring within system, to exterior by weep drainage network.

- .10 Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with [inside] pane of glass and heel bead of glazing compound.
 - .1 Position thermal insulation on exterior surface of air barrier and vapour retarder.
- .11 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.

2.03 MATERIALS

- .1 Materials and resources in accordance with Section [01 47 15 - Sustainable Requirements: Construction].
- .2 Extruded aluminum: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, application of required finish and complying with ASTM B221, Aluminum Association (AA) alloy 6063-T6.
- .3 Sheet aluminum: to [ASTM B 209](#), Aluminum Association (AA) alloy 1100, anodizing quality.
- .4 Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- .5 Fasteners: To ASTM A167, stainless steel, type 304 as recommended by curtain wall manufacturer selected to prevent galvanic action with the components fastened, of suitable size to sustain imposed loads.
- .6 Anti-Rotation Channels: Thermally broken anti-rotation channel/blocks designed to mechanically retain air seal membrane to the face of the tubular back section.
- .7 Concealed Flashing: Manufacturer's standard corrosion resistant, non-staining, non-bleeding flashing compatible with adjacent materials.
- .8 Isolation coating: alkali resistant bituminous paint.
- .9 Thermal Barrier: Thermal barrier consisting of 25 mm separation between the interior and exterior metal members in a typical condition, while maintaining a continuous watertight seal. Thermal barrier assembly shall be tested to the thermal cycling

requirements of ASTM E2692 and show no sign of degradation following the test.

.10 Glazing Tape:

- .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.
- .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.

.11 Sealant:

- .1 Perimeter sealant: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.
 - .1 To CAN/CGSB-19.24 and ASTM C920: type M; grade NS; class 50; use T, NT, M, A, O.
 - .2 Acceptable materials:
 - .1 Dymeric, Tremco.
 - .2 Sikaflex 2c NS, Sika.
 - .3 Sonolastic NP 2, BASF Sonneborn.

2.04 FRAMING SYSTEM COMPONENTS

.1 Mullion profile:

- .1 Horizontal and Vertical members: 63.5mm sightline x 152.4mm depth with 25.4mm double pane infill.
- .2 Cover Depth: 63.5 mm x 19 mm cap
- .3 Thermally broken with interior tubular section insulated from exterior pressure plate.
- .4 Matching stops and pressure plate of sufficient size and strength to ensure adequate bite on glass.
- .5 Drainage holes, deflector plates and internal flashings to accommodate internal weep drainage system.
- .6 Basis-of-Design:
 - .1 **Kawneer Canada Inc. 1600UT System 1**
- .7 Acceptable alternates:
 - .1 **Alumicor Limited Thermawall 2600, Windspec 5400HTP**

.2 Flashings: to Section 07 62 00 Sheet Metal Flashings and Trim.

- .3 Operable sash:
 - .1 Basis-of-Design: **Kawneer GlassVENT UT** (Ultra Thermal) Window in an awning open out configuration.
 - .2 Acceptable alternates: **Alumicor UniVent 1350** Window, Windspec 535 Window Series in an awning open out configuration with 100mm opening limiter.
- .4 Air barrier and Vapour retarder: specified in Section 07 27 19 Sheet Membrane Air and Vapour Control

2.04 GLAZING AND GLASS FABRICATION

- .1 Double Pane Insulating Glass Units: meet or exceed requirements of CAN/CGSB-12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two stage seal method of manufacture, as follows:
 - .1 Primary Seal: polyisobutylene sealing compound between glass and ETA metal spacer/separator, super spacer bar or TDSE Intercept.
 - .2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal.
- .2 Spacer/separator to provide continuous vapour barrier between interior of sealed unit and secondary seal.
- .3 Glazing:
 - .1 Insulating glass units: to CAN/CGSB-12.8, double unit, 25 mm overall thickness.
 - .1 Glass: to CAN/CGSB-12.3, CAN/CGSB-12.1, CAN/CGSB-12.2, CAN/CGSB-12.4, and CAN/CGSB-12.10.
 - .2 Glass thickness: tempered 6mm inner light and tempered 6 mm outer light.
 - .3 Inter-cavity space thickness: 13 mm with low conductivity spacers.
 - .4 Acid etching (where indicated on elevation drawings): Satin, surface number 2.
 - .4 Glass coating: surface number 3, low "E".
 - .5 Inert gas fill: air.

- .6 Performance Properties:
 - .1 Visible Light Transmittance: 63%
 - .2 Shading Coefficient: 0.52
 - .3 Solar Heat Gain Coefficient: 0.45
 - .4 Relative Heat Gain: 1.09 Btu/hr-ft²
 - .5 Basis of Design:
 - .1 Outboard Lite: 6 mm Pilkington Optifloat Blue-Green
 - .2 Inboard Lite: 6 mm PPG Sungate 500 on Clear Low-E Surface #3
- .2 Glazing Gaskets for Sections: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
 - .1 Profiled with a minimum of three (3) fins to contact glazing and to mechanically key into window frame and sash glazing stops, at interior and exterior of glass units.
 - .2 Removable without special tools and without dismantling of window frames.
 - .3 Designed to maintain pressure contact against glass units through design temperature range.
 - .4 Coextruded material is not acceptable.
- .3 Other Glazing Accessories: setting blocks to CAN/CSA-A440.

2.04 FABRICATION

- .1 Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- .3 Prepare components to receive anchor devices. Install anchors.
- .4 Arrange fasteners and attachments to ensure concealment from view.
- .5 Visible manufacturer's identification labels not permitted.
- .6 Finishes:
 - .1 Clear Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A41 anodized matching

Kawneer #14.

- .2 Concealed steel items: galvanized in accordance with CAN/CSA-G164M to 600 gm/m² primed with iron oxide paint.
- .3 Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- .1 Obtain all dimensions from the job site.
- .2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

3.03 INSTALLATION

- .1 Install curtain wall system in accordance with manufacturer's instructions.
- .2 Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- .3 Use alignment attachments and shims to permanently fasten system to building structure. Clean weld surfaces; apply protective primer to field welds and adjacent surfaces.
- .4 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

- .5 Use thermal isolation where components penetrate or disrupt building insulation.
- .6 Install sill flashings.
- .7 Co-ordinate attachment and seal of perimeter air barrier and vapour retarder materials.
- .8 Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- .9 Install operating sash in accordance with manufacturer's instructions.
- .13 Install glass in accordance with manufacturer's instructions. Cover caps to conceal screws and ensure continuous sightline.
- .14 Install perimeter sealant, backing materials and insulation as per drawings and manufacturer's recommendations.

3.04 SITE TOLERANCES

- .1 Maximum variation from plumb: 1.5 mm/m non-cumulative or 12 mm/30 m, whichever is less.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Maximum sealant space between curtain wall and adjacent construction: 13 mm.

3.05 ADJUSTING

- .1 Adjust operating sash for smooth operation.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove protective material from prefinished aluminum surfaces.
 - .3 Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
 - .4 Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
 - .5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.07 PROTECTION

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 08 11 00 Metal Doors and Frames
- .2 Division 26 Electrical
- .3 Division 28 Fire Alarm System

1.02 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI A117.1-1998, Standard for Accessible and Usable Buildings and Facilities.
 - .2 ANSI/BHMA A156, Series of Standards.
 - .3 ANSI/BHMA A156.1-2006, Butts and Hinges.
 - .4 ANSI/BHMA A156.13-2005, Mortise Locks and Latches, Series 1000.
 - .5 ANSI/BHMA A156.15-2006, Release Devices – Closer Holder, Electromagnetic and Electromechanical.
 - .6 ANSI/BHMA A156.16-2008, Auxiliary Hardware.
 - .7 ANSI/BHMA A156.18-2006, Materials and Finishes.
 - .8 ANSI/BHMA A156.19-2007, Power Assist and Low Energy Power Operated Doors.
 - .9 ANSI/BHMA A156.4-2008, Door Controls – Closers.
 - .10 ANSI/BHMA A156.6-2005, Architectural Door Trim.
- .2 Builders Hardware Manufacturers Association (BHMA)
 - .1 Directory of Certified Products.
- .1 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames – 2009.
- .5 Door and Hardware Institute (DHI)
 - .1 Sequence and Format for the Hardware Schedule.
 - .2 ANSI/DHI A115.IG, Installation Guide for Doors and Hardware.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door closers, locksets, door holders, electrified hardware, automatic door operators and related accessories and components for incorporation into manual.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Tools:
 - .1 Supply 2 sets of wrenches for door closers, operators and locksets.

1.06 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.07 DELIVERY, STORAGE AND HANDLING

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

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

1.08 WARRANTY

- .1 Provide written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
- .2 Failures include, but are not limited to, the following:
 - .1 Structural failures including excessive deflection, cracking, or breakage.
 - .2 Faulty operation of operators and door hardware.
 - .3 Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- .3 Warranty Period: From date of Substantial Performance, provide warranties by the accepted manufacturers as follows:

<u>Hardware Item</u>	<u>Warranty length</u>
Mortise Hinges:	1 year
Continuous Hinges:	Lifetime
Locks	10 years
Exit Devices:	3 years
Door Closers:	30 years
Auto Door Operators:	1 Year
Floor/Wall stops:	1 year
Electric Strikes:	5 years
Power Supplies:	1 year

2 PRODUCTS

2.01 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.

- .2 Refer to attached hardware groups 1 through 5.

2.02 DOOR HARDWARE

- .1 Locks and latches:
- .1 Lever locksets: BEST – Grade 1 Heavy Duty
 - .2 Passage set: BEST – Grade 1 Heavy Duty
 - .3 Electric Strikes: Von Duprin
 - .4 Cylinders/Cores: BEST – SFIC (Small Format Interchangeable Core)
Permanent Premium Core by Owner
Construction Core by Contractor

Note: No alternates or substitutions acceptable for BEST components. (TLDSB Standard)

- .2 Butts and hinges:
- .1 Hinges: Ives
 - .2 Self-closing spring hinges: Ives
- .3 Door Closers and Accessories:
- .1 Door controls (closers): LCN
- .5 Door Operators:
- .1 Power door operators: Ditec, LCN, Assa Abloy
- .6 Door Actuators/Push to Lock: Camden
- .7 Kick Plate: Canadian Builders Hardware
- .8 Wall stop: Canadian Builders Hardware
- .9 Door silencers: Ives
- .10 Gasketing: KNC
- .11 Interface boxes: Von Duprin
- .12 Advanced logic relays: Camden
- .13 Wire Harnesses Schlage
- .14 Door Contacts Schlage
- .15 Power Supplies Schlage
- .16 Overhead Stop: Glynn-Johnson
- .17 Emergency Call Kit: Camden

2.04 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.05 KEYING

- .1 Permanent BEST interchangeable core cylinders supplied by the Owner.
- .5 Provide colour coded temporary construction cores during construction period.

3 EXECUTION**3.01 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction cores when directed by Owner.

- .9 Install permanent cores and ensure locks operate correctly. The Owner will void the operation of the construction keys.

3.02 ADJUSTING

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

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.04 DEMONSTRATION

- .1 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers, locksets and door operators.
- .2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.05 PROTECTION

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

3.06 SCHEDULE

.1 See Hardware Groups as follows:

HARDWARE GROUP #1

- Washroom at corridor
- Single door 965mm (38") and 915mm (36") wide)
- Barrier Free, Power Door operated – doors on integral hold open typically for free passage.
- Integral hold-open to release on fire alarm signal
- Classroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	CLASSROOM LOCK	9K37R15K	626	BES
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	HA8-SP C/W INTEGRAL ON/OFF/ HOLD OPEN BUTTON	628	DIT
2 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F-FA 120/240 VAC	LGR	SCE

NOTES:

1. ELECTRICAL CONTRACTOR TO INTERFACE AUTO OPERATOR/ INTEGRAL HOLD OPEN FUNCTION WITH F/A PANEL.

HARDWARE GROUP #1A

- Change room at corridor/gymnasium/barrier free doors
- Single 965mm (38" wide)
- Barrier Free, Power Door operated – high traffic
- Hold-open function not required
- Classroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	CLASSROOM LOCK	9K37R15K	626	BES
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	HA8-SP C/W INTEGRAL ON/OFF/ HOLD OPEN BUTTON	628	DIT
2 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

HARDWARE GROUP #1B

- Change room interior – not rated
- Single 965mm (38" wide)
- Barrier Free, Power Door operated – high traffic.
- Storeroom lockset function
- No label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	STOREROOM LOCK	9K37D15K	626	BES
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	HA8-SP C/W INTEGRAL ON/OFF/ HOLD OPEN BUTTON	628	DIT
2 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

HARDWARE GROUP #2

- Universal Washroom
- Single 965mm (38" wide)
- Barrier Free, Power Door operated - Universal Washroom
- Emergency Call System
- Storeroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	STOREROOM LOCK	9K37D15K	626	BES
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	HA8-SP C/W INTEGRAL ON/OFF/ HOLD OPEN BUTTON	628	DIT
1 EA	AURA PUSH TO LOCK/ACTUATOR	CM-2520/4855SE1	630	CAM
1 EA	ILLUMINATED ACTUATOR	CM-45/455SE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	EMERGENCY CALL KIT	CX-WEC10K2		CAM
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

NOTE: PROVIDE TWO (2) ASSISTANCE REQUIRED ILLUMINATED SIGNS – ONE FOR OUTSIDE THE WASHROOM AND ANOTHER REMOTELY LOCATED INSIDE THE MAIN SCHOOL OFFICE. REFER TO ELECTRICAL FOR FURTHER INFORMATION AND SCHEMATIC.

HARDWARE GROUP #2A

- Barrier free Washroom
- Single 965mm (38" wide)
- Barrier Free, Power Door operated
- Storeroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	STOREROOM LOCK	9K37D15K	626	BES
1 EA	INTERFACE BOX	JB7	GRAY	VON
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	ELECTRIC STRIKE	6211 FSE CON	630	VON
1 EA	AUTO OPERATOR	HA8-SP C/W INTEGRAL ON/OFF/ HOLD OPEN BUTTON	628	DIT
1 EA	AURA PUSH TO LOCK/ACTUATOR	CM-2520/4855SE1	630	CAM
1 EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1	630	CAM
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	ADVANCED LOGIC RELAY	CX-33		CAM
1 EA	WIRE HARNESS	CON-6W		SCH
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

HARDWARE GROUP #3

- Washroom entrance non-barrier free,
- Closer with integral hold-open to release on fire alarm signal
- Classroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	CLASSROOM LOCK	9K37R15K	626	BES
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	FIRE/LIFE CLOSER	4040SE 24V AC/DC	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC
1 EA	TRANSFORMER	4040SE-3210		LCN

NOTES:

1. MOUNT CLOSER ON PULL SIDE.
2. ELECTRICAL CONTRACTOR TO INTERFACE FIRE/LIFE CLOSER WITH F/A PANEL

HARDWARE GROUP #3A

- Washroom entrance non-barrier free,
- Closer
- Classroom lockset function
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	CLASSROOM LOCK	9K37R15K	626	BES
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	SURFACE CLOSER	4040XP	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC

HARDWARE GROUP #4

- Custodial Rooms, Storage Rooms, Kitchen
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	STOREROOM LOCK	9K37D15K	626	BES
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	SURFACE CLOSER	4040XP	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC

HARDWARE GROUP #4A

- Not rated

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	STOREROOM LOCK	9K37D15K	626	BES
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	SURFACE CLOSER	4040XP	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC

HARDWARE GROUP #4B

- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	STOREROOM LOCK	9K37D15K	626	BES
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	SURFACE CLOSER	4040XP	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC

HARDWARE GROUP #5

- Staff Washroom (Single)
- 45 Min Label

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	PRIVACY SET	9K37L15K	626	BES
1 EA	SURFACE CLOSER	4040XP SCUSH ST-3068	689	LCN
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH
1 SET	GASKETING	W-22 X 1@HD / 2@JMB	BLK	KNC

HARDWARE GROUP #5A

- Staff Washroom (Single)
- Not rated

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	PRIVACY SET	9K37L15K	626	BES
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH

HARDWARE GROUP #6

- All Gender Washroom Stalls

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	PRIVACY SET	9K37L15K	626	BES
1 EA	WALL STOP	CBH 140	630	CBH

HARDWARE GROUP #7

- Gym office/changeroom door

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1HW 127X114MM	652	IVE
1 EA	CLASSROOM LOCK	9K37R15K	626	BES
1 EA	PERMANENT CORE	BEST - BY OWNER	626	BES
1 EA	CONSTRUCTION CORE	BEST - COLOUR CODED		BES
1 EA	KICK PLATE	CBH 903 150 X SIZE TO SUIT	630	CBH
1 EA	WALL STOP	CBH 140	630	CBH

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 07 84 00 Fire Stopping
- .2 Section 07 92 00 Joint Sealants
- .3 Section 09 91 23 Interior Painting

1.02 REFERENCE STANDARDS

- .2 CAN/CSA A82.31-M91 Gypsum Board Application
- .8 Underwriters' Laboratories of Canada (ULC)
 - .1 **CAN/ULC-S102-[10]**, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [gypsum board assemblies] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit gypsum board assembly drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate components such as fastener type, dimensions, spacing and locations at gypsum board edges, ends and in field of board as well as installation methods. Components and work to confirm CAN/CSA A82.31-M91 standard specification for application and finishing of gypsum board.
 - .3 Indicate type of joint compound, and number of joint compound layers.
 - .4 Indicate number and location of electrical boxes for wall and ceiling.
- .4 Certifications:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.04 DELIVERY, STORAGE AND HANDLING

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address and applicable standard designation.
- .3 Exercise care in unloading gypsum board materials shipment to prevent damage.
- .4 Storage and Handling Requirements in accordance with CAN/CSA A82.31-M91
 - .1 Store gypsum board assemblies materials level flat off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
 - .3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
 - .4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
 - .5 Protect from weather, elements and damage from construction operations.
 - .6 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .7 Replace defective or damaged materials with new.

1.05 AMBIENT CONDITIONS

- .1 Maintain temperature 10 °C minimum, 21 °C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, clean, 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.

2 PRODUCTS

2.01 MATERIALS

- .1 Standard board: to CAN/CSA A82.31-M91 regular, 16mm thick and Type X, 16mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.
- .2 Glass mat water-resistant gypsum backing board: CAN/CSA A82.31-M91, 16mm thick, 1200 mm wide x maximum practical length.
- .3 Metal furring runners, hangers, tie wires, inserts, and anchors.
- .4 Drywall furring channels: [0.5] mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .5 Steel drill screws: to [ASTM C 1002-14](#).
- .6 Laminating compound: as recommended by manufacturer, asbestos-free.

- .7 Casing beads, corner beads, control joints and edge trim: to [ASTM C 1047](#), Zinc 0.5mm base thickness, perforated flanges, one piece length per location.
- .8 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .9 Polyethylene: to [CAN/CGSB-51.34](#), Type 2.
- .10 Joint compound: to [ASTM C 475](#), asbestos-free.

2.02 FINISHES

- .1 Texture finish: asbestos-free [standard white] texture coating and primer-sealer, recommended by gypsum board manufacturer.
 - .1 Primer: VOC limit [50][100][200] g/L maximum to [GS-11][SCAQMD Rule 1113].

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 ERECTION

- .1 Do application and finishing of gypsum board CAN/CSA A82.31-M91 except where specified otherwise.
- .2 Do application of gypsum sheathing to CAN/CSA A82.31-M91
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to CAN/CSA A82.31-M91 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes CAN/CSA A82.31-M91, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across joists between layers of gypsum board], spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with drywall screws.

3.03 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls to CAN/CSA A82.31-M91
 - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250mm with base layer joints.
- .3 Apply single layer gypsum board to concrete block surfaces, where indicated, using laminating adhesive.
 - .1 Comply with gypsum board manufacturer's recommendations.
 - .2 Brace or fasten gypsum board until fastening adhesive has set.
 - .3 Mechanically fasten gypsum board at top and bottom of each sheet.
- .4 Apply glass mat reinforced gypsum sheathing where wall tiles to be applied and adjacent to slop sinks. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.

- .5 Apply 10 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. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250mm.
- .7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.04 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure [at [150] mm on centre][using contact adhesive for full length].
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install shadow mould at gypsum board/ceiling juncture [as indicated]. Minimize joints; use corner pieces and splicers.
- .6 Construct control joints of set in gypsum board facing and supported independently on both sides of joint.
- .7 Provide continuous polyethylene dust barrier behind and across control joints.
- .8 Locate control joints at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.
- .9 Install control joints straight and true.

- .10 Ensure that screws or nails are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.
- .11 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .12 Install expansion joint straight and true.
- .13 Install cornice cap where gypsum board partitions do not extend to ceiling.
- .14 Splice corners and intersections together and secure to each member with 3 screws.
- .15 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .16 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.
- .17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 0: no tapping, finishing or accessories required.
 - .2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces free of excess joint compound; tool marks and ridges are acceptable.
 - .3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
 - .4 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.
 - .5 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.
 - .6 Level 5: 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; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .19 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.
- .20 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.
- .21 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface

of board.

- .22 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .23 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .24 Mix joint compound slightly thinner than for joint taping.
- .25 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .26 Allow skim coat to dry completely.
- .27 Remove ridges by light sanding or wiping with damp cloth.

3.05 CLEANING

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

3.06 PROTECTION

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

3.07 SCHEDULES

- .1 Construct fire rated assemblies where indicated.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 07 84 00 Fire Stopping
- .2 Section 09 21 16 Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

- .1 CAN/CSA-S136 North American Specification for the Design of Cold Formed Steel Structural Members

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 MATERIALS

- .1 Non-load bearing channel stud framing: to [ASTM C 645](#), various stud sizes as indicated in drawings, roll formed from 0.53 mm thickness hot dipped zinc-coated (galvanized) steel sheet in accordance with [ASTM A 653](#), Z180, for screw attachment of gypsum board. Use 0.879mm (20 ga) for framing fire rated door openings.
 - .1 Knock-out service holes at 460 mm centres.
- .2 Floor and ceiling tracks: to [ASTM C 645](#), in widths to suit stud sizes, and as follows:
 - .1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm on centre along length of runner; tested and certified for use in fire rated wall construction.
 - .2 Base Runner: Bottom track with 33 mm upstanding legs.
- .3 Furring Channels: Commercial steel sheet in accordance with [ASTM A 653](#), Z180, hot dipped zinc-coated (galvanized), as follows:
 - .1 Hat Shaped, Rigid Furring Channels: [ASTM C 645](#), 0.75 mm thickness x 22 mm deep.
 - .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).
- .4 Metal channel stiffener: 1.4mm thick cold rolled steel, coated with rust inhibitive coating.
- .5 Acoustical sealant: in accordance with Section 07 92 00 - Joint Sealants.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation after unacceptable conditions have been remedied.

3.02 ERECTION

- .1 Erect partitions in accordance with framing requirements of [ASTM C 754](#).
- .2 Align partition tracks at floor and ceiling and secure at 610 mm on centre maximum.

- .3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .4 Place studs vertically at 400 mm on centre and not more than 50mm from abutting walls, and at each side of openings and corners.
 - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .5 Erect metal studding to tolerance of 1:1000.
- .6 Attach studs to bottom and ceiling track using screws.
- .7 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
 - .1 Secure studs together, 50mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
 - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
 - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to ceiling height except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
 - .1 Use double track slip joint as indicated.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .17 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.03 CLEANING

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

3.04 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by non-structural metal framing application.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 04 22 00 Concrete Unit Masonry
- .2 Section 09 21 16 Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

- .1 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00 [2016/2017], Tile Installation Manual.
 - .2 Hard Surface Maintenance Guide [2017-2019].
- .2 Canadian General Standards Board (CGSB)
 - .1 [CGSB 71-GP-22M-\[78\(AMEND.\)\]](#), Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .2 [CAN/CGSB-75.1-\[M88\]](#), Tile, Ceramic.
 - .3 [CAN/CGSB-25.20-\[95\]](#), Surface Sealer for Floors.
- .3 CSA Group (CSA)
 - .1 [CAN/CSA-A3000-\[03\(R2006\)\]](#), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Chemical resistant mortar and grout (Epoxy and Furan).
 - .3 Cementitious backer unit.
 - .4 Dry-set cement mortar and grout.
 - .5 Divider strip.
 - .6 Elastomeric membrane and bond coat.
 - .7 Reinforcing tape.
 - .8 Levelling compound.
 - .9 Latex cement mortar and grout.
 - .10 Commercial cement grout.
 - .11 Organic adhesive.
 - .12 Slip resistant tile.
 - .13 Waterproofing isolation membrane.
 - .14 Fasteners.

- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 No physical samples are required.
- .4 For tile installations on existing substrates such as existing concrete, concrete block or brick masonry, plaster, tile backer or gypsum board. Provide written explanation of the removal procedures of existing finishes and substrate preparation procedures for new tile installation to the Consultant for review and in accordance with Section 01 33 00 - Submittal Procedures.

1.04 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE AND HANDLING

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

1.07 AMBIENT CONDITIONS

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

1.08 MAINTENANCE

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

2 PRODUCTS

2.01 FLOOR TILE

- .1 Refer to individual project's room finish schedule and drawings for type, pattern, room location and extent of each product.
- .2 Porcelain Floor Tile (anti-slip): Rock Series by Olympia Tile

- .1 **PT1:** Grigio Grey 300 x 600mm (12"x24").
 - .2 **PT2:** Anthracite 300 x 600mm (12"x24").
 - .3 **PT4:** White 300 x 600mm (12"x24").
 - .4 **PT5:** Nero 300 x 600mm (12"x24").
- .3 Porcelain floor tile: Quebec Series – Porcelain Dot-Mounted Mosaic by Olympia Tile
- .2 **PT3:** Black Fleck 50 x 50mm

2.02 WALL AND CEILING TILE

- .1 Refer to individual project's room finish schedule and drawings for type, pattern, room location and extent of each product.
- .2 Ceramic tile: Colour and Dimension Collection – Glazed Wall by Olympia Tile
- .1 **CT1:** Arctic White Bright 100 x 400mm.
 - .2 **CT2:** Bone Matte 100 x 400mm
 - .3 **CT3:** Taupe Bright 100 x 400mm
 - .4 **CT4:** Chartreuse Bright 100 x 400mm
 - .5 **CT5:** Olive Matte 100 x 400mm
 - .6 **CT6:** Citron Bright 100 x 400mm
 - .7 **CT7:** Papaya Bright 100 x 400mm
 - .8 **CT8:** Red Pepper Bright 100 x 400mm
 - .9 **CT9:** Turquoise Bright 100 x 400mm
 - .10 **CT10:** Sapphire Bright 100 x 400mm
 - .11 **CT11:** Silver Grey Bright 100 x 400mm
 - .12 **CT12:** Sterling Grey Bright 100 x 400mm
 - .13 **CT13:** Dark Grey Bright 100 x 400mm
 - .14 **CT14:** Black Bright 100 x 400mm
- .3 Glass Mosaic Tile: American Olean Colour Appeal or Daltile Color Wave – Glass Mosaic

Codes: MT = Mosaic

= Preferred products are numbers with no "A" suffix.

A = Acceptable alternate if preferred product is out of stock/discontinued.

- .1 **MT1** Daltile Whisper Green CW12 25mm x 150mm (1"x6")
- .1A **MT1A:** American Olean Vintage Mint C107 75mm x 150 mm (3"x6")
- .2 **MT2** Daltile Blue Lagoon 25mm x 150mm (1"x6")
- .2A **MT2A:** American Olean Powder C109 75mm x 150mm (3"x6")
- .3 **MT3:** American Olean Fountain Blue C108 Blue 75mm x 150mm (3"x6")
- .4 **MT4** Daltile Twilight Blue CW14 25mm x 150mm (1"x6")
- .4A **MT4A:** American Olean Dusk C110 75mm x 150mm (3"x6")
- .5 **MT5** American Olean Cherry C117 75mm x 150mm (3"x6")
- .6 **MT6:** Daltile Feather White CW02 25mm x 150mm (1"x6")

- .6A **MT6:** American Olean Pearl C101 75mm x 150mm (3"x6")
- .7 **MT7** Daltile Ice White CW01 25mm x 150mm (1"x6")
- .8 **MT8:** Daltile Smoked Pearl CW17 25mm x 150mm (1"x6")
- .8A **MT8A:** American Olean Silver Cloud C102 75mm x 150mm (3"x6")
- .9 **MT9** Daltile Top Hat CW18 25mm x 150mm (1"x6")
- .10 **MT10:** Daltile Nine Iron CW19 25mm x 150mm (1"x6")
- .20 **MT20:** Daltile Evening Mixer CW28 25mm x 25mm (1"x1")
- .20A **MT20A:** American Olean Midnight Sky C135
- .21 **MT21** American Olean Silver Spring C134
- .22 **MT22:** American Olean Blue Moon C130
- .22A **MT22A:** Daltile Winter Blues CW27 (Acceptable alternate to MT22)

2.03 BASE TILE

- .1 Base: Porcelain Floor Tile (anti-slip): Rock Series by Olympia Tile
 - .1 **PT1:** Grigio Grey 100 x 600mm.
 - .2 **PT2:** Anthracite 100 x 600mm.
 - .3 **PT4:** White 300 x 600mm
- .2 Base: Porcelain Floor Tile (anti-slip): Quebec Series – Porcelain Dot-Mounted Mosaic by Olympia Tile
 - .1 **PT3:** Black Fleck 50 x 50mm
(Two rows of 50mm = 100mm high wall base.)

2.04 STAIR TREADS

- .1 Stair Treads: Porcelain Stair Tread Tile (anti-slip): Rock Series by Olympia Tile
- .2 **PT2:** Anthracite 300 x 600mm.

2.06 MORTAR AND ADHESIVE MATERIALS

- .1 Latex Modified Thin Set Mortar: C-Crylic 200 with Permabond (Premium mix over concrete substrate) and/or Multicure (Modified System) by C-Cure, Kerabond mixed with Keralastic by Mapei, Laticrete 272 Mortar with Laticrete 333 Super Flexible Additive or approved alternate.

2.08 GROUT

- .1 Wall Tile Grout: Unsanded dry set, coloured Laticrete 600 series/1776 or equivalent by Flextile. Colours of grout to be selected by Consultant from full range of standard colours.
- .2 Floor Tile Grout: Presanded coloured latex grout: Laticrete 500 Series/1776 or equivalent by Flextile. Colours of grout to be selected by Consultant from full range of standard colours.
- .3 Shower Wall and Floor Tile Grout: 100 Flex – epoxy grout by Flextile, colours selected by

consultant from full range of standard colours

2.09 ACCESSORIES

- .1 Tile Backer Board Joint Tape: minimum 50mm wide coated fiberglass mesh tape, self adhesive.
- .2 Shower Wall and Floor waterproofing membrane: Schluter Kerdi Waterproofing membrane.
- .3 Metal lath: to [ASTM C 847](#) [galvanized][painted] finish, 10 mm rib at Lath weight of 2.17 kg/m².
- .4 Corner and Edge Trim: purpose made metal extrusion; anodized aluminum type for terminating cut tile, at junction of tile and dissimilar materials. Size to suit tile thickness. Satin anodized finish. Schluter – refer to drawings.
 - .1 CG1: Schluter Rondec at all outside corners
 - .2 CG2: Schluter Jolly at dissimilar material joints.
- .5 Transition Strips: purpose made metal extrusion; anodized aluminum type. Schluter – refer to drawings.
 - .1 TS1A: Schluter Schiene at flush tile to adjacent existing finish transitions
 - .2 TS2: Schluter Reno-U at tile to VCT transitions
 - .3 TS3: Schluter Ramp at tile to exposed concrete transitions or to maintain barrier free compliance.
 - .4 TS4: Schluter DECO-DE
 - .5 TS5: Schluter RENO-T
- .7 Prefabricated Movement Joints:
 - .1 CJ1: Schluter DILEX-BWS 5mm. Finish: Stainless Steel
- .8 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .9 Floor sealer and protective coating: to tile and grout manufacturers recommendations.

2.10 PATCHING AND LEVELLING COMPOUND

- .1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.
 - .3 Flexural strength - 7 MPa.
 - .4 Density - [1.9] kg/m³
- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.

2.11 CLEANING COMPOUNDS

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

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Refer to drawings for working points (WP).
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Make internal angles square.
- .9 Install divider strips at junction of tile flooring and dissimilar materials.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.
- .11 Clean installed tile surfaces after installation and grouting cured.

3.03 FIELD QUALITY CONTROL

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

3.4 CLEANING

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 23 37 20 - Louvres, Intakes and Vents: Air inlets and outlets to be coordinated with ceiling work.
- .2 Division 26 Electrical and 28 - Lighting, electrical and fire alarm devices to be coordinated with ceiling work.

1.02 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 **CAN/ULC-S102-[2003]**, Surface Burning Characteristics of Building Materials and Assemblies.

1.03 COORDINATION

- .1 Do not begin erection of ceiling suspension system until work above ceiling has been reviewed by Consultant.

1.04 PRE-INSTALLATION MEETING

- .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and other affected trades in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with work of other sections.
 - .4 Review manufacturer's installation instructions and warranty requirements.
 - .5 Review accepted shop drawings for installation requirements.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension, acoustic panels, acoustic tiles, and system accessories. Include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit reflected ceiling plans for special grid patterns as indicated.

- .2 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, access door dimensions, and locations and acoustical unit support at ceiling fixture lateral bracing and accessories.
- .4 Samples:
 - .1 Submit for review and acceptance of each component specified or necessary for complete installation. Include technical descriptive data.
 - .2 Submit one sample of each component proposed for use in each type of ceiling suspension system.
 - .3 Submit 100 mm x 100 mm samples of each type of acoustical unit.

1.06 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit operation and maintenance data for acoustical suspension for incorporation into manual.

1.07 MAINTENANCE MATERIALS

- .1 Provide extra acoustical units in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide acoustical units amounting to 5% of gross ceiling area for each pattern and type of acoustical panel or tile, suspension system and trim required for project, minimum 1 complete factory-sealed package of each.
- .3 Ensure extra materials are from same production run as installed materials.
- .4 Deliver extra materials for each type of acoustical unit in original unopened packages clearly identified, including colour and texture.
- .5 Deliver to Owner, upon completion of the work of this section.

1.08 CERTIFICATIONS

- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Include certification of sustainable requirements.

1.09 MOCK-UPS

- .1 Not Used.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials flat, off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect acoustical ceiling panels, tiles suspension grid components from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Store extra materials required for maintenance, where directed by Owner.

1.11 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20 -40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

1.12 WARRANTY

- .1 Provide manufacturer's 30 year warranty for commercial suspension systems and ceiling products.

2 PRODUCTS**2.01 ACOUSTICAL CEILING SUSPENSION**

- .1 Acoustical Ceiling Suspension system **ACT-1 and ACT-3:**
 - .1 Exposed tee bar grid: Main and Cross Tees and Edge moulding: double webbed, hot dipped galvanized cold rolled steel construction, prefinished white cap, "Prelude XL 15/16" Fireguard" by Armstrong.
- .2 Fire-resistance rated suspension system **ACT-2 and ACT-4 :**
 - .1 Exposed tee bar grid: Main and Cross Tees and Edge moulding: double webbed, hot dipped galvanized cold rolled steel construction, prefinished white cap, "Prelude XL 15/16" Fireguard" by Armstrong.
- .3 Basic materials for suspension system: commercial quality zinc coated to Z265.
- .5 Hanger wire: galvanized soft annealed steel wire:

- .1 3.6 mm diameter for access tile ceilings.
- .2 To ULC design requirements for fire rated assemblies.
- .6 Hanger inserts: purpose made.
- .7 Carrying channels: 38mm channel, galvanized steel.
- .8 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

2.04 ACOUSTICAL CEILING PANELS

- .1 Acoustical Panel: **ACT-1:** Armstrong Georgian 764D 24" x 24" non fire rated, made up as follows:
 - .1 Type: **ACT-1.**
 - .2 Fire Classification: Class [A].
 - .1 Flame spread rating of 25 or less in accordance with **CAN/ULC-S102.**
 - .2 Smoke developed 50 or less in accordance with **CAN/ULC-S102.**
 - .3 Noise Reduction Coefficient (NRC) designation of 0.55
 - .4 Ceiling Attenuation Class (CAC) rating 33 in accordance with [ASTM E 1414.](#)
 - .5 Light Reflectance (LR) range of 86%
 - .6 Edge type: square
 - .7 Colour: White
 - .8 Size 24" x 24" x 15.9 mm thick.
 - .9 Shape: flat.
- .2 Acoustical Panel: **ACT-2:** Armstrong **SCHOOL ZONE FINE FISSURED 1810 FireGuard**
 - .1 Surface Texture: Medium Texture
 - .2 Composition: Mineral Fiber
 - .3 Color: White
 - .4 Size: 24 in x 24 in x 15/16" Thick
 - .5 Edge Profile: Square Lay-in
 - .6 Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: 0.70
 - .7 Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; Classified with UL label on product carton: 35, 40
 - .8 Flame Spread: ASTM E 1264; Class A
 - .9 Light Reflectance (LR) White Panel: ASTM E 1477; 0.82
 - .10 Dimensional Stability: HumiGuard Plus
 - .11 Recycle Content: Up to 56% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
 - .12 Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
 - .13 Life Cycle Assessment: Third Party Certified Environmental Product Declaration (EPD)
 - .14 Indoor Air Quality Certified to SCS-105 v4.2-2023

- .3 Acoustical Panel: **ACT-3:** Armstrong Georgian 763D 24" x 48" non fire rated, made up as follows:
 - .1 Type: ACT-3.
 - .2 Fire Classification: Class A.
 - .1 Flame spread rating of 25 or less in accordance with **CAN/ULC-S102**.
 - .2 Smoke developed 50 or less in accordance with **CAN/ULC-S102**.
 - .3 Noise Reduction Coefficient (NRC) designation of 0.55
 - .4 Ceiling Attenuation Class (CAC) rating 33 in accordance with [ASTM E 1414](#).
 - .5 Light Reflectance (LR) range of 86%
 - .6 Edge type: square
 - .7 Colour: White
 - .8 Size 24" x 48" x 15.9 mm thick.
 - .9 Shape: flat
- .3 Acoustical Panel: **ACT-4:** Armstrong **SCHOOL ZONE FINE FISSURED 1811 FireGuard**
 - .1 Surface Texture: Medium Texture
 - .2 Composition: Mineral Fiber
 - .3 Color: White
 - .4 Size: 24 in x 48 in
 - .5 Edge Profile: Square Lay-in
 - .6 Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: 0.70
 - .7 Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; Classified with UL label on product carton: 35, 40
 - .8 Flame Spread: ASTM E 1264; Class A
 - .9 Light Reflectance (LR) White Panel: ASTM E 1477; 0.82
 - .10 Dimensional Stability: HumiGuard Plus
 - .11 Recycle Content: Up to 56% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
 - .12 Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
 - .13 Life Cycle Assessment: Third Party Certified Environmental Product Declaration (EPD)
 - .14 Indoor Air Quality Certified to SCS-105 v4.2-2023

2.05 ACCESSORIES

- .1 Hold down clips: purpose made clips to secure tile to suspension system, approved for use in fire-rated systems.

3 EXECUTION

3.01 EXAMINATION

- .1 Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for acoustical ceiling tile and track installation in accordance with manufacturer's

written instructions.

- .1 Visually inspect substrate.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INTERFACE WITH OTHER WORK

- .1 Coordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.
- .2 Do not install acoustical panels and tiles until work above ceiling has been reviewed by Consultant.

3.03 SUSPENSION SYSTEM INSTALLATION

- .1 Comply with manufacturer's written installation instructions and recommendations, including product technical bulletins, product carton installation instructions, and data sheets.
- .2 Install suspension system in accordance with accepted shop drawings, Certification Organizations tested design requirements and [ASTM C 636/C 636M](#) except where specified otherwise.
- .3 Lay out system according to reflected ceiling plan.
- .4 Finished ceiling system to be square with adjoining walls and level within 1:1000.
- .5 Secure hangers to overhead structure using attachment methods as indicated.
- .6 Install hangers spaced at maximum 1200mm centres and within 150 mm from ends of main tees.
- .7 Ensure suspension system is coordinated with location of related components. Provide carrying channels as necessary to bridge at unavoidable interference between suspension system and other work above ceiling.
- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.
- .10 Support at light fixtures, diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 610 mm around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Install access splines where required for full body access to above ceiling equipment.

3.04 ACOUSTICAL CEILING PANEL INSTALLATION

- .1 Install lay-in acoustical panels in ceiling suspension system in accordance with manufacturer's instructions and as indicated.
- .2 In fire rated ceiling systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to Certification Organizations design requirements.

3.05 SITE QUALITY CONTROL

- .1 Arrange for periodic site visits by manufacturer's representative to review installed work for conformity to manufacturer's installation instructions and recommendations.
- .3 Submit written site reports by designer to Consultant within 3 days of visit.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
 - .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

3.07 PROTECTION

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 033500 Concrete Finishing

1.02 REFERENCE STANDARDS

- .1 ASTM International
 - .1 [ASTM F 1303-\[04\(2014\)\]](#), Standard Specification for Sheet Vinyl Floor Covering with Backing.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for resilient sheet flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit digital photographs.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide 10% of each colour, pattern and type flooring material required for project for maintenance use.
 - .3 Extra materials one piece and from same production run as installed materials.
 - .4 Identify each roll of sheet flooring and each container of adhesive.
 - .5 Deliver to Owner, upon completion of the work of this section.
 - .6 Store where directed by Owner.

1.05 DELIVERY, STORAGE AND HANDLING

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

recommendations in clean, dry, well-ventilated area.

- .2 Store and protect specified materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.06 SITE CONDITIONS

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

1.07 WARRANTY

- .1 Provide manufacturer's 15 yr warranty.

2 PRODUCTS

2.01 MATERIALS

- .1 **RF-1:** Sheet vinyl with backing: heavy duty commercial grade.
 - .1 RF-1, Altro Reliance 25,
 - .2 Colour: "Rock" D2504
 - .3 Thickness: 2.5 mm.
 - .4 Slip Resistant.
 - .5 Acceptable Alternate: Polyflor, Polysafe Verona
- .2 **VCT-1:** Vinyl Composite Tile
 - .1 Armstrong Excelon
 - .2 Size: 305mm x 305mm
 - .3 Thickness: 3.2mm
 - .4 Colour: "Sterling" 51904
 - .5 Adhesive: As recommended by manufacturer.
- .3 **RB-1:** Resilient base: continuous, top set, complete with premoulded end stops and external corners:
 - .1 RB-1, rubber Johnsonite
 - .2 Style: cove.
 - .3 Thickness: 3.17 mm.
 - .4 Height: 101.6 mm.
 - .5 Lengths: cut lengths minimum 2400 mm.
 - .6 Colour: Charcoal
- .4 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for resilient sheet flooring installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 SITE VERIFICATION OF CONDITIONS

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

3.03 PREPARATION

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

3.04 APPLICATION: FLOORING

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system.
- .2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring to produce a minimum number of seams. Border widths minimum 1/3 width of full material.
- .4 Run sheets in direction of traffic. Double cut sheet joints and continuously heat weld according to manufacturer's printed instructions.
- .5 Heat weld seams of linoleum sheet flooring in accordance with manufacturer's printed instructions.

- .6 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.
- .7 Cut flooring around fixed objects.
- .8 Install feature strips and floor markings where indicated. Fit joints tightly.
- .9 Install flooring in pan type floor access covers. Maintain floor pattern.
- .10 Continue flooring over areas which will be under built-in furniture.
- .11 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .12 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .13 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.05 APPLICATION: BASE

- .1 Lay out base to keep number of joints at minimum.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.
- .8 Use toeless type base where floor finish will be carpet, coved type elsewhere.
- .9 Install toeless type base before installation of carpet on floors.
- .10 Heat weld base in accordance with manufacturer's printed instructions.

3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
 - .1 Clean flooring and base surfaces to flooring manufacturer's printed instructions.

3.08 PROTECTION

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 033500 Concrete Finishing

1.02 REFERENCE STANDARDS

- .1 ASTM International
 - .1 [ASTM C 241/C 241M-\[13\]](#), Standard Test Method for Abrasion Resistance of Stone Subject to Foot Traffic.
 - .2 [ASTM D 2370-\[98\(R2010\)\]](#), Standard Test Method for Tensile Properties of Organic Coatings.
- .2 Canadian General Standards Board (CGSB)
 - .1 [CAN/CGSB-51.34-\[M86\(R1988\)\]](#), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 [CAN/CGSB-25.20-\[95\]](#), Surface Sealer for Floors.
- .3 CSA Group (CSA)
 - .1 [CSA A23.1/A23.2-\[09\(R2014\)\]](#), Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 [CSA A3000-\[13\]](#), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .5 Terrazzo, Tile and Marble Association of Canada (TTMAC)
 - .1 Maintenance Guide.
 - .2 TTMAC/CSCTEK-AID 09 40 00, Portland Cement Terrazzo Digest.
 - .3 TTMAC 2012/2014 Specification Guide 09 30 00 Tile Installation Manual.
 - .4 TTMAC 09 66 00 Terrazzo Installation Manual.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for Portland cement terrazzo flooring and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of TTMAC Maintenance Guide for inclusion in operations and maintenance manual prepared and submitted in Section 017800. Provide specific

warning of maintenance practices or materials that may damage or disfigure finished work.

.3 Submit WHMIS SDS sheets for floor sealer products.

.3 Samples:

.1 Submit digital photo samples of terrazzo indicating relation to existing terrazzo to be matched.

1.04 CLOSEOUT SUBMITTALS

.1 Provide maintenance data as set out in TTMAC publication for terrazzo work for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.05 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: trained and experienced in terrazzo work. Company must be registered as members in good standing with Terrazzo, Tile and Marble Association of Canada. If requested by Consultant submit listing of at least three previously completed projects of similar size and scope.

.2 Supplier: a member in good standing with Terrazzo, Tile and Marble Association of Canada, providing materials meeting the minimum standards of TTMAC.

.3 Mock-ups:

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Provide mock-up for evaluation of surface finishes and quality of work.

.3 Construct mock-up where directed.

.4 Allow 48 hours for inspection of mock-up Consultant before proceeding with work.

.6 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.06 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect specified materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.07 SITE CONDITIONS

- .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.
- .2 Ventilation:
 - .1 Provide continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.
- .3 Ambient Conditions:
 - .1 Maintain air temperature and structural base temperature at terrazzo installation area above 12 degrees C for 24 hours prior to, during, and for 24 hours following installation.

2 PRODUCTS**2.01 MATERIALS**

- .1 To match existing adjacent terrazzo finish.
- .2 Cement:
 - .1 To [CSA A3000](#).
 - .2 Type 10, grey for underbed.
 - .3 White for topping.
 - .4 6% air-entrainment.
- .3 Sand, fine and coarse aggregates:
 - .1 To [CSA A23.1/A23.2](#).
 - .2 Clean, washed, locally available.
 - .3 Oval aggregate.
- .4 Water: potable.
- .5 Marble chips:
 - .1 Graded in accordance with TTMAC standard.
 - .2 Abrasion resistance to [ASTM C 241/C 241M](#).
 - .3 No deleterious or foreign matter.
- .6 Pigments:
 - .1 Compatible with Portland cement.
 - .2 Alkali-resistant, colour-stable.
 - .3 Lime-proof mineral.
- .7 Epoxy bonding agent: two components, epoxy resin and epoxy hardener conforming to following performance properties after cure schedule of 28 days at 25 degrees C.
 - .1 Viscosity: mixed viscosity not less than 0.04 Pa.s or more than 0.5 Pa.s.
 - .2 Gel time: not less than half hour at 20 degrees C.

- .3 Flexibility: Gardiner flexibility test, passes bending over 12 mm mandrel, without cracking.
- .4 Elongation: [ASTM D 2370](#), minimum 10%.
- .5 Bond strength: 2 MPa, with 100% concrete failure at minimum coverage, test concrete specimen minimum compressive strength 20 MPa.
- .6 Coverage: 0.3 L/m² minimum, dry film thickness not less than 0.2 mm.
- .8 Divider strips: 3mm mm thick zinc with depth of 16 mm.
- .9 Accessories: base caps and base divider strips, separator strips, purpose made and of same material to match divider strips.
- .10 Reinforcing steel: billet steel, grade 300 deformed bars.
- .11 Welded steel wire fabric: to 50 x 50 x 1.6 x 1.6 mm wire, galvanized, in flat sheets only.
- .12 Slip sheet: polyethylene sheet to [CAN/CGSB-51.34](#), Type 2, 0.05 mm thick.
- .13 Non-slip aggregate: aluminum oxide of size and colour to match marble chips.
- .14 Non-slip inserts: zinc 10 x 10 x 0.8 mm thick, dove-tail shaped channels, with anchors.
- .15 Non-slip material for inserts: fine aluminum oxide and cement mixture in selected colours.
- .16 Curing compound: to manufacturer's standard.
- .17 Cleaning compound: to TTMAC standard
- .18 Sealants:
 - .1 To [CAN/CGSB-25.20](#).
 - .2 Sealants:
 - .1 Maximum VOC limit 50 g/L
- .19 Finishing compound: to TTMAC standard 3001.
 - .1 Sealant.

2.02 MIXES

- .1 Slurry coat: cement and water mixed to creamy paste.
- .2 Underbed: 1 part cement to 4 parts sand by volume.
- .3 Terrazzo topping: to match existing

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for Portland cement terrazzo flooring installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSPECTION

- .1 Examine area to receive terrazzo for defects in existing work which will affect proper execution of terrazzo work.
- .2 Ensure tolerances of concrete slab work do not deviate from tolerance set for finished terrazzo floor.
- .3 Terrazzo contractor to start work only when all defects are corrected.

3.03 INSTALLATION

- .1 Do terrazzo work in accordance with TTMAC 09 66 00 Terrazzo Installation Manual.
- .2 Install terrazzo after concrete slabs have cured 28 days.
- .3 Install divider strips true and level to detailed pattern.
- .4 Install non-slip channel on ramps and stairs where indicated.
- .5 Apply non-slip aggregate at rate of 1.25 kg/m² to designated surfaces.
- .6 Install covers at building expansion joints.
- .7 Install control joints above control joints in subfloor.
- .8 Provide mat recesses with frames made up using divider strips.
- .9 Slope finished terrazzo floors to drains.
- .10 Produce terrazzo finished surfaces to match samples.
- .11 Floors:
 - .1 Monolithic terrazzo: provide 16 mm minimum terrazzo topping bonded to concrete base slab.
 - .2 Bonded terrazzo: to TTMAC detail No. 1.
 - .3 Floating standard terrazzo: to TTMAC detail No. 2.

- .4 Venetian terrazzo: to TTMAC detail No. 2V.
- .5 Epoxy bonded terrazzo: provide 16 mm maximum topping and epoxy concrete adhesive underbed bonded to concrete base slab.
- .12 Bases:
 - .1 Terrazzo bases: as indicated.

3.04 FIELD QUALITY CONTROL

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

3.05 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
 - .1 Clean flooring [and][base] surfaces to flooring manufacturer's printed instructions.
- .3 Remove excess adhesive from floor, base and wall surfaces without damage.
- .4 Clean, seal and wax floor and base surface to flooring manufacturer's instructions. In carpeted areas clean, seal and wax base surface before carpet installation.

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 04 22 00 Concrete Masonry Units
- .2 Section 05 50 00 Metal Fabrications
- .3 Section 07 92 00 Joint Sealants
- .4 Section 08 11 00 Metal Doors and Frames
- .5 Section 09 21 16 Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .2 Master Painters Institute (MPI)
 - .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM)
- current edition.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Confirm products to be used are in MPI's approved product list.
- .3 Upon completion, provide records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour number[s].
 - .4 Manufacturer's Safety Data Sheets (SDS).
- .4 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
- .5 Test reports: Provide certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance

characteristics and physical properties.

- .1 Lead, cadmium and chromium: presence of and amounts.
- .2 Mercury: presence of and amounts.
- .3 Organochlorines and PCBs: presence of and amounts.
- .6 Certificates: Provide certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. MPI Gateway #.
- .7 Manufacturer's Instructions:
 - .1 Provide manufacturer's installation and application instructions.

1.05 CLOSEOUT SUBMITTALS

- .1 Provide in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.
- .3 Include:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour number[s].
 - .4 MSDS and WHMIS information sheets.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Submit 1 one four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.07 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
 - .5 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
 - .6 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Consultant.
 - .7 Standard of Acceptance:

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Soffits: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.08 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Labels: to indicate:
 - .1 Type of paint or coating.
 - .2 Compliance with applicable standard.
 - .3 Colour number in accordance with established colour schedule.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Observe manufacturer's recommendations for storage and handling.
 - .3 Store materials and supplies away from heat generating devices.
 - .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
 - .5 Keep areas used for storage, cleaning and preparation, clean and orderly. After completion of operations, return areas to clean condition to approval of Consultant.
 - .6 Remove paint materials from storage only in quantities required for same day use.
 - .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .8 Fire Safety Requirements:
 - .1 Provide fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada (NFC).

1.09 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.
 - .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until

- paint has cured sufficiently.
- .3 Provide continuous ventilation for 7 days after completion of application of paint.
 - .4 Co-ordinate use of existing ventilation system Owner and ensure its operation during and after application of paint as required.
 - .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
 - .7 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 12% for concrete and masonry (clay and concrete brick/block). Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15% for hard wood.
 - .3 17% for soft wood.
 - .4 12% for plaster and gypsum board.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .8 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated

- by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
- .3 Apply paint when previous coat of paint is dry or adequately cured.
- .9 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

2 PRODUCTS

2.01 MATERIALS

- .1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .7 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids to be:
 - .1 Be Water-based, Water soluble, Water clean-up.
 - .2 Be non-flammable.
 - .3 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

2.03 COLOURS

- .1 Consultant will provide Colour Schedule after Contract award.

2.04 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.

- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

2.05 GLOSS/SHEEN RATINGS

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

	<u>Gloss @ 60 degrees</u>	<u>Sheen @ 85 degrees</u>	
Gloss Level 1 - Matte	Max. 5	Max. 10	Finish (flat)
Gloss Level 2 -	Max.10	10 to 35	Velvet-Like Finish
Gloss Level 3 -	10 to 25	10 to 35	Eggshell Finish
Gloss Level 4 -	20 to 35	min. 35	Satin-Like Finish
Gloss Level 5 -	35 to 70		Semi-Gloss Finish
Gloss Level 6 -	70 to 85		Traditional Gloss
Gloss Level 7 - High	More than 85		Gloss Finish

- .2 Gloss level ratings of painted surfaces as indicated.

2.06 INTERIOR PAINTING SYSTEMS

- .1 Plaster and gypsum board: gypsum wallboard.
Institutional Low Odour//Low VOC
MPI Interior Finish System #9.2M – G3
- .2 Clay masonry units: pressed and extruded brick:
Institutional Low Odour//Low VOC
MPI Interior Finish System #4.1 – G4
- .3 Concrete masonry units: smooth and split face block and brick:
Institutional Low Odour//Low VOC
MPI Interior Finish System #4.2E – G5
- .4 Structural steel and metal fabrications: columns, beams, joists:
Institutional Low Odour//Low VOC
MPI Interior Finish System #5.1S – G5
- .5 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
Institutional Low Odour//Low VOC
MPI Interior Finish System #5.3N – G5

3 EXECUTION

3.01 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.

3.02 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.03 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Interior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.
- .3 Interior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Consultant in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .4 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .5 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Hard Wood: 15%.
 - .5 Soft Wood: 17%.

3.04 PREPARATION

- .1 Protection (not applicable to new painting work):
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Consultant.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect building occupants and general public in and about the building.

- .2 Surface Preparation (not applicable to new painting work):
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by [vacuuming,] wiping with dry, clean cloths [or compressed air].
 - .2 Wash surfaces with a biodegradable detergent [and bleach where applicable] and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Carried out during shop priming: clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted.
- .9 Touch up of shop primers with primer as specified.

3.05 EXISTING CONDITIONS

- .1 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test" and report findings to [Departmental Representative][DCC Representative][Consultant]. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .2 Maximum moisture content as follows:
 - .1 Stucco: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Hard Wood: 15%.
 - .5 Soft Wood: 17%.

3.06 APPLICATION

- .1 Method of application to be as approved by Consultant. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- .12 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

3.07 MECHANICAL/ ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.
- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .7 Paint fire protection piping red.
- .8 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .9 Paint natural gas piping yellow.
- .10 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .11 Do not paint interior transformers and substation equipment.

3.08 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.09 FIELD QUALITY CONTROL

- .1 Interior painting and decorating work to be inspected by a MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor will notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.
- .2 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Ceilings: no defects visible from floor at 45 degrees degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .3 Advise Consultant when surfaces and applied coating is ready for review. Provide adequate lighting at time of review.

3.10 CLEANING

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 09 30 13 Ceramic Tiling
- .2 Section 10 28 00 Toilet and Bath Accessories

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 [CSA B651-\[12\]](#), Accessible Design for the Built Environment.
- .2 ASTM A 666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- .3 ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .4 National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
- .5 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies"
- .7 CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies"

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plastic toilet compartments and include preparation instructions and recommendations, product characteristics, performance criteria, physical size, finish, limitations and installation methods.
- .3 Shop Drawings:
 - .1 Submit drawings to indicate fabrication details, plans, elevations with location and type of hardware, and installation details.
- .6 Samples:
 - .1 Submit 100 x 100 mm samples of manufacturer panel showing finish on both sides,

two finished edges and core construction representing actual product, colour and patterns.

1.04 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- .2 Installer Qualifications: A company regularly engaged in installation of products specified in this section, with a minimum of 5 years of experience.
- .3 Materials: Doors, panels and pilasters constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.
- .4 Performance Requirements:
 - .1 Fire Resistance. Partition materials shall comply with the following requirements when tested in conformance with CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies"
 - .2 CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies"

1.04 DELIVERY, STORAGE AND HANDLING

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

1.05 PROJECT CONDITIONS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under

environmental conditions outside manufacturer's absolute limits.

1.06 WARRANTY

- .1 Provide manufacturer's written warranty covering all plastic components and hardware against breakage, corrosion, and delamination for 25 years from Substantial Performance.

2 PRODUCTS

2.01 PRODUCT AND MANUFACTURER

- .1 Solid plastic (HDPE) toilet and shower compartment partitions (**TPT, SPT**).
 - .1 Acceptable Product: Hiny Hiders as manufactured and supplied by Scranton Products.
 - .2 Style: Floor mounted, overhead-braced toilet and shower compartments.

2.02 MATERIALS

- .1 Plastic Panels and Doors: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent. Colours to be selected from Scranton's CLASS B material colour range.
- .2 Stainless Steel Castings: ASTM A167, Type 304
- .3 Aluminum: ASTM 6463-T5 Alloy

2.03 SOLID PLASTIC TOILET COMPARTMENTS

- .1 Doors, Panels and Pilasters: 1 inch (25.4 mm) thick with all edges rounded to a radius. Mount doors and dividing panels based on height of specified system.
 - .1 Door and panel height: 55 inches (1397mm)
 - .2 Pilaster height: 82 inches (2083mm) high.
- .2 Panel Colour: Colours tested to meet ASTM E84, CLASS B Colour Collection and as indicated below:

NOTE: For RFT B25-03 tender TLDSB the panel/pilaster vs. door colours and textures are to be in contrast for those with a visual impairment.

- | | | |
|----|-------------------------------|---|
| .1 | Lady Mackenzie Public School: | Panels/Pilasters: Black – Orange Peel
Doors: Grey – Orange Peel |
| .2 | IE Weldon Secondary School | Panels/Pilasters: Black – Orange Peel
Doors: White – Orange Peel |

- .3 Headrails: clear anodized, heavy duty extruded 6463-T5 alloy aluminum, anti grip design. Fastened to headrail brackets with stainless steel tamper resistant Torx head sleeve bolt and nut, fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
- .4 Overhead braces [HR/OHB]. Provide overhead headrail braces perpendicular to long panels in barrier free stalls. Provide one (1) brace for stalls up to 2400mm in length, two(2) braces for stalls greater than 2400mm.
- .5 Pilaster shoe: 3 inches (76mm) high type 304, 20 gauge stainless steel. Secured to pilasters with stainless steel tamper resistant Torx head sleeve bolt and nut.
- .6 Attachment: stainless steel tamper proof type screws and bolts.

2.02 COMPONENTS

- .1 Hinges:
 - .1 Continuous stainless steel HELIX hinges.
 - .2 Material/finish: stainless steel pins.
 - .3 Swing: as indicated in drawings and reviewed submittal.
 - .4 Return movement: adjustable self closing.
 - .5 Emergency access feature.
- .2 Latch set: surface mounted anodized aluminum, emergency access feature.
- .3 Wall and connecting brackets: Heavy duty 6463-T5 anodized aluminum extrusion.
 - .1 Fastener locations relative to glass tile mosaic installation: No fasteners acceptable in glass tile.
- .4 Coat hook: Refer to Section 10 28 00.
- .5 Door pull: Barrier-free type suited for in-swinging or out-swinging doors, anodized aluminum or stainless steel both sides of barrier free stall doors.
- .6 Door Bumper. Provide where door swings against tile wall finish.
- .7 Shower curtain [SC-1]. Provide headrail with integral curtain track, curtain hooks and white, non-PVC curtain size to suit shower stall opening.

2.03 FABRICATION

- .1 Doors, panels and screens: 25 mm thick, solid HDPE panels
- .2 Pilasters: 25 mm thick, constructed same as door.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plastic toilet compartments installation in accordance

with manufacturer's written instructions.

- .1 Visually inspect substrate.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied Consultant.

3.02 INSTALLATION

- .1 Ensure supplementary anchorage, if required, is in place.
- .2 Do work in accordance with [CSA B651](#).

3.03 ERECTION

- .1 Partition erection:
 - .1 Install partitions secure, plumb and square.
 - .2 Leave 12 mm space between wall and panel or end pilaster.
 - .3 Anchor mounting brackets to masonry or concrete surfaces using screws and shields: to hollow walls using bolts and toggle type anchors.
 - .4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.
 - .5 Provide for adjustment of floor variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings with stainless steel shoes.
 - .6 All accessories indicated as mounted to work of this section to be performed by installer of toilet partitions for purposes of warranty.
 - .7 Equip each door with hinges, latch set, and each stall with coat hook. Adjust and align hardware for proper function. Set door open position at 30 degrees to front. Install door bumper wall door mounted. Refer to Section 10 28 00
 - .8 Equip outswinging doors with door pulls on inside and outside of door [in accordance with [CSA B651](#)].
 - .9 Install hardware grab bars where indicated attached to toilet partitions.
- .3 Floor supported and overhead braced partition erection:
 - .1 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device.
 - .2 Secure pilaster shoes in position.
 - .3 Secure headrail to pilaster face with not less than two fasteners per face.
 - .4 Set tops of doors parallel with overhead brace when doors are in closed position.

3.04 CLEANING

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

END OF SECTION

1 GENERAL**1.01 REFERENCE STANDARDS**

- .4 CSA Group (CSA)
 - .1 [CAN/CSA-B651-\[04\]](#), Accessible Design for the Built Environment.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

1.04 CLOSEOUT SUBMITTALS

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

1.05 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 78 00 - Closeout Submittals.
 - .2 Deliver special tools to Owner.

1.06 DELIVERY, STORAGE AND HANDLING

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

- .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 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.

2.02 COMPONENTS

- .1 Supply and install unless otherwise noted.
- .2 Toilet tissue dispenser: TP-1: Supplied by Owner, Installed by Contractor. Torx
- .3 Soap dispenser: SD-1: Supplied by Owner, Installed by Contractor
- .4 Feminine napkin disposal bin: SND-1: Supplied by Owner, Installed by Contractor: Bobrick
- .5 Hand dryer: HD-1: to Section 10 28 13.14 Electric Hand Dryers. Install and power supply circuit by Electrical trade.
- .6 Shower curtain: SC-1: By Toilet Partition supplier see 102113.19 or Bobrick 204. Size to suit opening.
- .7 Shower rods: SR-1: By Toilet Partition supplier see 102113.19 or Bobrick B-207. Size to suit opening.
- .8 Shower seat: SS-1: Bobrick B-918116 folding shower seat.
- .9 Grab bars: Bobrick, 38mm outside diameter x 1.6mm wall tubing, Type 304 stainless steel with No. 4 finish, wall flanges secured to wall with stainless steel set screws, concealed screw attachment, flanges welded to tubular bar. Peened hand grips. Grab bar material and anchorage to withstand downward pull of 2.2kN.
- | | | | |
|----|-------|---------------------------------|-------------------------|
| .1 | GB-1: | 90 Degree 760mm x 760mm x 38mm: | Bobrick B-6898.99 |
| .2 | GB-2: | Straight 610mm x 38mm: | Bobrick B-6806.99 |
| .3 | GB-3: | Straight 305mm x 38mm: | Bobrick B-6806.99 |
| .4 | GB-4: | Swing-up Grab-bar: | Bobrick B-4998.99 |
| .5 | GB-5: | 90 Degree 1000mm x 750 x 32mm | GBC-303.7/8 Peened grip |
| .6 | GB-6: | Straight 1100mm x 32mm | GBC-101 Peened grip |
- .10 Robe hook: CH-1: Frost 1150-SS – safety release coat hook. Stainless.
- .11 Tilt mirror: MI-1: Bobrick B-293 2436, wall mounted unit, 610mm wide x 915mm high with 6mm tempered glass mirror, No. 4 stainless steel frame.

- .12 Fixed mirror: MI-2: Bobrick B-1658 2436, wall mounted unit, 610mm wide x 915mm high with 6mm tempered glass mirror, No. 4 stainless steel frame.
- .13 Shelf: SH-1 surface mounted, 100mm deep, 460 wide, stainless steel. Bradley SA49, Gamco/Bobrick MS-18
- .14 Hand towel dispenser: PTD-1: Supplied by Owner, Installed by Contractor
- .15 Nursing Bench/Change Table: CT-1: Pressalit 2000. Note: Structural, mechanical and electrical requirements – refer to related disciplines drawings and specifications and architectural details.
- .16 Washroom signage: Acceptable supplier: Mirtec or approved equal. Black sign with raised white letters, symbols and Braille where required. Refer to Appendix A Details
 - .1 SN-1: Girl's Washroom with Barrier Free Symbol and Tactile Braille
 - .1a SN-1A: Girl's Washroom
 - .2 SN-2: Boy's Washroom with Barrier Free Symbol and Tactile Braille
 - .2a SN-2A: Boy's Washroom
 - .3 SN-3: Universal Washroom with Barrier Free Symbol and Tactile Braille
 - .4 SN-4: Female Staff Washroom with Barrier Free Symbol and Tactile Braille
 - .4a SN-4A: Female Staff Washroom
 - .5 SN-5: Male Staff Washroom with Barrier Free Symbol and Tactile Braille
 - .5a SN-5A: Male Staff Washroom
 - .6 SN-6: All Gender Staff Washroom
 - .7 SN-7: All Gender Washroom with Barrier Free Symbol and Tactile Braille
 - .7a SN-7A: All Gender Washroom
- .17 Door Stop: DS: Canadian Builders Hardware CBH 140
- .18 Backrest: BR-1: Frost 1028 32mm stainless steel tube with 1.6mm wall, concealed fastening, backrest 16mm solid plastic laminate (white). Coordinate with flush valve installation.
- .19 Sanitary Napkin Vending Machine (SNV-1): Supplied by Owner, Installed by Contractor.
- .20 Wire Shelving. (WS): Uline. Provide all hardware and accessories for a complete installation. Provide one additional shelf per unit. Dimensions as per drawing to be confirmed on site prior to order.
- .21 Recessed Soap Dish (SP): Bobrick B-4380 Recessed heavy-duty soap dish.
- .22 Plastic Laminate Shelving (PLS): Plastic laminate (White) on 19mm plywood c/w plastic laminate edging on all edges. Width to suit drawings.

3 EXECUTION**3.01 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied Consultant.

3.02 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.
 - .3 Solid masonry, marble, stone 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.
- .5 Install mirrors in accordance with manufacturer's instructions.

3.03 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.

3.04 CLEANING

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

3.05 PROTECTION

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

END OF SECTION

1 GENERAL**1.01 RELATED REQUIREMENTS**

- .1 Section 26 01 00 Electrical General Requirements
- .2 Section 26 05 00 Common Work Results - Electrical
- .3 Section 26 24 00 Power Distribution Systems
- .4 Section 26 27 00 Wiring Devices

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 [CAN/CSA-B651-\[04\]](#), Accessible Design for the Built Environment.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: Provide construction details, dimensions, anchoring and mounting requirements, material and finish descriptions, electrical requirements, and manufacturer's warranty.
- .3 Operation and Maintenance Data in accordance with Section 01 78 00 Closeout Submittals:
 - .1 Provide manufacturer's product information, maintenance information, contact information and replacement parts information.
 - .2 Warranty: Provide manufacturer's standard warranty for parts and labour.

1.04 QUALITY ASSURANCE

- .1 Product Certification: ETL listed in accordance with UL 507. National Sanitation Foundation (NSF) Protocol P335 "Hygienic Commercial Hand Dryers" compliant.
- .2 Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, and handle electric hand dryers in manufacturer's protective packaging.
- .2 Store electric hand dryers off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.06 COORDINATION

- .1 Coordinate locations of electric hand dryers with other work to prevent interference with clearances required for access, and for proper installation, adjustment, operation, cleaning, and servicing of electric hand dryers.
- .2 Coordinate installation and power supply with Division 26 Electrical. Refer to Division 26 sections and drawings for further information.

1.07 WARRANTY

- .1 Manufacturer's Standard Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective electric hand dryer components and labor within specified warranty period.
 - .1 Warranty Period: Five (5) years limited for labor and five (5) years for parts.

2 PRODUCTS**2.01 ACCEPTABLE MANUFACTURER'S**

- .1 Provide the electric Dyson Airblade V hand dryers manufactured by Dyson Canada Ltd.

2.01 ELECTRIC HAND DRYERS

- .1 Electric Hand Dryers: The electric Dyson Airblade V Electric hand dryer (Model HU02); Item No. 307174-01 (sprayed nickel LV).
 - .1 Mounting: Surface mounted on ABS/PBT plastic backplate/mounting bracket; protrudes four inches from wall, no recessing required; OBC Barrier Free compliant.
 - .2 Construction: Polycarbonate casing with anti-microbial additive in paint. Anti-microbially integrated external plastics and seals. Anti-tamper M4 exterior pin-hex screws. Water ingress protection to IP24.
 - .3 Color Finish: Sprayed nickel, White finish may be acceptable – to be confirmed with Consultant prior to ordering.
 - .4 Filtration: 99.97 percent particulate efficiency HEPA filter with anti-microbial coating.
 - .5 Operation: Touch-free capacitive sensor activation.
 - .1 Hand dry time: 12 seconds
 - .2 Airspeed at nozzle: 420 mph
 - .3 Operating Airflow: Up to 5.28 gal/sec.
 - .4 Rated Operating Noise Power: 79 db(A)
 - .6 Motor: Dyson Digital Motor (DDM), V4 switched reluctance brushless DC type; 92,000 rpm motor speed; less than 0.5 watt standby power consumption.
 - .7 Electrical Requirements: 110-127 V AC, 12 A, 1000 W, coordinate with Div 26.
 - .8 Operating Temperature Range: 0 - 40 degrees C.

- .9 Standby Power Consumption: Less than 0.5 W.

3 EXECUTION

3.01 EXAMINATION

- .1 Verify availability and characteristics of electrical power. Drill minimum two (2) inch diameter holes for electrical service entrance through backplate.
- .2 Do not begin installation until substrates are complete and ready for installation of electric hand dryers.

3.02 INSTALLATION GENERAL

- .1 Locate and install mounting bracket in accordance with manufacturer's written instructions. Use minimum 0.25-inch anchors to mount bracket. Mount electric hand dryer at height above finished as indicated in Appendix A.
- .2 Install electric hand dryer in accordance with manufacturer's written instructions, using fasteners appropriate to substrate indicated and recommended by manufacturer. Install electric hand dryers level, plumb, and firmly anchored in locations and at heights indicated.

3.03 CLEANING AND PROTECTION

- .1 Adjust electric hand dryers for smooth operation. Replace damaged or defective components.
- .2 Remove protective coverings from finished surfaces.
- .3 Clean exposed surfaces using materials and methods recommended by manufacturer.

END OF SECTION



HL ENGINEERING

MECHANICAL SPECIFICATIONS

FOR PROJECT:

TLDSB WASHROOM RENOVATIONS 2025

HL PROJECT NO.: 25004

**ISSUED FOR TENDER
MARCH, 2025**



HL ENGINEERING LTD

7725 BIRCHMOUNT RD, UNIT 46
MARKHAM, ON CANADA
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TEL: 905-713-0003



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Part 1 General

1.1 RELATED INSTRUCTIONS

- .1 Division 00, General Requirements is part of this Section and shall apply as if repeated here.
- .2 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 23, & 25. The Mechanical Contractor's scope shall include Divisions 21, 23, & 25.
- .3 Conform to the conditions stated in the Contract Documents.
- .4 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.

1.2 INTENT AND SCOPE OF WORK

- .1 The Work shall include all labour, materials, tools, equipment, services and incidentals, etc., necessary to provide the complete systems.
- .2 The intent of these specifications is to provide complete systems that are ready for operation, and while no attempt has been made to detail or list each individual part required.
- .3 Sections of these Specifications are not intended to delegate functions nor to delegate Work and supply to any specific trade.
- .4 The Specifications are integral with the Drawings which accompany them. Neither is to be used alone. Any item or subject omitted from one, but included in the other is properly specified.
- .5 Wherever differences occur in the Contract Documents, the maximum conditions will govern and be allowed for in the Contract Price. The item to be incorporated will be at the option of the Consultant.

1.3 DEFINITIONS

- .1 Where used, words "Mechanical" or "Mechanical Work", "Mechanical Divisions", "Mechanical Systems" shall include all Work in Divisions of 21, 22, 23 and 25.
- .2 Where used, words "Section" and "Division" shall also include other Subcontractors engaged on Site to perform work to make the building and Site complete in all respects.
- .3 Where used, the word "Product" shall mean the material, equipment, component, machinery, or fixture forming the completed Work.
- .4 Where used, the word "supply" shall mean to include all labour, materials and services to furnish to the Site in the location required or directed complete with accessory parts, but is not intended to include installation.

- .5 Where used, the word "install" shall mean to include all labour, materials and services to secure in place Products, including receiving, unloading, transporting, storage, uncrating, installing, connecting and performance of such testing and finish Work as is compatible with the degree of installation specified complete ready for use.
- .6 Where used, the word "provide" shall mean to supply and install as each is described above.
- .7 Where used, the word "commission" shall mean to start-up and initial operation of Products as required to demonstrate satisfactory operation of Products and the entire system including calibration of any instrumentation.
- .8 Where used, the word "Work" shall mean the total construction required by the Contract Documents and includes all labour, Products and services.
- .9 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance, report to", shall mean "approved, directed, permitted, accepted, report to", by the Consultant.

1.4 STANDARDS AND REGULATIONS

- .1 Conform to latest version of the applicable standards and regulations, including Federal, Provincial and Municipal laws, By-laws, regulations, Codes and Standards and the requirements of other authorities having jurisdiction in the area where the Work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract Price. Standards established by the Drawings and Specifications shall not be reduced by applicable codes or regulations.
- .2 Comply with the latest editions and all amendments of the following standards and regulations. Where conflicts in requirements occur, the higher standards shall apply.
 - .1 Canadian Standards Association (CSA) Standards
 - .2 Underwriter's Laboratories of Canada (ULC) Standards
 - .3 Canadian Underwriters Association (CUA) Standards
 - .4 Ontario Building Code (OBC)
 - .5 Ontario Fire Code (OFC)
 - .6 National Building Code of Canada (NBCC)
 - .7 National Fire Code of Canada (NFCC)
 - .8 National Fire Protection Association (NFPA) Standards
 - .9 American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE) Handbooks
 - .10 American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE) Standards
 - .11 Air Conditioning, Heating and Refrigeration Institute (AHRI) Standards
 - .12 Sheet Metal & Air Conditioning Contractors National Association (SMACNA) Standards
 - .13 Air Movement and Control Association (AMCA) Standards
 - .14 Canadian Heating, Ventilating and Air Conditioning Code

- .15 Sections 41 and 42 regarding provision of sewers and water mains, Ontario Regulation 54/76 of the Ontario Water Resources Act
- .16 All standards and regulations mentioned in other Sections of this Division

1.5 TENDERS AND FORMS

- .1 State separate prices in the Bid Form for the Work indicated in the Contract Documents. Prices shall include the complete cost of the Work, i.e. all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. It shall be the Owner's option to delete from the Contract any of the Work indicated at the prices stated.
- .2 Cash allowances shall be carried in the Contract for the Work indicated, including all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. If the actual cost is less than the Cash Allowance, the remainder shall be reverted to the Owner. If the actual cost exceeds the Cash Allowances, the Owner will reimburse the extra amount.

1.6 PERMITS AND FEES

- .1 Apply for, obtain, and pay for permits, licenses, certificates, connection charges, tests and inspections required for the work and/or by authorities having jurisdiction. Include any premiums applicable due to requirements for after office hour inspections.
- .2 Submit all required documentation to the authorities for their approval and comments before starting any Work. Provide all additional drawings, details or information as may be required. Comply with any changes requested by Authorities as part of the Contract, but notify the Consultant immediately of such changes.

1.7 EXAMINATION OF SITE AND CONDITIONS

- .1 Examine the Site and local conditions prior to tender submission.
- .2 Examine carefully all Drawings and complete Specifications to ensure that Work and equipment will satisfy Site conditions and performance requirements as shown. The Drawings do not show all Site conditions, mechanical systems, fire protection systems and existing equipment. The Contract Price shall cover all existing Site conditions.
- .3 No allowance will be made later for any expense incurred through failure to make these examinations or to report any such discrepancies and omissions in writing, refer to tender documents for tender closing date.
- .4 Examine the work of Other Contractors and report at once any defect or interference affecting the work, its completion or warranty.
- .5 Submission of a tender confirms that the Contract Documents and Site conditions are completely understood and accepted without qualifications unless exceptions are specifically indicated in the Bid Form.

1.8 CONTRACT DOCUMENTS

- .1 The Contract Drawings of this Division are performance drawings and indicate the scope and general arrangement of the Work. They are diagrammatic except where specific details are given.
- .2 They shall be read in conjunction with Architectural, Structural, Electrical and all other Division Drawings of the Contract.
- .3 Obtain accurate dimensions from the architectural and structural Drawings, or by Site measurement. Locations and elevations of services are approximate and must be verified before construction is undertaken.
- .4 Equipment dimensions are based on the first or top named manufacturer. Dimensions of items by other listed manufacturers shall not exceed variable space with necessary allowance for service and maintenance.
- .5 Make necessary change to runs of piping, ductwork and raceways to accommodate structural conditions. Location of pipes, ductwork, raceways and equipment may be altered without additional charge or expense to Owner providing such change is made before installation of items involved. Such changes will be authorized by ratified site instructions and shall be recorded on Record Set of Drawings.
- .6 The general location and route to be followed by pipes and ductwork is indicated on Drawings. Install these items to conserve headroom and interfere as little as possible with the free use of space through which they pass.

1.9 SHOP DRAWINGS

- .1 Prepare and submit shop drawings of all Products in accordance with Division 1-General Requirements as specified herein and in each Section of this Division.
- .2 PDF files are acceptable.
- .3 Shop drawings shall have a minimum 210 mm x 285 mm (8-1/2" x 11") clear space on the front sheet, suitable for stamping. The cover sheet shall include the project name, Contractor's name and Product description. Where multiple Products are submitted in one binding, include an index of all equipment as the front sheet.
- .4 Assume full responsibility for submission of shop drawings. Allow a minimum of 10 Working Days for the Consultant review.
- .5 The Consultant will only review shop drawings bearing the Mechanical Division and Contractor's stamps of approval.
- .6 Submit shop drawings showing the following:
 - .1 Contract name
 - .2 Contract number
 - .3 Manufacturer's name and model number
 - .4 Supplier's name
 - .5 Approval agencies

- .6 Shipping and working weight
- .7 Performance characteristics
- .8 Dimensions, including required clearances
- .9 Power characteristics
- .10 Bill of materials and finishes
- .11 Time required to fabricate and deliver
- .12 All variations from Contract Documents
- .13 Construction and field connection details
- .14 Installation requirements
- .7 The review shall not relieve the Contractor of its responsibility to provide Products in accordance with the design intent and Contract Documents.
- .8 Manufacturer's printed data sheets for standard items are acceptable providing pertinent characteristics are identified and relate to specified items.
- .9 Each shop drawing shall be checked and stamped as being correct, by trade purchasing item, and by the Contractor, before drawing is submitted.
- .10 Verify and check dimensions to ensure proper installation of equipment in available space and without interference to the Work of other Divisions.
- .11 Where requested, submit samples of Products for review and approval.
- .12 Do not have equipment delivered to the Site until a shop drawing for the item has been reviewed.

1.10 EXISTING, INTERFERENCE AND DETAIL DRAWINGS

- .1 Submit complete existing mechanical system drawings prior to construction work.
- .2 Existing drawings shall show complete and accurate existing system conditions, location of all devices and equipment, piping, ductwork and raceways.
- .3 Prepare Existing, Interference and Details Drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of piping, ductwork and raceways through building structure.
- .4 Prepare fully dimensioned detail drawings of Products and services in service and ceiling spaces, and all other critical locations. Coordinate the Work with all other Divisions. Base drawings on reviewed shop drawings and indicate all details pertaining to access, clearances, sleeves, inserts, curbs, equipment bases, anchors, special hangers, weights on all load points, electrical connections, and elevations of pipes, ducts and conduits. Include location of access doors provided under this Division.
- .5 Ensure that clearances required by jurisdictional authorities are indicated on the interference drawings.
- .6 The Owner will not consider any extra cost as a result of the Contractor's failure to prepare proper drawings. Submit drawings two (2) weeks after receipt of the Notice to Commence the Work.

1.11 RECORD DRAWINGS

- .1 Maintain at least 2 sets of documents at the start of Contract Work and clearly mark on same as the Work progresses, changes and deviations from Work shown so that on completion the Owner will have records of the exact location (dimensioned) of ducts, piping, services and equipment and a record of material and equipment changes.
- .2 The Contractor shall obtain a clean set of prints at the start of Contract Work and shall keep these prints up-to-date at the Site, accurately recording all changes made on the project and locating all services, equipment, etc. which may have been shown only diagrammatically on the Contract Documents.
- .3 The Contractor shall ensure that as-built information is accurately recorded and shall check same. As-Built drawings shall be reviewed at each Site meeting.
- .4 Prepare record drawings showing the following:
 - .1 All buried piping runs are to be shown complete with dimension from building lines.
 - .2 Inverts of all services entering and leaving the building and at property lines
 - .3 Dimensions of underground services in relation to property lines at key points of every run
 - .4 Elevations of underground services in relation to ground floor level of the building
 - .5 Location of all services embedding in the structure, utilizing grid line references
 - .6 Dimensioned locations of all services left for future work
 - .7 All changes to the Work due to Change Orders and Site Instructions
 - .8 All changes to the Work during construction
 - .9 All changes to structural and architectural elements that affect the backgrounds of this record set
 - .10 Location and designation of all electrically supervised valves, flow switches and pressure switches
 - .11 Location and designation of all items requiring access or service in a hidden location
 - .12 Location of all access doors provided
 - .13 All changes and revisions to Specifications, details and equipment schedules
 - .14 All homerun conduits, junction boxes for complete electrical systems
- .5 Upon completion of the Work, prior to the Substantial Performance inspection and after final review with, the Contractor shall neatly transfer recorded information and make a final As-Built submission for review.

1.12 OPERATION AND MAINTENANCE MANUAL

- .1 The Contractor will be responsible for collecting and organizing three (3) copies of all data, operating instructions, maintenance and trouble-shooting instructions, parts lists, parts diagrams, evidence of all tests and certifications, complete reviewed shop drawings, etc. and assembling them in neat manuals in hard cover. Identify cover "Operation and Maintenance Manual for NAME OF THE PROJECT". Manuals shall be separated with dividers in logical sections and volumes.

- .2 The Contractor shall also collect from Subcontractors and Suppliers all Guarantees/Warranties specified in the Contract Documents. Check that starting date (date of Total Performance of the Work) and extent of each guarantee/warranty are clearly indicated. Check also that all guarantees/warranties indicate the Supplier's Name or Subcontractor's Name as appropriate together with contact phone number. Assemble neatly in labelled section of each manual.
- .3 Prior to requesting the Substantial Performing inspection, submit one (1) copy for review. Make all corrections as requested and forward the corrected two (2) copies to the Owner.
- .4 Each book shall contain the following as minimum:
 - .1 Manufacturer's literature, parts list, approved shop drawing, and name and address of closest service organization and spare parts source, for each item of equipment
 - .2 Method of operation for each piece of equipment, and list of equipment with replacement parts, part number, suppliers, addresses etc
 - .3 Air Reports
 - .4 Contractor warranty and equipment extended warranties

1.13 SCHEDULING

- .1 Comply with the construction schedule. Conform to phasing of Work if applicable. Conform to interim and final completion dates.
- .2 Coordinate with general construction schedule.
- .3 Submit a bar chart schedule showing the start and completion dates for each activity based on a critical path analysis of the Work.
- .4 Include in the schedule for Mechanical Work done by others.

1.14 ALTERNATES AND SUBSTITUTIONS

- .1 Substitute Products will only be considered when tendered Products become unobtainable. State in the tender the proposed substitute and amount added or deducted.
- .2 It is the responsibility of the Contractor to ensure "Substitute Products" fit the space allotted and provides the performance specified in the Contract Documents.
- .3 If Products manufactured and/or specified by a manufacturer named as equivalent are used in lieu of the manufacturer specified, the Contractor shall be responsible for ensuring that the substituted Product is equivalent in performance and operating characteristics to the specified Product, and, it shall be understood that all costs for additional space, larger power feeders and changes to associated or adjacent Work will be borne by the Contractor offering the substitution. In addition, in Equipment Rooms where Products named as equivalent is used in lieu of specified Products and the dimensions of such Products differs from the specified Products, prepare and submit for approval, accurately dimensioned layouts of rooms affected.

1.15 VALUATION OF CHANGES

- .1 For each change submit a complete itemized breakdown of labour and material.
- .2 Only the net difference between an extra and a credit will be subject to overhead and profit mark up.
- .3 Material shall be valued at current trade prices incorporating all discounts and labour rates. Overhead and profit shall be as shown in the Tender Form.

1.16 WORKMANSHIP

- .1 Workmanship and method of installation shall conform to best standards and practice and be performed to approval. Work shall be done by tradesmen skilled in the type of work to be performed. Where required by local or other By-laws and Regulations, tradesmen shall be licensed in their trade. Install all Work and equipment according to the manufacturer's printed directions.

1.17 INSTALLATION REQUIREMENTS

- .1 Coordinate the Work of this Division with the Work of all other Divisions. Inform the Subcontractors for the Work of other Divisions of the locations of openings, chases, sleeves, supports, services, connections, etc., to be incorporated into the Work.
- .2 Check the locations of all expansion/building joints and ensure that all electrical installations, are at or crossing these locations, are as detailed and as required to compensate for the possible movement at the joint.
- .3 Confirm the exact location of outlets, fixtures and connections. Check architectural details and elevations for more requirements. Confirm location of connection points for equipment supplied under other Divisions or by the Owner.
- .4 Install neatly all equipment and apparatus to allow free access for maintenance, adjustment and eventual replacement.
- .5 Install metering and/or sensing devices to provide accurate and reliable sampling of quantities being measured. Install instruments to permit easy observation.
- .6 Provide suitable shielding and physical protection for devices.
- .7 Install all Products and services in accordance with the manufacturer's requirements and/or recommendations.
- .8 Provide all supports, hangers and fasteners. Secure all Products and services so as not to impose undue stresses on the structure and systems.
- .9 Ensure that the load onto structures does not exceed the maximum loading per square meter (foot) as shown on structural Drawings or as directed.
- .10 Do not use explosive activated tools.
- .11 Install services and equipment which are to be concealed, as close as possible to building structure so that necessary furring can be kept to minimum dimensions.

- .12 Locate wall and ceiling diffusers in exact accordance with dimensions furnished by the ceiling installer, wall finish installer, masonry installer and Consultant. Make any necessary adjustments in duct branches to allow diffusers to coincide with ceiling and wall patterns.

1.18 FIELD REVIEW

- .1 The Owner and Consultant shall have access to the Site at all times for review of the Work during construction.
- .2 Arrange for review of Products during manufacturing.
- .3 Provide all gauges, instruments and other necessary measuring equipment required for review of the Work.
- .4 Maintain a complete set of Contract Documents at all times for field reference.
- .5 Correct any deficiencies as they are reported during the performance of the Work.

1.19 TEMPORARY SERVICES

- .1 Provide temporary office, workshop and tools and material storage space for the Work and assume responsibility for any loss or damage thereto. Buildings erected for this purpose shall conform in appearance to those erected for similar purposes under other Divisions of the Specifications.
- .2 Provide scaffolding and shoring necessary for the Work of this Division. Scaffolding and shoring shall be adequate to protect the workmen according to Provincial and Local Regulations.
- .3 Provide rigging and mill-wrighting, labour and equipment necessary for the Work of this Division. Employ only workmen well experienced and skilled in such trades for this portion of the Work.
- .4 Provide hoisting machinery, operators, labour and materials necessary to lift and place equipment supplied under this Division.
- .5 The permanent systems or any part thereof shall not be used during construction for construction purposes, unless so permitted in advance by the Owner, in writing.

1.20 PROTECTION AND CLEANING

- .1 Securely plug or cap open ends of piping, ductwork, raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice.
- .2 Equipment stored on Site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.
- .3 Protect all finished and unfinished Work of this and other Divisions from damage due to carrying out of this Work.

- .4 Make good any damage caused directly or indirectly to walls, floors, ceilings, woodwork, brickwork, finishes, etc.
- .5 Clean all polished, painted and plated Work. Remove all debris, surplus material and tools.
- .6 Carry out additional cleaning operations of systems as specified in other Sections of this Division and as Division 1 requires.

1.21 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling.
- .3 Divert unused wiring and metal materials to a metal recycling facility, or place in appropriate on-site bins for recycling.

1.22 MOCK-UPS AND TRIAL USAGE

- .1 Provide mock-ups in accordance with the conditions stated in the Contract Documents and Division 1 of the Specifications.
- .2 Trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to, or breaking of, any part of such Work which may be so used.

1.23 COMMISSIONING, TESTING AND DEMONSTRATION

- .1 Be responsible for commissioning of all Work provided under this Division.
- .2 Operating equipment and systems shall be tested in presence of Owner or Owner's commissioning group (and the sub-consultant at their option) to demonstrate compliance with specified requirements in the Contract Documents.
- .3 Contractor shall notify the Consultant, in writing, fourteen (14) days prior to tests scheduled under requirement of this Section.
- .4 Testing shall be conducted under specified design operating conditions as required in the Contract Documents or other conditions as accepted by the sub-consultant.
- .5 All elements of the systems shall be tested to demonstrate that total systems satisfy all requirements of the Contract Documents. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by inter-connections of other major systems.
- .6 All Special testing materials and equipment shall be provided by the appropriate Subcontractor, as determined by the Contractor.
- .7 The Contractor shall be responsible for completing and submitting start-up and pre-functional performance testing reports.

- .8 If acceptable performance cannot be achieved, the necessary corrective measures shall be carried out promptly.
- .9 Demonstrate to the Owner and Consultant the operation of all systems when commissioning has been completed. Demonstration will include the following:
 - .1 Operation of all equipment and systems under each mode of operation
 - .2 Operation of all automatic control
 - .3 Location of and operation of all access panels
 - .4 Noise levels of all mechanical equipment and terminal devices under maximum operating conditions
- .10 At the completion of commissioning, testing, balancing and demonstration submit the following to the Consultant:
 - .1 Letter certifying that all work specified is complete, clean and operational in accordance with the Contract Documents
 - .2 As-built documents
 - .3 All inspection authorities approvals
- .11 Provide a sequence of operation for seasonal switch-over (heating/cooling) of systems indicating valves to be normally open or closed.
- .12 If field tests show deficient equipment, independent test of the equipment may be requested by Consultant. If the equipment does not conform to Specifications be responsible for all tests, corrective action and retesting and balancing.

1.24 INSPECTION

- .1 Arrange for inspection of all Work by the authorities having jurisdiction. Upon completion of the Work furnish final unconditional certificates of approval by the inspection authorities.
- .2 Application for final review will be considered when the Work has been completed and written declarations submitted that all commissioning, testing adjustment, set up and documentation is complete. Final review shall be done when:
 - .1 All reported deficiencies have been corrected.
 - .2 All systems have been balanced, tested, commissioned and are operational.
 - .3 The Owner has been instructed in the operation and maintenance of all equipment.
 - .4 All reports have been submitted and reviewed.
 - .5 All maintenance manuals have been submitted and reviewed.
 - .6 All tags and nameplates are in place and all data submitted and reviewed.
 - .7 Cleaning up is finished in all respects.
 - .8 All certificates are furnished.
 - .9 All spare parts and replacement parts specified have been provided.
 - .10 All record drawings have been submitted and reviewed.

1.25 WARRANTY

- .1 Provide a written guarantee stating that systems, equipment, components, etc. have been installed to manufacturer's instructions, that systems meet the Contract requirements and that all deficiencies in material and labour occurring within two (2) years after Substantial Performance of the work, will be corrected at no charge to the Owner.
- .2 Obtain Product warranties in excess of two (2) years from the manufacturer on behalf of the Owner. These Product warranties shall be issued by the manufacturer to the benefit of the Owner.
- .3 Instruct all manufacturers and suppliers that warranties on Products will commence upon the date of Total Performance of the Work and not from the date the Products are put into operation.
- .4 All corrections to deficiencies listed in field review reports and other correspondence, as well as but not limited to those indicated in testing, adjusting, balancing and commissioning, shall be completed prior to turn over.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 23, & 25.
- .4 Work to be done under this Section shall include furnishings of labour, materials, and equipment required for installation, testing and putting into proper operation complete Mechanical systems as specified in the Contract Documents, as shown on the Drawings and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.

1.2 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.

1.3 QUALITY ASSURANCE

- .1 Mechanical Work shall be carried out by qualified, licensed Technicians.

Part 2 Products

2.1 PRODUCTS

- .1 Products shall be new, of Canadian manufacture where available, first quality and uniform throughout. The Contractor shall submit in tender based on the use of Products specified in the Contract Documents, or on the listed acceptable alternate Products as further noted.
- .2 Products shall be CSA or ULC approved and be so labelled. Products not CSA/ULC approved shall receive acceptance by the Owner for installation, and modifications and charges required for such acceptance shall be included in the Work of this Section.
- .3 Where a manufacturer is not specified, provide Products of high commercial standard and quality consistent with the standards of these Specifications. Provide Products of the same manufacture for like applications unless noted otherwise in the Contract Documents.
- .4 Products shall be designed and manufactured in accordance with latest issue of applicable Standards or authorities when such are either mentioned herein, or have jurisdiction over such materials or items of equipment.
- .5 Acceptance of Products installed presumes that Products have not been damaged or exposed to conditions that would adversely affect performance and life expectancy. If in

the opinion of the consultant, Products have sustained damage, or have been exposed to abnormal conditions it shall be the responsibility of the Contractor to have such tests performed as are deemed necessary by the Consultant to establish the condition and therefore, acceptability of installed Products.

2.2 EQUIPMENT IDENTIFICATION AND DIRECTORIES

- .1 Tag shall be brass with stamped numbers filled in with black enamel and shall be approximately 38 mm diameter.
- .2 All services, i.e. water, gas, heating lines etc., shall be identified using stencils with two inch letterings. Identification shall be placed at minimum ten feet intervals and shall also show direction of flow. Minimum lettering size - 50 mm (2") or maximum possible.
- .3 All ductwork shall be identified using stencils with minimum 63 mm (2.5") high lettering. Direction of flow shall be marked.
- .4 The following colour coding shall be used for the various services:

Type of Piping	Colour Coding and Labelling
Sprinkler	Red-white (SPKR)

- .5 All system tagging and identifications shall follow existing colour coding, and the numbering sequence extended to the new additions.
- .6 Location of Identification on Piping and Ductwork Systems
 - .1 On long straight runs in open areas in equipment rooms. At not more than 5 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, other confined spaces, at entry and exit points, and at each access opening.
 - .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, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
 - .9 Identification to be easily and accurately readable from usual operating areas and from access points.
 - .10 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

2.3 SLEEVES AND FLOOR PLATES

- .1 Pipes, ducts and conduits shall be sleeved, as they pass through walls, floors, ceilings and partitions.

- .2 Clearance within sleeves shall be 12 mm. Sleeves shall be sized to clear insulated pipes and ducts which have a vapour barrier.
- .3 Sleeves, except those extended above floors shall be flush with finished surfaces.
- .4 Sleeves through walls, partitions and floors, other than waterproofed, shall be as follows:
 - .1 For pipes, conduits and ducts smaller than 0.4 square meters, solid walls, use Schedule 40 steel pipe or 20 gauge (minimum) sheet metal, lapped and spot welded.
 - .2 For pipes, conduits and ducts smaller than 0.4 square meters through dry wall partitions, use 20 gauge, minimum, sheet metal, lapped and spot welded with lip flange at one end.
 - .3 For ducts 0.4 square meters and larger, sleeves shall be sheet metal as above, of 16 gauge minimum.
- .5 Fire dampers shall be installed in accordance with the conditions of their approval given in the manufacturer's instructions. Provide angle steel frames and collars.
- .6 Place and secure sleeves in concrete formwork. Pack within such sleeves with sand to prevent deformation during pouring of concrete.
- .7 Provide and locate sleeves for setting in walls and partitions by the appropriate general trade.
- .8 Pack and seal the void between the sleeve and the pipe, conduit, duct or insulation, for the full depth of the sleeve with ULC approved methods to maintain the same integrity as the slab, wall and partitions. Submit shop drawing of selected ULC approved installation for review. To maintain fire rating, use 3M™ Fire Barrier Sealant CP 25WB+, Dow-Corning #3-6548 'Silicone RTV' foam, Thomas & Betts 'Flamesafe' firestop system, installed in accordance with the manufacturer's specifications and recommendations.
- .9 Material to be provided by M.W. McGill & Associates (416-291-8393) Fire-Bloc systems or Double A/D Distributors (416-292-2361) "Firebarrier Firestopping".
- .10 Seal the exposed ends of the sleeve packing with approved silicone compound.
- .11 Seal the void between sleeve and bare pipe passing through outside foundation walls or floors on grade with "Thunderline Linkseal" as distributed by:
 - .1 Corrosion Services Co. Limited
- .12 Provide chrome plated split type floor plates where exposed pipes pass through finished floors. Floor plates shall be as manufactured by:
 - .1 Crane Canada Ltd. - No. 1-BC or 10-BC
- .13 Provide similar plates where exposed pipes pass through walls or ceilings, but with set screw to hold them in position. Terminate pipe sleeves at these locations so that ends of sleeves are covered by the plates. Plates shall be secured tight against finished surface.

2.4 SUPPORTS AND BASES

- .1 Supply and erect special structural required for the installation of mechanical equipment. Provide anchor bolts and other fastenings unless noted otherwise. Mount equipment

required to be suspended above floor level, where details are not shown, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.

- .2 Concrete bases and housekeeping pads for mechanical and electrical equipment, which are in direct contact with the floor slab, will be provided under Concrete Division No. 3. Submit drawings to Concrete Division giving dimensions and requirements.
- .3 Concrete pads shall be set on the slab and shall be 100 mm high above the slab. Edges of pads are to be chamfered (25 mm). Generally pads shall be 160 mm larger than base of the equipment being supported.
- .4 Provide concrete bases for all mechanical equipment unless otherwise shown. Provide a 100mm raised curb around all ductwork and piping penetrating the floor of Mechanical Rooms.
- .5 Support hangers, in general, form inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting pipes and conduits.
- .6 Do not use explosive drive pins in any section of Work.

2.5 EXPANSION JOINTS AND ANCHORS

- .1 Provide for expansion and contraction of pipe being installed.
- .2 Erect piping so that strain and weight does not bear on cast connections or apparatus.
- .3 Provide bends, expansion loops or swing joints complete with anchors and pipe guides as required to adequately handle pipe expansion and contraction except where expansion joints are specified or shown.
- .4 Expansion joints, in domestic hot water and recirculation water piping up to and including 75 mm size and heating system piping up to 65 mm size, shall be expansion compensators with pressure external to bellows and complete with anti-torque device, limit stops and internal guides. Compensators shall be of bronze construction with female solder type ends for copper pipe and shall be suitable for 1033 KPa (150 psig) working pressure. For steel pipe, compensators shall be of steel construction with stainless steel bellows and screwed ends and shall be suitable for 1033 KPa (150 psig) working pressure. Compensators shall be as manufactured by:
 - .1 Flexonics Corporation of Canada Limited
 - .2 United Flexible Metallic Tubing (Canada) Limited
 - .3 Hyddro -Flex. Inc.
- .5 Expansion joints shall be suitable for the type of pipe and service for which they are installed and shall be capable of handling the expansion between anchors in the pipe plus not less than 50% safety factor with (-18°C) 0°F ambient and corresponding fluid temperature. Expansion joints for heating system service shall be suitable for a minimum working pressure of (1379 kPa) 200 psig.

- .6 Provide pipe guides for each expansion joint using two guides on each side of and adjacent to the joint. Guides shall be pipe rolls or structural steel shapes secured to building structure in an approved manner. Guides may be omitted where an anchor is located within 36" of expansion joint.
- .7 Locate anchors where shown or required. Anchors shall consist of structural steel angles, channels or plates secured in an approved manner.

2.6 INSERTS AND FASTENINGS

- .1 Supply and install all inserts and fastenings required for support of equipment and hangers provided under this Division. Use beam clamps attached onto structural steel and/or inserts set in concrete.
- .2 Inserts shall be of the Midwest, Truscon manufacture and shall be firmly secured to the forms before the concrete is poured. Be responsible for correct location of inserts.
- .3 Where supports are required under the roof slab and in other areas where structural bearings of sufficient strength do not exist, provide angle or channel iron supports, properly sized to support the load from the structural framework using beam clamps. Where the wall, partition, floor or roof does not permit the support of heavy equipment, carry suitable support to building structure.
- .4 Percussion type fastenings of any kind will not be permitted unless prior approval in writing is obtained from the Architect Consultant.
- .5 Bolts and anchors at metallic waterproofed surfaces shall be supplied under this Section but installed under the Waterproofing Section. Refer to architectural drawings for such areas.
- .6 Brackets may be attached to masonry walls using expansion shields in shear, but walls must not be punched through and before drilling is started, approval must be obtained from the Architect Consultant.

2.7 FIRE STOPPING & SMOKE SEALS

- .1 Sealants for vertical joints to be non-sagging.
- .2 Firestop and smoke seal around mechanical and electrical assemblies penetrating non-rated fire separations.
- .3 Rigid ducts with dimensions greater than 1300 mm to be fire stopped by bead of fire stopping material between retaining angle and fire separation, and between retaining angle and duct, on each side of fire separation.
- .4 Remove excess materials and debris and clean adjacent surfaces immediately after application.
- .5 Remove temporary dams after initial set of fire stopping and smoke seal materials.

2.8 PIPE HANGERS

- .1 Provide pipe hangers, and their supports, for piping. Install hanger rods vertically, without bends or offsets, and so that finished piping is true with respect to both line and grade.
- .2 Hang or support horizontal cast iron drainage piping at every hub. Hangers shall properly fit outside diameter of pipe. Hangers shall be Clevis type and shall be as manufactured by:
 - .1 E. Myat & Co. Ltd. - Fig. 126
 - .2 Grinnell Co. of Canada Ltd.
 - Fig. 260 for soil pipe
 - Fig. 590 for C.I. pressure pipe
- .3 Hang or support horizontal plumbing piping, other than cast iron drainage, as follows:
 - .1 Up to and including 19 mm size
 - 1.8 m maximum intervals
 - .2 Size 25 mm and above
 - 2.4 m maximum intervals
- .4 Horizontal piping, for service other than plumbing shall have maximum support space as follows:

NOM. PIPE SIZE (MM)	MAX. SPAN M	NOM. PIPE SIZE (MM)	MAX. SPAN M
12	1.5	75	3.6
19	1.8	89	4.0
25	2.1	100	4.3
38	2.7	125	4.9
50	3.0	150	5.2
65	3.3	200	5.8

- .5 Spacing where pipes are grouped shall satisfy the smallest size pipe.
- .6 Hangers, for piping, other than cast iron drainage unless otherwise specified, shall be Clevis type as manufactured by:
 - .1 E. Myatt & Co. Ltd.
 - Fig. 124 for uninsulated piping
 - Fig. 124L for insulated hot piping
 - Fig. 125 for heavy duty uninsulated piping
 - Fig. 125L for heavy duty insulated hot piping
 - Fig. 125 or 125 for hangers sized to suit O.D. of insulation for cold piping.
 - .2 Grinnell Co. of Canada Ltd.
 - Fig. 260 for uninsulated piping
 - Fig. 300 for insulated hot piping
 - Fig. 260 for hangers sized to suit O.D. of insulation for cold piping.

- .7 Hangers, for copper or brass piping not being used for domestic cold water service, shall be copper plated or plastic coated, as manufactured by:
 - .1 E. Myatt & Co. - Fig. 152CT
 - .2 Grinnell Co. of Canada Ltd. - Fig. 97-C
- .8 Support vertical cast iron drainage piping, including soil, waste, vent stacks, and rainwater leaders at hubs by a riser clamp located at every other floor slab. Bolt riser clamps around pipe and anchor to concrete slab. Riser clamps shall be as manufactured by:
 - .1 E. Myatt & Co. - Fig. 182
 - .2 Grinnell Co. of Canada Ltd. - Fig. 261
- .9 Hangers, installed under domestic cold water piping shall be large enough to go completely around covering.

2.9 ACCESS DOORS

- .1 Provide access doors for locations where equipment requiring maintenance or adjustment such as expansion joints, dampers, fire dampers, valves and pressure reducing valves, are "built-in". These access doors will be coordinate with general contractor.
- .2 Access doors, unless otherwise specified or shown, shall be at least 12 gauge steel, finished prime coat only, with concealed hinges, anchor straps, plaster lock, without screws. Access doors in ceilings, where acoustic tile is applied to plaster or gypsum board, shall be dish type designed to receive tile insert.
- .3 Access doors in fire rated ceilings or walls shall be ULC labelled to match the rating.
- .4 Inside frame dimensions shall be approximately 300 x 300 mm. However, if it is necessary for personnel to enter through doors, they shall be at least 600 x 450 mm.
- .5 Access doors shall be as manufactured by:
 - .1 Ancon-Lehage - L1000
 - .2 Zurn Industries Canada Ltd. - Inspectors
 - .3 A.G. Baird Limited - ABCO
 - .4 Stelpro Limited - Type 700
- .6 Submit list of proposed door locations and obtain approval thereof before commencing access door installation.
- .7 Submit access door shop drawings for approval as soon as possible after Award of Contract, showing size, type and exact location of access doors.
- .8 Access doors are not required in removable acoustic panel type ceilings. Provide approved coloured marking devices after completion of such ceilings, at four corners of each panel below point requiring access.

2.10 MAINTENANCE OF BEARINGS

- .1 "Run-in" sleeve type bearing in accordance with manufacturers written recommendations. After they are "run-in", drain, flush out and refill with a new charge of oil or grease as required.
- .2 Protect bearings and shafts during installation. Grease shafts and sheaves, to prevent corrosion and dust or dirt accumulation during building construction. Provide extended nipples as required for lubrication purposes. Provide galvanized metal drip pans under oil lubricated fan bearings. "Turn over" rotating equipment at least once a month after delivery to site until building has been accepted by Owner.
- .3 Bearings which are found to have been damaged due to the lack of suitable protection shall be replaced.

2.11 SPARE PARTS AND TOOLS

- .1 Identify spare parts containers as to contents and replacement part numbers.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturer.
- .3 Furnish one grease gun and adaptors to suit different types of grease and grease fittings.
- .4 Upon completion of project and immediately before hand-over, replace all filters.

Part 3 Execution

3.1 CUTTING AND PATCHING

- .1 Provide all cutting and patching required for the Work of Mechanical Division. Work shall be carried out in conformance with the requirements of Concrete Division. Include any radiography required to locate concealed services before penetrating into inaccessible locations.
- .2 Any modifications to building shall be done so as not to diminish structural, fire resistance, or smoke barrier integrity.
- .3 Proposed modifications to the structure shall require acceptance by the Structural Engineer.
- .4 The Consultant shall be afforded the opportunity to review the intent prior to any major cutting.

3.2 PAINTING

- .1 Provide all exposed ferrous metal Work, and Products, except conduit, with at least one (1) factory prime coat or paint one prime coat on Site. Clean up or wire brush all equipment before painting. The primer shall be rust inhibiting primer in accordance with CGSB-GB-40d.
- .2 Unless otherwise noted in the Contract Documents, finish painting will be done under Division 9 of these Specifications.

- .3 Do not paint galvanized supports and hangers.
- .4 Repaint or refinish all damaged factory applied finishes.
- .5 Paint all visible portions of ductwork with one coat flat black paint, unless otherwise noted.

3.3 CONCRETE

- .1 Concrete Work shown on the structural Drawings will be done as part of Concrete Division of these Specifications.
- .2 Provide all other concrete Work necessary for Mechanical Work. Have such Work carried out in accordance with the Concrete Division of these Specifications.

3.4 EXCAVATION AND BACKFILLING

- .1 Before commencement of excavation of the Work, determine with the Consultant, the municipalities and utilities, the presence of existing underground services at the site and verify satisfactory condition. Locate such services and mark out same. Ensure that all trades concerned are aware of their presence.
- .2 Do all excavation and backfilling up to grade required for Mechanical Work inside and outside of building. Check available soil test reports. Obtain instructions of the Consultant regarding the type of soils and their extent.
- .3 Carry out all trench excavation in strict conformity with all applicable acts and bylaws.
- .4 Excavate to the required depth and width. Backfill excess excavation.
- .5 Provide additional protect ducts under roads and paved areas.
- .6 Refer to details and to Utility Company requirements for concrete encased duct installations.
- .7 Where excavation is necessary in proximity to and below the level of any footing, provide a sleeve at the proximity and backfill with 14,000 kPa (2,000 psi) concrete to the level of the highest adjacent footing. Proximity is determined by the angle of repose as established by the Consultant.
- .8 Protect the bottom of excavations against flooding and freezing. Use pumping or other means to keep bottom dry. Do not open more than weather will permit. Have excavations inspected at least once a week by authorities. Break up rocks and boulders and remove these by drilling and wedging. Do not use blasting unless approved in writing by the Consultant.
- .9 Compact all backfill to a density of 95% Modified Proctor. Before backfilling, obtain approval. Remove all shoring during backfilling. Obtain approval for all compaction machines used.
- .10 Backfill trenches within building, with clean sharp sand in individual layers of maximum 150 mm (6") thickness. Manually compact the first layers up to a compacted level of 300 mm (12"). Machine compact the balance up to grade, using approved equipment.

- .11 Backfill trenches outside buildings, not under roads, parking lots, or traffic areas, manually compact up to a compacted level of 450 mm (18") above the cable or duct bank with individual layers of material up to 150 mm (6") thick, using sand or granular 'A' gravel. Machine compact the balance up to grade with 150 mm (6") layers of approved excavated material.
- .12 Backfill all other trenches outside buildings with granular 'A' gravel in layers not exceeding 150 mm (6") thickness, up to grade level; manually compact up to 450 mm (18"), machine compact the balance.
- .13 Do not use water for consolidation or during compaction of backfill, unless approved in writing by the Consultant.
- .14 After a period has passed adequate to reveal any settlement fill all depressions to correct grade level with appropriate material, machine compacted. Pay all costs required to make good all damage caused by settlement.
- .15 Store and dispose of excavated materials as follows:
 - .1 During the progress of the contract place the material as directed in such a manner that a minimum of damage or disfigurement of the existing ground will result and the material will not in any way impede the progress of the work. Dispose of surplus material as directed by the Consultant.
 - .2 Place surplus topsoil separately from subsoil. Leave the site clear and unencumbered.
 - .3 Protect, brace, support as required existing pipes, ducts, cables, etc. encountered in the work. Do not disturb or interrupt the operation of any services without written approval from the Consultant.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 22, 23, & 25.

1.2 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.
- .2 Provide shop drawings to the General Contractor for setting anchor bolts and other appurtenances necessary for the proper installation of this equipment. Submit drawings for approval showing complete details of foundations including necessary concrete and steel work, vibration isolation devices and reinforcing steel. Contractor under Division of Mechanical shall supply necessary information to the Vibration Isolation Manufacturer regarding equipment to be isolated.

Part 2 Products

2.1 GENERAL

- .1 Mount equipment, apparatus and piping on approved foundations or suspend from approved supports, as specified herein, shown, or as required.
- .2 Erect floor mounted equipment, complete with vibration devices as required, on 100 mm high concrete housekeeping pads unless otherwise specified.
- .3 Vibration and sound control materials shall be manufactured by:
 - .1 BVA Systems
 - .2 Vibron Limited
 - .3 E.H Price
 - .4 IAC

2.2 SPRING HANGERS

- .1 Spring hangers shall be Type SH or SHR with completely colour coded stable springs. SHR hangers shall have a 25 mm thick acoustic isolation pad in series with the spring. Hanger frames for loads over 680 Kg shall be heavy-duty welded channel construction.
- .2 Acoustic Media:

- .1 Dissipative and Film Lined silencers, including models RD, RFL, CD, CFL, RED, REFL, TD, TFL, EX-RD, EX-RFL, EX-RED, EX-REFL, RLP-D, RLP-FL, CLP-D, CLP-FL, AC-D, AC-FL, SRD and SRFL:
Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be bacteria and fungus resistant, resilient such that it will not crumble or break, and conforming to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.
- .2 No-Media silencers, including RNM, CNM, RENM, CENM, TNM, EX-RNM, EX-RENM, RLP-NM, CLP-NM, AC-NM and SRNM:
All No-Media silencers shall not contain absorptive media of any kind. Attenuation shall be achieved with controlled impedance membranes and broadly tuned resonators.
- .3 Media Protection:
 - .1 Dissipative silencers, including models RD, CD, RED, TD, EX-RD, EX-RED, RLP-D, CLP-D and SRD:
Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber. All AC-D Axial Cone silencers shall have a glass fiber cloth liner.
 - .2 Film Lined silencers, including models RFL, CFL, REFL, TFL, EX-RFL, EX-REFL, RLP-FL, CLP-FL, AC-FL and SRFL:
The acoustic media shall be completely wrapped with Tedlar film to help prevent shedding, erosion and impregnation of the glass fiber. The wrapped acoustic media shall be separated from the perforated metal by a factory installed 1/2" thick acoustically transparent spacer. The spacer shall be flame retardant and erosion resistant. A mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.
- .4 Combustion Ratings:
 - .1 Dissipative silencers, including models RD, CD, RED, TD, EX-RD, EX-RED, RLP-D, CLP-D and SRD:
 - .1 Silencer materials, including glass fiber shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723.

.1	Flamespread Classification:	15
.2	Smoke Development Rating:	5
 - .2 Film Lined silencers, including models RFL, CFL, REFL, TFL, EX-RFL, EX-REFL, RLP-FL, CLP-FL, AC-FL and SRFL:
 - .1 Silencer materials, including glass fiber, Tedlar film and acoustical spacer shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723.

.1	Flamespread Classification:	20
.2	Smoke Development Rating:	45

Part 3 Execution

3.1 INSTALLATION

- .1 Isolate motor driven mechanical equipment over 1/2 hp unless other shown (except propeller fans).
- .2 Pad type isolation shall be provided for all roof mounted equipment.

3.2 INSTALLATION OF SPRING HANGERS

- .1 All piping over 50mm diameter connected to spring isolated equipment shall be supported with minimum 25mm static deflection spring mounts or hangers as follows:
 - .1 Up to 25mm diameter: first 3 points of support
 - .2 125 to 200mm diameter: first 4 points of support
 - .3 250mm diameter and over: first 6 points of support
- .2 The first point of support shall have a static deflection of twice the deflection of the isolated equipment, but not more than 50mm.
- .3 Any piping supported from the mechanical penthouse floor shall be isolated on type CM or SL mounts with the deflection being equal to that of the isolated equipment.

3.3 PENETRATION OF WALLS AND SLABS

.1 DUCT PENETRATIONS

- .1 Contractor shall make sure that all openings around pipes and ducts in the structure surrounding the mechanical equipment rooms shall be sealed airtight as described herein and on the drawings.
- .2 Where each duct passes through a wall, floor or ceiling, there shall be a clear annular space of 25 mm between the duct and structure. After all of the ductwork is installed the Contractor shall check the clearance, pack the voids full depth with glass fibre, and caulk both ends with a non-aging, non-hardening approved fireproof sealant (Firestop). Where there is not sufficient access space to pack around all sides of a duct (for example, at the underside of a slab), place a short stub duct in the wall, pack and caulk around it and then attach the inlet and outlet ducts to each end.

.2 PIPE PENETRATIONS

.1 HVAC and Domestic Water Piping

- .1 Where a pipe passes through a wall or floor slab, a steel sleeve shall be cast or grouted into the structure. The internal diameter of the sleeve shall be 50 mm larger than the external diameter of the pipe passing through it. After all of the piping is installed in that area, the Contractor shall check the clearance and correct it, if necessary, to within 12 mm. Then the void shall be packed full depth with a ULC approved glass fibre and sealed at both ends, 25 mm deep, with a non-aging, non-hardening, approved fireproof sealant (Firestop).

.2 Vent Pipes

- .1 Pipes shall be grouted and caulked into the structure as follows: Before grout has set, rake a groove around the pipe on each side of the wall or

slab; groove shall be 12 mm wide and 12 mm deep. After grout has set, fill groove full depth with sealant.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Mechanical Divisions, 21, 22, 23, & 25.
- .4 Work to be done under this Section shall include furnishing of labour, materials and equipment required for installation of Insulation as specified.

1.2 REFERENCES

- .1 Comply with the requirements of the ASHRAE/IES Standard 90.1 latest edition

1.3 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.

1.4 REGULATIONS

- .1 The type, manufacture and application of pipe covering materials including application of sealer coat, shall be in strict accordance with requirements and final approval of local authorities having jurisdiction.

Part 2 Products

2.1 APPLICATOR AND MATERIAL LIST

- .1 Pipe covering, equipment and duct insulation shall be provided by a recognized specialist insulation applicator with and established reputation for this type of work.
- .2 The following manufacturers are acceptable:
 - .1 Insulation Materials:
 - .1 Mineral Fibre for Low and Medium Temperature (with or without integral vapour retarder jacket)
 - .1 Knauf Fiber Glass
 - .2 Manson Insulation Inc.
 - .3 Johns- Manville Canada
 - .2 Mineral Fibre for High Temperature
 - .1 Fibrex Inc.
 - .2 Partek Insulations Inc.
 - .3 Roxul Inc.

- .3 Cellular Glass
 - .1 Pittsburgh Corning Inc. (Foamglas)
- .4 Flexible Elastomeric
 - .1 Armstrong World Industries
 - .2 Rubatex Corp.
- .5 Coatings, Sealers and Adhesives
 - .1 Bakor
 - .2 Childers
 - .3 Foster
- .6 Finishing Cement
 - .1 Ryder Industries Inc.
 - .2 Johns- Manville Canada
- .7 PVC Fitting Covers and Jacketing
 - .1 Proto Corp.
 - .2 Ceel-Co
 - .3 Zeston (Johns- Manville)
- .8 Foil Faced Vapour Retarder Tape
 - .1 Avery Dennison
 - .2 Compac
 - .3 Mactac
- .9 Glass Fabric Reinforcing Cloth
 - .1 Alpha Associates
 - .2 Clairmont Corp.
 - .3 Compac
- .10 Aluminum and Stainless Steel Sheeting with Integral Moisture Barrier
 - .1 Childers
 - .2 Pabco
 - .3 Permaclad
- .11 Caulking Compounds
 - .1 Dow-Corning
 - .2 Foster
 - .3 Tremco Manufacturing
- .12 Bands
 - .1 Childers
 - .2 Permaclad

2.2 MATERIALS

- .1 Fibreglass insulation:
 - .1 Duct insulation shall be rigid board vapour seal 48 kg/cu.m. (3 lbs/cu.ft.) density duct insulation with factory applied vapour barrier. Flexible duct insulation shall be 24 kg/cu.m. (1-1/2 lbs/cu.ft.) type with vapour barrier.
 - .2 Insulation for linear radiant heating panels shall be 12 kg/cu.m. (3/4 lb.cu.ft.) density fibreglass batt insulation with foil back.

- .2 Exterior to the building shall be 125 kg/cu.m. (8 lbs/cu.ft.) density board insulation with factory applied reinforced foil vapour barrier.
- .3 Flexible elastomeric insulation shall be complete with adhesive applied to both surfaces to be joined. Flexible elastomeric insulation shall not be used on pipes that are electrically traced.
- .4 Insulation jacket for services and ductwork exterior to the building, and for indoor components such as valves, pump, meters, etc. shall be field applied U.V. protected mesh reinforced mastic.
- .5 Corner beads and channels at floor line shall be 0.4 mm (28 ga.) galvanized sheet metal.
- .6 All cements and adhesives shall be as recommended by the manufacturer of the insulation. Insulation, insulation jacket, canvas and adhesive shall be fire retardant with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50 when tested in accordance with CAN/ULC-S102-M.
- .7 P.V.C. fitted jackets and covers shall have a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50 when tested in accordance with CAN/ULC-S102-M.
- .8 Aluminum Jacket shall be 0.51mm (24 B&S Gauge - 0.0201 in) this sheet, embossed finish, with longitudinal slip joints and 50mm (2 in.) laps, die shaped fitting covers with factory applied moisture barrier.
- .9 Fire resistant duct insulation shall meet the requirements of NFPA 96. Product shall meet flame spread rating of 25 and smoke developed rating of 50. Insulation product shall be complete with all manufacturers standard fastenings, including (where applicable) aluminum foil tape, filament tape, banding materials, pins, cup-head weld pins, and speed clips for a ULC listed installation.

Part 3 Execution

3.1 INSTALLATION - GENERAL

- .1 Ensure that pipe, fittings, sheet metal and equipment on which insulation is to be applied is free from moisture, dirt, and rust, before applying insulation.
- .2 Do not apply insulation until the item to be covered has been leak tested.
- .3 Apply insulation in a neat workmanlike manner so that finished job is uniform in diameter and smooth in finish. Locate longitudinal seams so as to be invisible.
- .4 Insulation finish shall be designated "CONCEALED" where mechanical services (ie: pipe, ducts, etc.) are installed in trenches, chases, furred spaces, pipe and ducts shafts, hung ceilings or raised floors.
- .5 Insulation finish designated "EXPOSED" will mean "NOT CONCEALED" as defined herein.

- .6 Mitre insulation at pipe elbow and wrap joint with adhesive tape. Where pipe is not to be recovered, cover joints with glass fabric reinforcing cloth pasted on and extending each side of joint throat for a distance equal to one covering diameter.
- .7 Insulation having a vapour barrier jacket shall be continuous where it passes through walls or floors. Protect exposed pipe insulation at floor line with 18 ga galvanized steel jacket approximately 100 mm high, secured to floor slab.
- .8 Tightly pack annular space between sleeve and pipe covering with insulation and fireproof vapour barrier where insulated pipes pass through sleeved openings in walls or floors. Packing shall extend full length of sleeve, and be finished flush at each end with caulking compound, aluminum colour.
- .9 Smooth aluminum sheeting used for re-covering shall be not less than 18 ga. thick on piping, ducts or equipment, and not less than 0.4 mm thick on pipework. The sheeting and insulation shall be detachable at valves, flanges and other bolted connections. Bends shall be custom made swaged ring or lobster back. Sheeting shall be neatly shaped over fittings, valves and strainers. Seal joints with mastic caulk corners. Secure sheeting with bands 450 mm apart.
- .10 Bands shall be 12 mm wide stainless steel or aluminum alloy straps with cadmium plated mechanical fasteners.
- .11 Where applicator proposes to use material other than those specified as acceptable, submit to the Consultant a complete list of such materials, indicating thickness of material for each individual service and the finishing procedures and materials proposed before installation.
- .12 Rigid insulation shall be applied with edges tightly butted. Secure insulation to flat sheet metal surface by means of welded pins or perforated base metal fasteners and speed washers. Locate on not more than 450 mm centres throughout the sheet metal surface with a minimum of two rows per duct side, and adhere with a fire resistant cement. Attach speed washers, when insulation has been placed on the metal spikes and cut off the excess spike flush with washer and re-cover washer with foil faced vapour barrier tape. Cover angles or standing seams on the outside of plenums, casings and ducts which extend beyond face of applied rigid insulation with 12 mm layer of flexible insulation. Extend this insulation 75 mm on each side of the angles and place tight around the projecting leg of the angle. Apply rigid insulation overlapping edge of flexible insulation on angle so that vertical part of insulated angle projects through work.
- .13 Flexible insulation shall be wrapped tightly on to the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 50 mm. Insulation shall be adhered to duct surface with mechanical fasteners at 300 mm on centre.
- .14 On circumferential joints, the 300 mm flange on the facing, and on longitudinal joints, the overlap shall be stapled with 14 mm flare-door staples 150 mm apart.
- .15 After insulation is applied, seal holes, speed washers, corners and joints with 75 mm wide foil faced vapour barrier tape.

3.2 DUCTWORK AND AIR HANDLING EQUIPMENT

- .1 Externally insulate:

- .1 Exhaust ducts and relief air ducts min. 1.5m back from outdoor connection
 - .2 Combustion air ducts and plenums
 - .3 blank-offs behind unused sections of louvres
 - .4 Return air ductwork located in unconditioned space
 - .5 All supply air ductwork except branch duct work exposed in conditioned space.
- .2 Unless otherwise noted, insulate round supply ducts up to 750mm (30") diameter and rectangular supply ducts up to 750mm (30") width with 25mm (1") thick fiberglass reinforced foil faced 19kg/m³ (1.15lbs/ft³) density flame resistant flexible duct insulation. Adhere insulation to duct surface with adhesive applied in strips 150mm (6") wide on 300mm (12") centres. Use fiberglass tying cord or 16 gauge annealed wire until the adhesive sets. Butt edges of insulation tightly together, and seal all breaks and joints with self-adhering aluminum tape.
- .3 Unless otherwise noted, insulate round supply ducts over 750mm (30") diameter and rectangular supply ducts over 750mm (30") width with 25mm (1") thick fiberglass reinforced foil faced 48kg/m³ (3.0lbs/ft³) density flame resistant rigid duct insulation board. Fasten the insulation with welded pins and speed washers on maximum 300mm (12") centres. Use a minimum of two (2) rows of fasteners per side. Butt edges of insulation tightly together, and seal all breaks and joints with self-adhering aluminum tape.
- .4 Where interior acoustic insulation is required, decrease the exterior insulation by equal thickness. Overlap the exterior insulation by at least 300mm (12"), upstream and downstream
- .5 Cover plenums, casings, and ductwork which are to be thermally insulated with 25mm thick rigid preformed flexible foil faced duct insulation with factory applied fire retardant vapour barrier, or field applied Kraft laminate attached with adhesive.
- .6 Combustion air and fresh air intake ductwork, and plenums shall be insulated with 25mm thick rigid foil faced FF Fibreglass vapour seal insulation. Vapour seal all insulation joints.
- .7 Insulate all ductwork exposed to the outside with 75mm (3") insulation and weatherproof aluminum jacket.
- .8 Insulate all ductwork exposed to unheated space with 75mm (3") insulation.
- .9 After insulation is applied, seal holes, corners and joints the same day with 75mm wide Mac-Tac scrim foil tape.
- .10 Cover angles or standing seams on the outside of plenums, casings and ducts, which extend beyond face of applied rigid insulation with a 12mm layer of flexible fire resistant fiberglass, 16 kg per cu m density, with facing. Extend this insulation 75mm on each side of the angle and place tight around the projecting leg of the angle. Apply rigid insulation, overlapping edge of flexible fiberglass on angle, so that vertical part of insulated angle projects through work. Vapour seal joints with an approved sealer.

3.3 RECOVERING AND FINISHING

- .1 Finish externally insulated ducts in fan rooms, penthouses, duct shafts where access is available and equipment rooms, with canvas and lap adhesive after joints and holes have been sealed with 75mm wide Mac-Tac scrim foil tape.
- .2 Cement recovering laps with lapping adhesive. After canvas has been applied, give the entire surface a heavy brush coat of the same adhesive applied undiluted.
- .3 Canvas for recovering shall be as previously specified with close weave and smooth finish. Submit sample of canvas for approval before installation.
- .4 For recovering and finishing of exposed pipe insulation PVC Jacketing may be used instead of canvas. Apply Jacketing and Pipefitting Covers in accordance with manufacturer's recommendations.
- .5 Securely fasten a layer of 25mm hexagonal wire mesh over externally insulated exposed fresh air intakes, exhausts, return and supply plenums, (excluding those formed by masonry walls or those acoustically lined), sheet metal blank-offs, and units and casings which are susceptible to damage (i.e. mounted at floor level). Securely apply a corner bead on corners. Apply a 12mm coat of insulating cement in two 6mm layers. Temper final coat with Portland cement. Recover finish coat with canvas as previously described.
- .6 Cover insulated circular ducts in exposed locations with backing paper prior to applying canvas.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.

1.2 REFERENCES

- .1 Comply with the requirements of the latest editions of the following:
 - .1 Federal, Provincial and Municipal Building Codes and fire regulations
 - .2 NFPA 13: Installation of Sprinkler Systems
 - .3 NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

1.3 SCOPE OF WORK

- .1 These specifications for the Fire Protection Systems are "Performance" specifications and are intended to establish design criteria and basic guidelines for the work. This contractor shall assume full responsibility for the layout and details of all fire protection work to meet the requirements of local governing Codes or regulations; and to the approval of The Ontario Fire Marshall. All sprinkler systems to be hydraulically designed.
- .2 As minimum requirements, all fire protection work shall comply with the applicable provisions for the National Fire Codes published by the National Fire Protection Association (NFPA), the local Fire Department and the Owners' Insurance Underwriter.
- .3 The scope of work shall include all labour, materials, equipment and accessories necessary for the complete fire protection systems including, but not limited to the following major items:
 - .1 Sprinkler contract starts at flanged connection where indicated on drawings.
 - .2 Payment of all costs relating to fees, permits, inspections, tests, and plan reviews for the fire protection work and systems
 - .3 All signs and labels required by the insurance rating agency and/or local authorities.
 - .4 Hangers and supports, drains, test connections, sleeves, escutcheons, spare sprinkler heads with cabinet, and other necessary appurtenances.
 - .5 Perform all testing and submit completed contractor's test certificate for each sprinkler system.
- .4 Identify all changes to the fire alarm system resulting from sprinkler shop drawings. All cost related to changes initiated by the Sprinkler Designer shall be the responsibility of Mechanical Division.

1.4 DESCRIPTION OF SYSTEMS

- .1 Provide the following fire protection systems:

- .1 Sprinkler head replacement of Automatic Sprinkler Systems.

1.5 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.
- .2 Including:
 - .1 Sprinkler Layouts
 - .2 Sprinkler System Components

1.6 INTERFERENCE DRAWINGS

- .1 Assist in the coordination of services by providing the necessary input with regard to Fabrication Drawings described in Section of Mechanical General Requirements.
- .2 Sprinkler system layouts, where shown, are diagrammatic; the piping is to be coordinated with other services in addition to the structure, suspended ceilings, and other building components affecting the layouts. Off-sets, drains, etc., are to be provided as required in order to integrate the sprinkler layouts with other systems and components.
- .3 Where sprinkler piping distribution is not shown on the drawings, the system is to be hydraulically designed for the most economical layout. Distribution piping must be coordinated with other services in addition to the structure, suspended ceilings and other building components.

Part 2 Products

2.1 SPRINKLER HEADS

- .1 Provide sprinkler systems in areas indicated. Occupancy hazard shall meet ANSI/NFPA 13 requirements.
- .2 Head Types:
 - .1 Type A: Standard, upright or pendant for unfinished areas.
 - .1 Bronze finish.
 - .2 Type B: Standard, exposed, pendant for suspended ceilings:
 - .1 Bright chrome finish (satin option)
 - .2 3" (75 mm) dia. escutcheon plate, bright chrome finish (satin/white options).
 - .3 Type C: Semi/fully recessed pendant for drywall or suspended ceilings.
 - .1 Bright chrome finish (satin option).
 - .2 Sprinkler cup assembly.
 - .4 Type D: Concealed pendant for drywall or suspended ceiling:
 - .1 Bronze finish.
 - .2 Sprinkler cup assembly.
 - .3 Coverplate to suit Architectural finishes. Submit sample to Consultant for approval prior to installation.

- .5 Type E: Sidewall Sprinklers – horizontal:
 - .1 Bronze finish for unfinished areas.
 - .2 Bright chrome finish (satin option) for finished areas.
 - .3 3" (75 mm) dia. escutcheon plates for finished areas. Bright chrome finish (satin or white options).
- .6 Provide red protective baskets for sprinkler heads in mechanical and electrical rooms and in areas indicated.
- .7 Sprinkler heads to be listed with and bear certification marking of nationally recognized testing agency.
- .8 Coverplates for concealed sprinkler heads to have a release temperature of 135°F (57°C) unless otherwise noted on the drawings.
- .9 Minimum 1/2" (12 mm) discharge orifice.

2.2 SPARE SPRINKLER HEADS

- .1 Provide not less than the minimum number of spare sprinkler heads, for each type and rating used on the job, in accordance with NFPA Pamphlet 13.
- .2 Provide metal cabinet or cabinets for storage of spare sprinklers. Cabinets shall be provided, hinged door and latch and shall be finished with red enamel paint. Provide engraved plastic sign on each cabinet front to read: SPARE SPRINKLERS. Provide a sprinkler wrench in each cabinet.

Part 3 Execution

3.1 INSPECTION

- .1 Do not recess, paint or conceal piping, accessories or work prior to inspection and approval by authorities having jurisdiction.

3.2 INSTALLATION

- .1 The entire installation shall apply with NFPA 13 as minimum requirements.
- .2 All fire protection piping shall be standard weight schedule 40, black steel pipe with 2100kPa heavyweight malleable iron screwed fittings. All isolation valves shall be fully supervised using Potter Model PIVSU A1 switches for butterfly valves or OSYSU A1 for OS&Y valves.
- .3 Grooved couplings may be used in lieu of welded or screwed pipe.
- .4 Coordinate the installation of all fire protection systems with the work of all other trades. Provide all necessary offsets in piping to avoid interference with other equipment and systems and provide additional sprinkler heads due to offsets and/or interference as required to achieve design coverage at no additional cost.
- .5 All horizontal piping shall be installed as high above finished floor as possible with due allowance for clearances for sprinklers as required by NFPA 13. Refer to notes on the drawings for additional requirements, if any, regarding clear heights for piping.

- .6 All piping shall be concealed above ceiling in all areas. Drains and/or test connections shall not be terminated exposed in finished rooms, areas or toilet rooms.
- .7 All piping through interior walls and partitions shall be sleeved and closed off with escutcheons where visible. Penetrations through fire rated walls shall be sleeved, packed, and grouted as required to maintain the fire rating of the wall. Piping through floors and exterior walls, including foundation walls, shall be sleeved, packed and grouted with non-shrinking cement as required to make watertight.
- .8 Install signs required by local fire protection department.
- .9 Provide a spare parts cabinet for storage of maintenance materials, spare sprinkler heads and special tools, all supplied by sprinkler head manufacturer.
- .10 Testing and Approvals:
 - .1 Test sprinkler systems in accordance with requirements of latest edition of NFPA 13.
 - .2 Schedule testing to give at least two weeks notice to following authorities:
 - .1 Local Fire Department
 - .2 Insurer's Representative
 - .3 Owner's Personnel
 - .4 Project manager
 - .5 Consultants
 - .3 Prior to testing, ensure that flow switches, pressure switches, supervisory, and other devices are in working condition and function as specified and as recommended by manufacturer.
 - .4 Obtain Contractor's Material and Test Certificate for above ground piping.
 - .5 On completion of project obtain Certificate of Approval showing that work is in accordance with rules and regulations of national Fire Protection Association.
 - .6 Copies of Certificates to be distributed as per shop drawing requirements

3.3 FIELD QUALITY CONTROL

- .1 Subject systems and equipment to operational test
- .2 Hydrostatically test fire protection systems, including water supply connections, in accordance with NFPA-13, latest edition. Provide labour and equipment necessary to carry out testing required by Regulating Agencies.
- .3 Upon complete installation of piping and apparatus for sprinkler systems, test joints for tightness and good condition of piping. If impossible to test whole installation in single operation, subdivide into several zones and test each zone in manner described.
- .4 During tests, stop any leaks and remove and repair any defective part. Perform test over again until satisfactory results are obtained.
- .5 Provide hydraulic pump, temporary connections and labour required for tests.
- .6 Hydrostatically test dry pipe system in accordance with NFPA-13, latest edition. Provide labour and equipment necessary to carry out testing required by Regulating Agencies.

- .7 Test fire pump, drive and controllers in accordance with NFPA-20, latest edition. For electric motor, conform to Division 16 and provide written report indicating, starters and no load current and capacity of thermal relay in starter.
- .8 Test dry chemical systems under working conditions of manual and automatic operation. Include discharge of expellant gas through piping and nozzles.

3.4 PROTECTION OF COMPLETED WORK

- .1 Assume responsibility for protecting of Completed Work sprinkler heads during painting. Replace damaged and painted components.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.

1.2 SCOPE OF WORK

- .1 Provide all labour, materials, plant, tools, transportation, testing and put into proper operation a complete plumbing and drainage system to the full intent of the drawings and/or specifications.
- .2 In general, the major divisions of the work are as follows:
 - .1 Plumbing fixtures, floor drains and other plumbing fittings and equipment
 - .2 Storm and sanitary drainage piping inside the building, except where shown to be provided by base building
 - .3 Domestic hot, cold, and recirculation piping inside the building downstream of building water meter
 - .4 System of natural gas piping
 - .5 Miscellaneous Plumbing Work as shown on drawings and/or as specified herein

1.3 STANDARDS

- .1 All work shall conform to the National Building Code; the Ontario Building Code; and all regulations of City, Local, Provincial or Territorial Authorities having jurisdiction. In case of conflict of codes with Specifications and Drawings, the most severe requirements shall apply. Where Drawings call for pipe sizes larger than minimum of the codes, Drawings shall be followed. The codes, however, shall not be violated under any circumstances.

1.4 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Mechanical General Requirements.
- .2 Submit Shop Drawings for the following:
 - .1 Valves
 - .2 Plumbing specialties, including cleanouts, floor drains, backwater valves, scupper drains, area drains, trap primers, etc.
 - .3 Domestic hot water tanks and heaters
 - .4 Plumbing fixtures, including water closets, lavatories, sinks, showers, faucets, traps, stops, etc

Part 2 Products

2.1 PLUMBING PIPE AND FITTINGS

- .1 Buried storm and sanitary drainage piping and fittings shall be plastic SDR 35 type.
- .2 Above ground sanitary and storm drains, 75mm (3") dia. and under shall be copper drainage tube (DWV), cast brass fittings and 50/50 solder joints. Drains 100mm (4") dia. and over shall be standard weight cast iron pipe and fittings with mechanical joints.
- .3 Above ground sump and sewage pump discharge piping from pump to gravity drain shall be Schedule 40 galvanized steel pipe; stretch reduced continuous weld, ASTM A53, with screwed fittings.
- .4 Vents 50mm (2") dia. and less shall be type DWV copper, 65mm (2-1/2") and over shall be galvanized steel.
- .5 Branch vents shall be type "DWV" hard drawn copper with cast bronze or wrought copper solder type fittings. Buried vents may be plastic ABS DWV type piping.
- .6 Domestic water piping installed above the floor, including hot and cold and recirculating piping shall be Type "L" hard drawn copper tubing with cast bronze or wrought copper solder type fittings. No copper piping shall be in contact with ferrous materials. Unions or flange connections similar to Epcor "Di-Electric" pipe fittings shall be used when making such connections. Copper pipe and fittings shall be in accordance with the latest issue of C.S.A. Standard Specification. ASTM Standard B88. Copper pipe with roll groove and mechanical coupling Victaulic Style is acceptable for 50mm (2") pipe size and larger.
- .7 **Type M copper is not acceptable.**
- .8 Buried water pipe (100mm) 4" size and larger shall be Class 150 Ring-Tite PVC or cement lined ductile cast iron water pipe. Buried water pipe less than 100mm 4" size shall be soft temper copper with no joints below the floor, Type "L".

2.2 FLEXIBLE CONNECTORS

- .1 Flexible connectors shall be Flexonics RW-81 or RW-91, all bronze construction, of length as recommended by manufacturer.

2.3 VALVES

- .1 Conform to requirements of ANSI, ASTM, ASME, and applicable MSS standards.
- .2 Provide valves with manufacturer's name and pressure rating clearly marked on body. Product shall carry valid CRN (Canadian Registration Number).
- .3 Provide valves of same manufacturer throughout, where possible. Provide Valves shall be Kitz, MAS, Toyo or approved equal.
- .4 All valves shall be suitable for 1.4MPa/200PSIG water working pressure and up to and including 60mm (2 1/4") size, shall be all brass or bronze. Larger sizes shall have Stainless steel, or cast iron bodies and bronze trim. All valves 100mm (4") and larger on main distribution piping shall be with rising stem and shall be flanged.

- .5 Valves on branch piping supplying plumbing fixtures from mains and riser shall be globe valves set behind access doors, except for unfinished areas, where they may be exposed.
- .6 Domestic Water Systems (Hot and Cold), portable water, lead free valves Up to 200 PSIG
 - .1 Check Valves – Back Flow Prevention. For sizes 50 mm (2") and under, Screwed Ends - Kitz 822T; Solder Ends - Kitz 823T
 - .2 Ball Valves - For Isolation and Balancing Service. For sizes 50 mm (2") and under, Screwed Ends - Kitz 858; Solder Ends - Kitz 859. For sizes 65 mm (2-1/2") and over: Kitz 150UTDZM-N
- .7 Check valves 50mm (2") size and smaller shall be 15 degree swing type, Kitz #23. Check valves larger than 50mm (2") shall be Kitz#78.
- .8 Gate valves up to and including 50mm (2") size shall be Kitz #44. 65mm (2 1/2") size and over shall be Kitz#72.
- .9 Globe valves up to and including 50mm (2") size shall be Kitz #12. 65mm (2 1/2") size and over shall be Kitz #76.
- .10 Ball valves size 50mm (2") and less may be used in lieu of globe and gate valves, Kitz #59.
- .11 Butterfly valves may be used in lieu of globe and gate valves size 60mm (2 1/4") and over, Kitz #6122El.
- .12 Inside hose bibbs shall be Zurn Z-81302 or approved equal, chrome plated 12mm (1/2") or 20mm (3/4") bibb and located in general 1m above floor unless otherwise specified.

2.4 FLOOR DRAINS

- .1 Floor drains in finished areas shall be dura coated cast iron body with anchor flange, cast iron reversible waterproofing clamp with weepholes, seepage collection sump and 5" (127mm) diameter x 2" (12.7mm) thick polished nickel bronze strainer.
- .2 All floor drains, hub drains, funnel drains, etc., shall be trapped and provided with a 10mm (1/8") water connection for trap seal. Install trap primer units,.
- .3 Floor drains in waterproofed areas protected with a waterproofing membrane, shall have flashing ring and clamping device to receive the waterproofing membrane.
- .4 Hub drains shall terminate 25mm (1") above finished floor. Provide welded steel funnel caulked into hub and sized to accommodate all open drains.

2.5 CLEANOUTS

- .1 Cleanouts shall be complete with secondary seal plugs.
- .2 Cleanout plugs shall be gasketed and fastened with brass hex bolts.
- .3 Cleanouts in waterproofed areas shall have flashing clamp devices to receive the waterproofing membrane.

2.6 PLUMBING FIXTURES

- .1 Plumbing fixtures shall be as described on the drawings.
- .2 Fixtures shall be complete with necessary trim, including traps, faucets, supplies, stops, strainers, escutcheons, spuds, wastes, tail pieces, gaskets, brass bolts and carriers of type capable of being secured to floor slab.
- .3 Provide wheel handle or screwdriver stop valve on the hot and cold water supply to every fixture on the job, in addition to the valve or faucet on the fixture itself.
- .4 Shop drawings for fixtures shall consist of a carefully prepared portfolio showing illustrations, dimension drawings and detail descriptions of the fixtures to be furnished.
- .5 Manufacturer: as specified on the drawings or equivalent.

2.7 BACKFLOW PREVENTERS

- .1 Provide backflow preventers in accordance with CAN/CSA-B64.10-01.
- .2 Use screwed connections to DN50 (2") size, flanged connections for larger sized valves, bronze or cast iron body, bronze trim, and stainless steel pilot trim.
- .3 Backflow preventers shall have a minimum working pressure of 1,206 kPa (175 psi).
- .4 Provide thermal expansion tank as indicated in the drawings.

2.8 EXPANSION TANKS

- .1 Provide expansion tanks for domestic water system.
- .2 Tanks shall be sealed, diaphragm, air cushion type, pre-charged, complete with drain valve, charging valve, and support legs.
- .3 FDA approved replaceable heavy-duty butyl bladder and polypropylene liner. Working temperature of 115°C (240°F).
- .4 Vertical installed on concrete pad. Provide 50mm high concrete pad.
- .5 Manufacturers: Watts, Bell & Gossett, Amtrol, Taco, or approved equal.

2.9 ELECTRIC HOT WATER TANKS

- .1 Tank(s) size and capacity are indicated on the drawings.
- .2 Models shall meet or exceed the standby loss requirements of the Department of energy and current edition of ASHRAE/IESNA 90.1.
- .3 Heater(s) shall have 150 psi working pressure and be equipped with extruded high density anode rod. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch. The outer jacket shall be of backed enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panels and shall enclose the tank with foam insulation.

- .4 Electrical junction box with heavy duty terminal block shall be provided (except on 120V & 277V).
- .5 The brass drain valve shall be located in the front for ease of servicing. ASME rated temperature and pressure T&P relief valve.
- .6 Heater tank shall have a three-year limited warranty as outlined in the written warranty. Fully illustrated instruction manual to be included.

Part 3 Execution

3.1 PIPING INSTALLATION

- .1 All work shall be executed by plumbers holding certificates of competency. All fixtures and equipment shall be roughed-in, installed and connected exactly in conformity with respective manufacturer's details and all fitted with individual shut offs. All lines shall be laid or hung to approved falls, and all lines shall be arranged so that any or all systems may be completely drained. All roughing-in shall be concealed, save where specifically excepted by the Architect Consultant. Piping shall not touch the structure, sleeves, other piping, conduits or equipment at any point, save at the necessary connections. This shall be observed carefully to avoid transmission of noise. Allow sufficient space in sleeves, etc. for thermal expansion of piping.
- .2 Where piping is installed in filled ground, or earth that cannot support piping, piping shall be supported on a concrete pad or piers, or alternatively it shall be cast iron hung at every joint from reinforcing rods 10mm (3/8") diameter min. asphalt coated as described in Ontario Building Code. Where piping passes through foundation walls, it shall be supported on a reinforced concrete pad as specified under "Excavation and Backfill" in Section of Basic Materials and Methods.
- .3 In all piping 75mm (3") size and over, located anywhere, provide copper or brass flanges at each valve and at apparatus.
- .4 Water pipe in boiler room and mechanical equipment rooms shall be copper as previously specified but disconnecting copper or brass flanges shall be installed at boilers, chillers, etc., using wrought copper streamlined fittings and with Silfos solder within 8m (25 ft.) of such connections.
- .5 Pipes to circular wash fountains and island fixtures shall be insulated, wrapped with polyken tape and run in individual ABS Plastic conduits.

3.2 JOINTS

- .1 Joints in cast iron pipes shall be Mechanical type.
- .2 Joints in screwed steel pipe shall be made up with an approved joint compound. The use of lampwick will not be permitted. Pipe threads shall be full and clean cut. Pipes shall be reamed after being cut.
- .3 Joints in copper piping shall be made using special tools of proper size. Ends shall be cut off at right angles to pipe and reamed. Inside of fitting and outside of pipe shall be thoroughly cleaned with steel wool and coated with flux. Joints shall be soldered with a

blowtorch or oxyacetylene flame using single or double tip torch depending on fitting size. Use hard solder made up of 95% tin and 5% antimony for pipe sizes up to and including 78mm (3"). Use Silfos for pipe sizes 100mm (4") and above. Working parts of valves must be removed during soldering. Wrought copper streamlined fittings must be used where Silfos is specified.

- .4 Joints in plastic piping to be solvent welded.
- .5 All solders and jointing materials shall meet the current code requirements regarding the maximum allowable lead content.

3.3 CLEANOUT INSTALLATION

- .1 Provide cleanouts on straight horizontal pipes with maximum spacing between cleanouts as followings:
 - .1 In the case of a sink waste pipe, 6m (20 ft).
 - .2 In the case of a horizontal sanitary drainage pipe, or storm drainage pipe, other than a waste pipe from a sink, DN100 (4") and less ,15m (50 ft).
 - .3 In the case of a horizontal sanitary drainage pipe or storm drainage pipe larger than DN150 (6"), 30m (100 ft).
- .2 Provide cleanouts at changes of direction greater than 45° in a sanitary drain, at the end of all branches, at the base of all riser lines, on all exposed or accessible traps (except water closet traps), at where drains leave the building, at all points on the system where so indicated or required by Code, or where necessary because of interruption of general line of flow.
- .3 Cleanouts shall be full size of pipe up to 100mm (4") and not less than 100mm (4") for larger pipes. Full size "Y" or "TY" branches shall be provided for cleanouts on drains and their branches.
- .4 All cleanouts shall be made accessible and wherever necessary branch connections shall extend to finished surfaces of floors with polished bronze floor plate and frame for each, set flush with floor and with vandalproof socket head screws to match the cover finish.
- .5 Care shall be taken to locate all Barrett type cleanouts above any curbs, bases, etc. Barretts shall be covered with access doors as specified.

3.4 PIPE HANGERS

- .1 Provide pipe hangers and supports for all piping and equipment supplied and installed under this Section. Refer to Section of Basic Materials and Methods for detailed requirements.

3.5 FLASHING

- .1 All piping extending through the roof or other waterproofed area shall be flashed with Thaler Roofing Specialties Products roof flashing. Flashing shall be left ready as directed by the roofers or water proofers for them to make watertight connections.
- .2 Piping other than cast iron may be flashed with 0.5mm sheet copper soldered at all joints and provided with a conical weather drip clamped to pipe.

- .3 Where pipes pass through walls, flashing shall be turned back into the wall and caulked.

3.6 PIPE EXPANSION AND CONTRACTION

- .1 Provide for the expansion and contraction of pipe work. Erect all pipe in such a manner that the strain and weight does not come upon cast connections or apparatus. Provide bends or swing joints for this purpose.
- .2 Provide anchors and expansion loops where required and where shown on drawings. Anchors shall be equal in strength to the pipe being anchored, both in shear and in bending.

3.7 TRAP PRIMERS

- .1 All floor drains, hub drains, funnel drains etc., shall be trapped and provided with a 10mm (3/8") water connection for trap seal.
- .2 Install insulated flush valve tanks at high level for priming and/or P.P.P. Model P1 & P2 Prime Rite automatic primer valves complete with distribution units.

3.8 CO-ORDINATION

- .1 Coordinate the work with reference to ceiling space and heights, partitions, lighting, ductwork, etc.
- .2 Where the food store merchandising layouts or commercial kitchen layouts are applicable, coordinate these layouts supplied for plumbing work prior to the rough-ins of plumbing pipes and fixtures.

3.9 BACKVENTS

- .1 Every plumbing fixture shall have its own trap and these shall be vented in accordance with the Ontario Building Code or any other local rules and regulations. Vents are shown on drawings only to indicate the required routing.
- .2 Vents smaller than 75mm (3") shall be increased to 75mm (3") before passing through the roof.

3.10 AIR CHAMBERS

- .1 Provide air chambers at least 600mm (24") long on all supplies at each fixture. They shall be of the same size as the main supply pipe to the fixture, and shall be concealed in the rough work.

3.11 DRIPS AND DRAINS

- .1 Supply and install 12mm (2") drip cocks with hose connectors at the base of all water risers and all low points. These shall be Dahl 2316 or James Robertson JR-4532 (Type "C" for copper pipe).

3.12 COLD WATER DISTRIBUTION

- .1 Run piping to plumbing fixtures, hose bibbs and all other miscellaneous equipments requiring cold water connections on the job.

3.13 HOT WATER DISTRIBUTION

- .1 Run hot water piping as indicated on the Drawings and connect to all fixtures, and all other miscellaneous equipment requiring hot water connection.
- .2 Recirculation piping shall be arranged to provide a continuous and positive circulation of hot water throughout the system at all times. Branch shut-offs in recirculation piping shall match the shut-offs in the hot water mains, so that any section of the system could be shut down and drained for maintenance. No recirculation branch shall be less than 20mm (3/4") size.
- .3 There shall be no high points or air pockets in any recirculation lines. Lines shall be so arranged and graded that air shall collect at the fixtures or at the hot water tanks. Where it is impossible to avoid high points, install automatic air eliminator traps, Sarco Type 13WN with discharge piped to nearest drain.

3.14 DRAINAGE AND SANITARY SEWER SYSTEM

- .1 The general arrangement of the storm and sanitary drainage piping is shown on the Drawings. Install a complete drainage system as shown.
- .2 Include connections and revisions to the existing sewers.
- .3 The area drains connecting to internal drainage system are part of the work of this Section.
- .4 Provide complete venting system per Ontario Building Code.
- .5 Connect vent lines into the soil stack above highest fixture or extend separately through roof to a height of 600mm (24") above roofline and 3.6m (12 ft) away from any opening into building and flash properly

3.15 DOMESTIC HOT WATER TANKS

- .1 Provide all hot, cold, and recirculation piping and drain connections.
- .2 Supply and install 125mm (5") scale thermometer in supply main from each hot water tank. Thermometer to have separable socket and to be installed so that it can be read easily. Thermometers installed in insulated lines shall have extended bulbs and sockets. Thermometers shall be Taylor or approved equal.
- .3 Provide install hangers and supports from building structural.

3.16 SPECIAL WATER AND WASTE CONNECTIONS

- .1 Supply and install all necessary gas pressure and water pressure regulators where required by individual apparatus and equipment and run necessary vents to atmosphere.

- .2 In all direct connections of city water to equipment such as expansion tanks, boilers, fill connection to piping systems, provide a back-flow preventing device, approved by Ontario Water Resources Commission and local Plumbing Inspection. Backflow preventors to be Watts, Clayton or Singer manufacture.
- .3 Provide backflow connectors on all inside and outside hose bibb connections equal to Watts manufacture.
- .4 In the case of "Existing Relocated" items include all work and materials for disconnection in the old location and reconnection in the new location.
- .5 All exposed valves, traps, etc. in kitchen and dining area to be chromeplated. Provide pressure reducing valve assembly on water line to dishwasher to maintain 140-175kPa with 45 L/min flowing. Include 75mm (3") chromeplated pressure gauge on low pressure side and 3 valve bypass around reducing valve.
- .6 Supply and install gas solenoid valves on gas lines serving gas fired equipment under kitchen hoods.

3.17 FIXTURE INSTALLATION AND SUPPORTS

- .1 Supply, install and connect up complete all plumbing fixtures shown on the Drawings. Protect all fixtures until the building is accepted by the Owner.
- .2 All wall hung plumbing fixtures shall be supported by wall brackets. The bolts for these brackets are to be carried through the wall and through a steel plate 150mm (6") wide, 3mm thick and full length of bracket, plus 50mm (2") or to suit studs on wall.
- .3 Water closets shall be set in mastic to prevent water on floor from entering space between floor and bowl or pipe sleeve.
- .4 Supply and install below showers, janitor's receptors, and all other waterproofed areas required for plumbing fixtures a 2.5mm sheet lead safe, soldered at all joints, flashed into the floor drain and turned up 150mm (6") into all walls and curbs. "Compotite" manufactured membrane may be used in lieu of sheet lead.

3.18 THERMAL INSULATION

- .1 Provide insulation as required in Section of Thermal Insulation.

3.19 TESTING

- .1 Conduct high pressure flushing on all drainage pipes prior to the entire plumbing system is functioning. Minimum flushing pressure 3,500 PSI. Submit report by flushing contractor indicating work details, and record drawings showing flushing locations.
- .2 Conduct camera video test after flushing on all drainage pipes. Submit video record and test report.
- .3 Conduct hydrostatic tests on all piping included in this Contract. Furnish all pumps, compressors, gauges and connectors necessary for tests.

- .1 Conduct tests in presence of Consultant and all other personnel of Governing Authorities having jurisdiction. Notify all parties in ample time to permit them to be present.
- .2 Conduct tests before piping is painted, covered or concealed.
- .3 Conduct hydrostatic tests for a minimum period of 2 hours, or longer when requested. During this time the pressure shall remain constant and the exterior surfaces of pipe or fittings shall not show any cracks or other form of leak.
- .4 Hydrostatically test domestic water piping to a pressure of at least 1050 KPa (152Psi).
- .4 Test all drains for tightness and grade as required by OBC, and Ontario Water Resources Commission Act, Regulation No. 736, and the local plumbing inspector.
- .5 Any tests required by the Architect and/or Consultant during the progress of the work or at its completion, shall be made without cost to the Owner. Such tests shall be carried out solely for the purpose of determining if the work as actually installed meets specified requirements.
- .6 Promptly correct any defects that develop through tests and re-test to complete satisfaction of Consultant and Governing Authorities.
- .7 Caulking of leaking threaded joints shall not be acceptable, faulty piping shall be replaced with new pipe and fittings.
- .8 Submit records of all tests, and Approvals of Governing Authorities.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.

1.2 REFERENCES

- .1 Comply with the requirements of the latest edition of the following:
 - .1 Building codes and fire codes
 - .2 ASHRAE Standards
 - .3 SMACNA Standards
 - .4 AMCA Standards
 - .5 NFPA-90A
 - .6 NFPA-96
 - .7 ANSI/AHRI 430-2009: Central Station Air Handling Units
 - .8 ANSI/AHRI 1060 (I-P)-2011, Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment
 - .9 NEBB (National Environmental Balancing Bureau)
 - .10 NABC (National Air Balance Council)
 - .11 AABC Standards (Associated Air Balance Council)

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Mechanical General Requirements for all equipment supplied under this Section, including:
 - .1 Grilles and diffusers
 - .2 Louvres
 - .3 Fire dampers
 - .4 Fans

Part 2 Products

2.1 DUCTWORK

- .1 Ductwork shall be constructed of first-class material and according to the recommended standards of ASHRAE Handbook, latest edition.
- .2 Ductwork, unless noted or specified elsewhere, shall be first grade galvanized steel lock forming quality.
- .3 Supply ductwork from the air handling units to the variable volume boxes to be fabricated in accordance with requirements of SMACNA 500 Pa (2" w.g.) pressure class.

- .4 Exhaust ductwork serving the showers and dishwasher shall be aluminum in accordance with requirements of SMACNA 500 Pa (2" w.g.) pressure class.
- .5 Round ductwork and fittings to be spiral lock seam galvanized ductwork.
- .6 Flexible ductwork shall be aluminium (maximum length of 3 meters (10 ft)).
- .7 Splitter dampers shall be with Durodyne bracket and adjusting rods.
- .8 Fasteners shall be rivets and bolts throughout, sheet metal screws accepted on low velocity ducts except adjacent to all fire dampers and access doors where pop rivets shall be required.
- .9 Turning vanes shall be S.E. Rozell manufacture. Duct turning vanes shall be reinforced where air velocity exceeds 10 m/s.

2.2 SEALANTS AND TAPES

- .1 Except where used in conjunction with impermeable tape sealants shall be fire resistive compounds, non-flammable (ASHRAE) in wet state. Sealants used in conjunction with impermeable tape shall consist of non-oxidizing resin compound and shall have a 1034 kPa shear strength; sealant shall not support combustion in the dry state.
- .2 Duct tapes shall be of the pressure sensitive type, at least 51 mm wide. Tape used with a sealer compound shall have polyethylene coating on 80-thread count cloth with total thickness of 18 mil, and shall be furnished by the sealant manufacturer to ensure compatibility of materials for proper curing.
- .3 Vapour seal adhesive tape, and that used without sealant, shall be vinyl plastic, flame resistant and shall have physical properties as follows: 45 g/mm width, tensile strength 23 kg/mm width. Maximum flame spread rating of sealant and tapes to be 25.
- .4 All ductwork joints for supply and return ductwork shall be provided with duct tape and sealant.

2.3 ACOUSTIC LINING OF DUCTWORK AND PLENUMS

- .1 Provide acoustic lining for ducts where connected to existing ducts that have acoustic lining. Internal size of duct with acoustic lining shall be net size called for.
- .2 Rigid ductliner shall be:
 - .1 Fibreglass Canada Ltd.
- .3 Adhesive, metal clips and washers shall be:
 - .1 Goodloe E. Moore - Gemco
- .4 Acoustic lining in rectangular ductwork shall be 50 mm on outdoor exposed ducts and 25 mm on interior rigid ductliner fastened to interior of duct with metal clips and washers spaced on not more than 300 mm centres.
- .5 Acoustic lining in plenums shall be 50 mm

- .6 Caulk abutting edges of liner and protect leading and trailing exposed edges with sheet metal nosings.
- .7 Provide perforated metal liner over all acoustic lining.

2.4 FLEXIBLE DUCT CONNECTORS

- .1 Provide flexible connections between air handling equipment and ductwork as shown.
- .2 Connections for conventional systems shall be fabricated from non-combustible, air-tight, moisture-proof material coated with layers of neoprene or vinyl. Provide 1.3mm (18-gauge) protective collar over flexible connections
- .3 Connection materials shall be:
 - .1 Duro-Dyne of Canada Ltd. - Durolon
 - .2 Ventfabric Inc. - Ventglas
 - .3 Elgen Manufacturing Corp. - Neoprene
- .4 Securely anchor ductwork to building structure at the flexible connection and select length of flexible material to allow 100 mm movement of supply air equipment and 50 mm for other fans.

2.5 FANS

- .1 GENERAL
 - .1 Provide fans of type, size arrangement and performance as detailed in Schedules and as required herein.
 - .2 Acceptable manufacturers:
 - .1 Cook, Greenheck, Reversomatic, PennBarry
 - .3 Space allocation, motor sizes, base details and connection arrangements are based on equipment by manufacturers as shown in Schedules. In submitting a Tender based on installation of equipment supplied by another of the named manufacturers, include allowance for changes in ductwork, piping, electrical starters and wiring necessary to accommodate proposed equipment. After submission of shop drawings, submit details, drawn to same scale as Contract Drawings showing how layout is to be modified to accommodate approved equipment.
 - .4 Fans shall be selected from manufacturer's catalogued range of standard products, shall be statically and dynamically balanced, and when operating at maximum speed for class of construction shall be running at least 20% below first critical speed.
 - .5 The fan manufacturer will check that the motor horsepower specified is sufficient to accelerate the fan to operating speed without motor overload within normal time limits.
 - .6 Interior and exterior surfaces of fan equipment manufactured from black steel shall be factory cleaned and primed with red oxide chromate primer.
 - .7 Fans used for smoke exhaust shall be suitable for continuous operation at 205°C (400°F).

- .8 Utility sets shall be of light weight construction, Arr #10, with V belt pulley outboard of fan bearings and fan shaft and motor shaft pointing in same direction. Include motor and belt drive enclosing covers where installed outdoors.
- .9 Fan motor shall be:
 - .1 Not less than the motor horsepower, shown in the schedule.
 - .2 Sized in accordance with criteria specified under "motors"
- .10 V-belt Drives
 - .1 The V-belt drive provided with belt drive fan shall be selected with 140% safety margin over motor horsepower listed. Fan belts shall be oil and heat resistant, non-static type. Drives shall be precision-machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 - .2 For belt driven fans with variable pitch motor drive, the drive must be factory set to the specified fan RPM.
 - .3 For belt driven fans with fixed drives, allow for one (1) drive change for air balancing purposes (parts only, labour by Air Balancing Contractor).
- .11 Fan Bearings
 - .1 All fans shall be equipped with heavy duty pillow block type bearings. Access doors shall be provided in casings or ductwork to permit the bearings to be inspected and replaced if necessary.
 - .2 Except for permanently lubricated bearings, run in all bearings and after they are run in, drain, flush out and refill with new charge of oil or grease as required.
 - .3 Provide extended lubrication tubes for all bearings that require periodic lubrication. For permanently lubricated bearings provide for a future grease fitting.
 - .4 Bearings shall be packed with grease at factory.
- .12 Variable frequency drives shall be Graham, AC Tech, ABB, Siemens, Emerson.
- .2 CEILING EXHASUT FANS
 - .1 Provide ceiling fans with integral aluminum ceiling grille or in-line type. Each fan shall be completed with a backdraft damper. Provide fans with aluminum wall outlet boxes or roof cap containing a built-in backdraft damper.

2.6 GRILLES AND DIFFUSERS

- .1 Supply and install all grilles and diffusers as required and as shown on the drawings.
- .2 Diffusers shall be of type, performance and size indicated on the drawings.
- .3 Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.
- .4 Provide one balance damper for each supply air diffuser.
- .5 Provide door grilles as specified on drawings.
- .6 Acceptable manufacturers: E.H. Price, Titus, Nailor Industries.

2.7 DAMPERS

- .1 Provide manual dampers at all duct branches, and where necessary for system balancing.
- .2 Install motorized dampers supplied under Controls and Instrumentation where shown. Motorized dampers shall be equipped with actuator types as indicated on the schedule/specifications.
- .3 Manual dampers in rectangular ductwork shall be of the opposed blade type provided with extended control shaft and locking quadrant.
- .4 Manual dampers in round ductwork shall be butterfly type with round edged 10 gauge disk set in round sheet metal housing with rubber packing glands and wing nuts. Damper blades shall fit snugly when fully closed, 10 degrees from vertical and shall have indexing device to indicate position.
- .5 Dampers shall be located so that access is available for adjusting quadrant or servicing damper motors.
- .6 Acceptable manufacturers: Ruskin Corp, Nailor Industries Inc, E.H. Price.

2.8 FIRE DAMPERS

- .1 Provide fire dampers throughout supply, return and exhaust air systems as shown.
- .2 Submit drawings showing fire damper locations to authorities for approval before work is commenced.
- .3 Fusible link dampers shall be Type B or Type C (as required) with curtain blade out of air stream. Type A dampers (with the curtain blade in the air stream) shall be installed where size or location are such that Type B and Type C cannot be installed. Consultant shall approve Type A installation
- .4 Fire dampers shall meet or exceed the following criteria: Fire dampers shall be manufactured, tested and labeled in accordance with UL 555 Safety Standard for Fire Dampers - Sixth Edition, June 1999, and shall have 1 1/2 hour fire resistance rating. Each fire damper shall bear a ULC label verifying fire resistance rating in addition to intended mounting position.
- .5 Fire dampers shall be suitably constructed for vertical or horizontal installation as required for each specific location and include a steel sleeve of appropriate length/gauge and retaining angles, supplied by damper manufacturer to ensure proper installation in accordance with damper manufacturer's instructions.
- .6 Contractor shall provide and install an access door at each fire damper, of appropriate size to allow for inspection, testing and fusible link replacement.
- .7 Fire dampers shall be Ruskin Corp, Nailor Industries Inc or E.H. Price to suit rating of fire separation

2.9 ACCESS DOORS IN DUCTS & CASINGS

- .1 Provide access doors in ducts, casings and plenums as shown and as specified herein. Where prefabricated duct access doors are proposed, submit shop drawings for approval.

- .2 In insulated plenums and ductwork, access doors shall be installed in a metal collar flush with the face of the finished insulation. Doors shall be 22 gauge and shall be constructed with an insulated liner, not less than 25 mm thick and shall be double wall construction in plenums.
- .3 Access doors shall be fitted with neoprene gaskets.
- .4 In ductwork doors shall be secured with sash type fasteners.
- .5 Access doors in ducts shall be maximum size possible with duct sides up to and including 350 mm. With duct sides 375 mm and larger, access doors shall be 300mm x 375mm.

2.10 OUTSIDE OPENINGS AND LOUVERS

- .1 Provide louvers, bird screens, ductwork, plenums and blank-offs for intakes and exhausts. Confirm and co-ordinate opening size and location with other trades concerned.
- .2 Louvers shall be:
 - .1 Air performance rating and water penetration shall be in accordance with AMCA publication 511
 - .2 6" deep extruded aluminum frame, with drainable head collects and removes water
 - .3 Extruded aluminum drainable blades
 - .4 16mmx1mm expanded, flattened aluminum bird screen
 - .5 Where required, provide hinged frame, double side security bars.
- .3 Provide back draft damper for all exhaust louvers.
- .4 Provide motorized dampers as required.
- .5 Blank-offs shall be 18 gauge galvanized sheet steel suitably reinforced (including 50 mm thick insulation) and sealed with fire resistant mastic between galvanized steel and aluminum.
- .6 Acceptable manufacturers:
 - .1 E.H. Price, Ruskin, Nailor

2.11 THERMOSTATS

- .1 Programmable electronic thermostat, white.
- .2 Temperature range: -10°C to 50°C
- .3 Resolution and precision: 0.3°C.
- .4 Digital display of ambient and set point temperature; temperature setting recorded permanently; 4-settings per week, and 4-setings per weekend.
- .5 24VAC or 120VAC and complete with line-voltage, built-in (or remote) switching relay to suit control equipment requirements of voltage, phases, and wattage
- .6 Surface wall mounted at 1300mm AFF. Provide temper-resistant guard as required. Do not mount outside wall.

- .7 Three (3) years warranty.

Part 3 Execution

3.1 DUCTWORK

- .1 All ductwork shall be constructed in strict accordance with the latest ASHRAE Guide.
- .2 All ductwork unless specifically noted otherwise, shall be made of galvanized iron. Metal shall be best quality open hearth steel. The galvanizing shall be carefully done to prevent cracking.
- .3 All laps shall be in the direction of air flow. No sheet metal screws shall be used in the duct where it is possible to use rivets and bolts. All edges and slips shall be hammered down so as to leave a smooth finished surface inside the ducts.
- .4 All ducts shall be braced and stiffened so that they will not breathe, rattle, vibrate or sag.
- .5 Rectangular ducts shall be constructed by breaking the corners and grooving the longitudinal seam, using the Pittsburgh lock or approved air tight joint. Elbows and transition sections shall be formed with Pittsburgh corner seams or double seam corners.
- .6 Ducts shall be free of obstruction, vibration and rattle. Leakage will be permitted to a maximum of 5% in the longest duct run.
- .7 All rectangular ductwork carrying air at low or medium pressure and having any side over 300mm in width or depth shall be reinforced by cross bracing.
- .8 All ducts shall be complete in themselves and no single partitions shall be permitted between ducts unless specifically shown.
- .9 All tees, elbows or bends shall be made with a centre-line radius of not less than 1-1/2 times the width of the duct. Where space conditions do not permit the specified radius, then squish shall be throat fittings may be used complete with double thickness turning vanes.
- .10 In special cases only, with prior approval of the Consultant, pipes may pass through ducts. In these cases, the pipe shall be covered with a streamline deflector, the duct shall be sealed air-tight and increased in size to provide the original free shall be.
- .11 Where drawings indicate that the ductwork is to be insulated, make provisions for neat insulation finish around damper quadrants, access doors, etc. Mount metal collars of suitable size and width on insulated ducts to allow insulation to be neatly finished.
- .12 Provide counterflashing for roof mounted equipment and any other duct openings in the roof.
- .13 The sides of tapered fittings shall not slope at an angle exceeding 15 deg. from the line of air flow unless specifically shown or approval of the Consultant is obtained.
- .14 The transitions at the axial fan shall not exceed 10 deg.

- .15 Minimum low pressure duct gauges shall be as follows:
- .1 Rectangular Ductwork, Galvanized Iron:
 - .1 Up to 300 mm (Largest side) .55 mm thick
 - .2 310 to 750 mm .70 mm thick
 - .3 760 to 1370 mm .85 mm thick
 - .4 1380 to 2150 mm 1.01 mm thick
 - .5 2160 mm and up 1.31 mm thick
 - .2 Round Ductwork, Galvanized Iron:
 - .1 660mm or less dia. .55mm thickness
 - .2 670 to 910mm dia. .85mm thickness
 - .3 920 to 1270mm dia. 1.01mm thickness
 - .4 1280 to 1520mm dia. 1.31mm thickness
- .16 Round ductwork shall be shop or factory fabricated of helically wound galvanized iron strips with spiral lock seam. Each duct section and fitting shall have a plain and a belled or swaged end to permit a sliding fit with an overlap of not less than 100mm. Insert sheet metal screws in joints at 300mm centres around perimeter with not less than three screws per joint. Ducts over 1000mm dia. shall have flanged joints. Surface of overlap or flanges shall be cleaned and painted with duct sealing compound before sections shall be joined.
- .17 Ninety-degree elbows shall be of five piece construction. Mitred elbows with approved turning vanes may be used where space limitations do not permit use of five piece elbows. Forty-five degree elbows shall be of three piece construction.
- .18 Flexible ducts shall be aluminum helically wound spiral duct, equal to Flexmaster T/L, maximum 10 ft. length. Provide acoustic flex equal to Flexmaster model T/L-A, where ducts shall be to be internally insulated.
- .19 Supply and install deflectors or splitters with quadrant dampers at all points on supply systems and exhaust systems where small ducts shall be taken from larger ones.
- .20 Supply and install manual dampers and turning vanes where shown.

3.2 DUCT SUPPORTS

- .1 Ducts 1500mm and less in width or depth shall be supported by 25mm wide by 16 gauge or heavier galvanized bent hangers fastened to the side and bottom of the duct by bolts, rivets or metal screws. Straps shall be continuous under the duct. Speed nuts and nailed units shall not be used to fasten hangers to ducts. Hangers shall be spaced at not more than 2.5m intervals.
- .2 Ducts over 1500mm width or depth shall be supported with 10mm diameter vertical rod hangers bolted to an angle supporting the duct from below and bolted to the bottom of the duct at 600mm intervals. Space hangers at not more than 1200mm intervals.
- .3 Where vertical ducts pass through floors, they shall be supported by angles rivetted or bolted to the duct and bearing on the building structure.
- .4 Support all ducts immediately adjacent to flexible connections.

- .5 Duct hangers for ducts shall not be suspended from the steel roof deck. Hangers for such ducts shall be supported from structural bearings such as beams, top chords of steel joists, or structural concrete slabs. Where structural bearings do not exist, provide angle or channel iron from neshall best structural bearings to support hangers.
- .6 Refer to Section 15050 Basic Materials and Methods for further details regarding hangers and supports.

3.3 FLEXIBLE DUCTWORK

- .1 At connection points between sheet metal and flexible duct use sealing compound and tape. Make a further mechanical connection using sheet metal screws.
- .2 Sharp bends of flexible duct with centreline radius less than diameter of duct will not be accepted.
- .3 Install maximum length of 3m (10') of flexible duct for each ceiling outlet.
- .4 Flexible duct shall not penetrate through masonry or metal enclosure.
- .5 Flexible ductwork may not be used on any branch ducts that have penetrated a ½ hour fire separation.

3.4 FLEXIBLE CONNECTIONS

- .1 On the suction and discharge of all fans, provide 150mm wide airtight Duralon, elastomer coated, fibreglass fabric, flexible connections to isolate the fan from the ductwork.
- .2 Length of connection:
 - .1 75 mm (3 in) for movement up 40 mm (1.5 in)
 - .2 150 mm (6 in) for movement over 40 mm (1.5 in)
- .3 Minimum distance between metal parts when system is in operation: 25 mm (1 in).
- .4 Securely anchor ductwork to building structure on building side of flexible connection.

3.5 CONNECTION TO LOUVRES

- .1 Extend ductwork up to weatherproof louvres and make connections to same. Fill and caulk all openings to prevent water from draining to the wall or ceiling between the louvre and ductwork.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Mechanical General Requirements.
- .3 Employ a single qualified and approved independent company to perform testing, adjusting, balancing and commissioning of all systems and products under Mechanical Divisions.

1.2 QUALIFICATIONS

- .1 The company must be a member in good standing with either National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC), and will be subject to approval by the Consultant.
- .2 Perform testing, adjusting, balancing (TAB) and commissioning in accordance with most stringent conditions of selected standard:
 - .1 AABC Standards (Associated Air Balance Council)
 - .2 NEBB (National Environmental Balancing Bureau)
 - .3 NABC (National Air Balance Council)
 - .4 SMACNA Standards
 - .5 ASHRAE Standards
 - .6 AMCA Standards
 - .7 ANSI/AHRI 1060 (I-P)-2011, Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment
 - .8 NFPA-90A
 - .9 NFPA-96

1.3 WORK INCLUDED

- .1 Perform all tests specified and all tests required by authorities having jurisdiction.
- .2 Review Contract Documents before project construction is started and confirm in writing the adequacy of provisions for the work.
- .3 Schedule time required for the work (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .4 Provide all equipment, labour, calibrated instruments, and pay for expenses of manufacturers representatives, incidentals, and all power and fuel required to carry out the tests.
- .5 Test equipment to the requirements of the equipment manufacturer.
- .6 Follow start-up procedures as recommended by the manufacturer.

- .7 During construction, coordinate location and installation of TAB & commissioning devices, equipment, accessories, measurement ports and fittings.
- .8 Have the person in charge visit the project site at least once a month and submit a report stating that the work is satisfactory for future balancing and testing with respect to number, location and accessibility of balancing and testing devices, openings and all other aspects pertinent to this work.
- .9 Fully record all tests including date, location, system, equipment tested, test set up, test results, etc.
- .10 Test records of all manufactured equipment shall be complete with a manufacturer's affidavit.
- .11 Have all test records signed by testing technician, and witnesses.
- .12 Do not balance systems until each system has successfully passed the initial operational test.
- .13 Where applicable, phasing of the work will require portions of the new and existing systems balanced at different times. Refer to the General Conditions on phasing.
- .14 Start final TAB & commissioning only when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows and other construction
 - .2 Application of sealing, caulking and weather-stripping
 - .3 Normal operation of mechanical systems
 - .4 Air systems:
 - .1 Filters in place, clean
 - .2 Duct systems clean
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances
 - .4 Correct fan rotation
 - .5 Fire, smoke, volume control dampers installed and open
 - .6 Coil fins combed, clean
 - .7 Access doors, installed, closed
 - .8 Outlets installed, volume control dampers open
 - .5 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

1.4 ACCURACY

- .1 Perform TAB to within plus or minus 5% of design values.

- .2 Prior to TAB, submit list of instruments used together with serial numbers.
- .3 Calibrate in accordance with requirements of most stringent of referenced standard for the applicable systems.
- .4 Calibrate within 3 months of TAB. Provide certificate of calibration.

1.5 VERIFICATION

- .1 Reported measurements shall be subject to verification by Consultant. Provide instrumentation and manpower to verify results of up to 30% of all reported measurements. Number and location of verified measurements shall be at discretion of Consultant.
- .2 Bear costs to repeat TAB, as required to satisfaction of Consultant.
- .3 After TAB is completed, replace drive guards, close access doors, lock devices in set positions, and ensure sensors are at required settings.
- .4 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.
- .5 TAB will be considered complete only when all final reports are approved by Consultant.

1.6 SUBMITTALS

- .1 Prior to commencing TAB work, submit shop drawings showing:
 - .1 Details of instruments to be used
 - .2 Details of TAB procedures to be used
 - .3 Certificate of instruments calibration
 - .4 Forms and diagrams to be used
- .2 Produce “as-built” full system schematics. Use as-built drawings for reference. Show location of permanent and temporary instruments and gauges, required for testing and balancing. Show location of any work for future.
- .3 Submit PDF files of preliminary TAB reports, complete with index tabs for verification and approval of Consultant.
- .4 Submit PDF files and 6 copies of final TAB reports after approval by the Consultant.
- .5 TAB report format to be in accordance with referenced standard listed above, but using design drawing units.
- .6 In TAB report, note those records for which tests have been witnessed by Authorities having jurisdiction.
- .7 In TAB report, prepare a complete list of instruments used for each type of test and attach to each copy of the test report. Each list shall contain for each instrument:
 - .1 Name of instrument manufacturers
 - .2 Instrument number

- .3 Scale(s) and full scale accuracy
- .8 At the completion of testing, adjusting, balancing, commissioning and demonstration submit the following to the Consultant:
 - .1 Letter certifying that all work specified is complete, clean and operational in accordance with the Contract Documents
 - .2 As-built documents, sequences of operation and all maintenance manuals
 - .3 All TAB & commissioning reports
 - .4 All inspection authorities approvals

Part 2 Products

2.1 NIL

Part 3 Execution

3.1 AIR SYSTEMS

- .1 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, Velocity pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power voltage and current, noise, vibration.
- .2 Locations of equipment and system measurements: to include as appropriate:
 - .1 Inlet and outlet of damper, filter, coil, humidifier, fan, other equipment causing changes in conditions
 - .2 Controller and controlled device
 - .3 Main duct, main branch, sub-branch, and run-out (or grille, register or diffuser)
 - .4 Provide fan curves indicating operating point with the air balancing report.
- .3 Adjust, balance and test all system components until the trial test data are within five percent (5%) of design requirements for the overall system and each component. Repeat balancing and adjusting until the requirements are met.
- .4 Adjust each outlet by anemometer, velometer, pitot tube, or anemotherm readings to provide proper air quantities. Adjust each supply outlet to provide proper throw and distribution in accordance with space and occupancy requirements.
- .5 Perform all work required within the air handling unit casings to assist in balancing the systems.
- .6 Balance main duct branches using the number of pitot tube traverses required to verify that required distribution has been achieved.
- .7 Balance sub-branches to the required amounts as summated from measured quantities at all outlets.
- .8 Systems shall be balanced so that fans operate at lowest possible speed and static pressure consistent with delivery of specified air quantities.

- .9 After adjustment of supply, return and related exhaust fans, adjust minimum fresh air damper position to obtain design fresh air quantity. Damper position shall be determined by measurement of outside return mixed air temperatures and confirming calculations shall be included in balance report.
- .10 Provide pressure testing of the ductwork according to SMACNA. Minimum test length shall be 15 meters and 2 takeoffs and elbows.
- .11 The air balancing report shall include the following information, but not limited to:
 - .1 Diffusers, grilles, registers, floor outlets: System, room no., outlet designation and required air volume as per drawings, test air volume, test air velocity.
 - .2 Air supply systems: Provide design and test information including fan number, fan make, total fan air volume, minimum outside air volume, return air volume, total pressure, total static pressure, suction static pressure, discharge static pressure, fan RPM, motor make, size, motor nameplate information, rated amperage, actual amperage.
 - .3 Exhaust systems: Provide information including fan number, size and model, motor size, motor nameplate information, rated amperage, actual amperage, fan RPM, total pressure, static pressure, suction static pressure, air volume.

3.2 FIRE PROTECTION SYSTEM

- .1 Check installation of fire protection equipment for proper mechanical and electrical connections.
- .2 Test ball drip valves at fire department pumper connections for proper operation.
- .3 Test alarm valves and other alarm devices for proper operation.
- .4 Test supervisory switches on valves for proper operation.
- .5 Provide a report of the adjusted settings of the controllers for the Owner's record.

3.3 FIRE AND SMOKE CONTROL SYSTEM

- .1 Test the entire life system by simulating emergency conditions. Spot checking of typical systems will not be acceptable.
- .2 Test each smoke and/or heat detector for proper operation and function.
- .3 Check all fire and smoke dampers for proper installation.
- .4 Test all smoke dampers for proper operation under simulated control signals. Ensure smoke dampers function as intended.
- .5 Ensure fans stop and start as intended. Ensure that normal temperature controls are bypassed as specified, during a life safety emergency.

3.4 DEMONSTRATION

- .1 Arrange for demonstration and instruction of Owner's staff on all aspects of equipment and system operation.

- .2 Arrange for and pay for services of manufacturer's representatives required to provide instruction on specialized portions of the installation.
- .3 Demonstration and instruction will be provided on the following systems:
 - .1 Operation of all automatic control dampers and temperature control devices
 - .2 Response of all terminal units to thermostats and other controls
 - .3 Location of and operation of all access panels
 - .4 Location of all valves and control devices above ceilings
 - .5 Operation of all smoke dampers
 - .6 Operation of smoke exhaust and building pressurization fans and devices
 - .7 Operation of building occupied/unoccupied controls
 - .8 Location and operability of fire dampers
 - .9 Noise levels of all mechanical equipment and terminal devices under maximum operating conditions
- .4 Operation of all equipment and systems under each mode of operation including:
 - .1 Automatic controls and safety interlocks
 - .2 Boilers and associated gas/oil fired systems
 - .3 Cabinet unit heaters
 - .4 Unit heaters
 - .5 Fans
 - .6 Domestic hot water heaters
 - .7 Sump pumps
 - .8 Fire standpipe pump
 - .9 Sprinkler system pump
 - .10 Domestic water booster pumps
 - .11 Others specified

3.5 FLUID SYSTEMS

- .1 Run each system with the applicable pumps and all permanent equipment in the path of the fluid.
- .2 Measure the flow with fluid meters and/or utilizing pump characteristics and actual brake horsepower.
- .3 Adjust the flow to result in the required system performance.
- .4 Rough balance the flow in each system branch to achieve even distribution at equipment and systems as indicated by pressure differential readings.
- .5 Perform final balancing of operating systems based upon pressure and temperature readings commensurate with actual loads.
- .6 Submit a test report listing measured data versus design data. Include in report, schematics, reference numbers and all pertinent information relative to the particular system.

.7 Hot Water Heating System

- .1 Test heating water circuit by means of flow meter installed in the heating water supply line. Adjust flow as required.
- .2 Test heating water pumps. Open valves gradually to obtain design flow rate as measured by flow meter. Record pump pressures and correct for suction and discharge level difference.
- .3 Adjust flow in each heating coil, radiation, and reheat coil using flow meter.

3.6 UNIT HEATERS, CABINET UNIT HEATERS, DUCT HEATERS AND FAN COIL HEATERS

- .1 Test units for proper performance, air pattern, and cycling under their automatic controls.
- .2 Check for proper mechanical and electrical installation.

3.7 AIR ELIMINATION SYSTEM

- .1 Test the operation of all air elimination devices in fluid systems for proper operation.
- .2 Bleed all air entrained in systems and equipment where not eliminated by automatic air vents, by operating the manual air vents.

3.8 PRESSURE AND TEMPERATURE GAUGES

- .1 Check all field mounted thermometers and pressure gauges for ease of observation. Adjust these gauges so they are readily visible from the floor.
- .2 Where the installation is such that temperature and pressure gauges are not conveniently located, arrange for the relocation of such instruments.

3.9 TEMPERATURE CONTROL

- .1 Check automatic valves and dampers for correct installation, smoothness of operation, and proper stroking.
- .2 Test two way control valves for tight shut off under maximum pressure drop conditions (no flow through associated circulating pumps).
- .3 Check that sequenced control devices operate properly without overlap. Check that such sequenced devices are equipped with properly functioning pilot positioners.
- .4 Check the accuracy of all sensor-controller assemblies by comparing the results with those obtained with independent measuring instruments.
- .5 Check the accuracy of all panel mounted indicating gauges by comparing with readings obtained with independent measuring instruments.
- .6 Check reset systems for proper compliance with design reset schedules.
- .7 Monitor the adjustment of the temperature control system to ensure that the system performs as intended.

- .8 The temperature control system shall be commissioned during the applicable season, i.e., heating systems during winter and cooling system during summer.
- .9 Submit a full report including a statement that the systems perform satisfactorily and as intended over the full range of operating conditions.

3.10 VIBRATION ISOLATION EQUIPMENT

- .1 Check all vibration isolators for proper deflection and freedom of movement under all operating conditions of equipment being isolated.
- .2 Check flexible connections at all equipment isolated with vibration isolators to ensure that they are free from binding under no load, full load, start up and coast down of the isolated equipment.

3.11 RUNNING-IN

- .1 After completion, balancing and adjusting and prior to takeover and operation by the Owner, run each system in with automatic controls fully operational during a period of at least fourteen (14) days including weekends.
- .2 Maintain a daily log of key operating parameters.
- .3 Before handing any system over, submit certified records for review by the Consultant.
- .4 Systems without record of 14 days uninterrupted acceptable operation will not be taken over.
- .5 Systems which cannot be run in prior to occupation shall be run in after occupation. The Owner shall delay his own operation until the performance of each system proves satisfactory and has been accepted.
- .6 Adjust systems as necessary to result in acceptable operation.

END OF SECTION



HL ENGINEERING

ELECTRICAL SPECIFICATIONS

FOR PROJECT:

TLDSB WASHROOM RENOVATIONS 2025

HL PROJECT NO.: 25004

**ISSUED FOR TENDER
MARCH, 2025**



HL ENGINEERING LTD
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Part 1 General

1.1 SUMMARY

- .1 Division 00, General Requirements is part of this Section and shall apply as if repeated here.
- .2 Unless specified otherwise, this Section shall apply to all Sections of Electrical Divisions, 26, 27, & 28. The Electrical Contractor's scope shall include Divisions 26, 27, & 28.
- .3 Conform to the conditions stated in the Contract Documents.
- .4 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.

1.2 INTENT AND SCOPE OF WORK

- .1 The Work shall include all labour, materials, tools, equipment, services and incidentals, etc., necessary to provide the complete systems.
- .2 The intent of these specifications is to provide complete systems that are ready for operation, and while no attempt has been made to detail or list each individual part required.
- .3 Sections of these Specifications are not intended to delegate functions nor to delegate Work and supply to any specific trade.
- .4 The Specifications are integral with the Drawings which accompany them. Neither is to be used alone. Any item or subject omitted from one, but included in the other is properly specified.
- .5 Wherever differences occur in the Contract Documents, the maximum conditions and higher standards will govern and be allowed for in the Contract Price. The item to be incorporated will be at the option of the Consultant.

1.3 DEFINITIONS

- .1 Where used, words "Electrical" or "Electrical Work", "Electrical Divisions", "Electrical Systems" shall include all Work in Divisions of 26, 27 and 28.
- .2 Where used, words "Section" and "Division" shall also include other Subcontractors engaged on Site to perform work to make the building and Site complete in all respects.
- .3 Where used, the word "Product" shall mean the material, equipment, component, machinery, or fixture forming the completed Work.
- .4 Where used, the word "connect" shall mean to supply and install all wiring and raceways and make all power connections to Products.
- .5 Where used, the word "supply" shall mean to include all labour, materials and services to furnish to the Site in the location required or directed complete with accessory parts, but is not intended to include installation.

- .6 Where used, the word "install" shall mean to include all labour, materials and services to secure in place Products, including receiving, unloading, transporting, storage, uncrating, installing, connecting and performance of such testing and finish Work as is compatible with the degree of installation specified complete ready for use.
- .7 Where used, the word "provide" shall mean to supply and install as each is described above.
- .8 Where used, the word "commission" shall mean to start-up and initial operation of Products as required to demonstrate satisfactory operation of Products and the entire system including calibration of any instrumentation.
- .9 Where used, the word "Work" shall mean the total construction required by the Contract Documents and includes all labour, Products and services.
- .10 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance, report to", shall mean "approved, directed, permitted, accepted, report to", by the Consultant.

1.4 STANDARDS AND REGULATIONS

- .1 Conform to latest version of the applicable standards and regulations, including Federal, Provincial and Municipal laws, By-laws, regulations, Codes and Standards and the requirements of other authorities having jurisdiction in the area where the Work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract Price. Standards established by the Drawings and Specifications shall not be reduced by applicable codes or regulations.
- .2 Comply with the latest editions and all amendments of the following standards and regulations. Where conflicts in requirements occur, the higher standards shall apply.
 - .1 Canadian Standards Association (CSA) Standards
 - .2 Underwriter's Laboratories of Canada (ULC) Standards
 - .3 Canadian Underwriters Association (CUA) Standards
 - .4 Ontario Building Code (OBC)
 - .5 Ontario Fire Code (OFC)
 - .6 National Building Code of Canada (NBCC)
 - .7 National Fire Code of Canada (NFCC)
 - .8 National Fire Protection Association (NFPA) Standards
 - .9 Ontario Electrical Safety Code (OESC) and Bulletins
 - .10 Electrical Safety Authority (ESA) Requirements
 - .11 National Electrical Manufacturers Association (NEMA) Standards
 - .12 Electrical and Electronic Manufacturers Association of Canada (EEMAC) Standards
 - .13 All standards and regulations mentioned in other Sections of this Division

1.5 TENDERS AND FORMS

- .1 State separate prices in the Bid Form for the Work indicated in the Contract Documents. Prices shall include the complete cost of the Work, i.e. all equipment, wiring, material,

labour, incidentals, profit, overhead, etc, excluding taxes. It shall be the Owner's option to delete from the Contract any of the Work indicated at the prices stated.

- .2 Cash allowances shall be carried in the Contract for the Work indicated, including all equipment, wiring, material, labour, incidentals, profit, overhead, etc, excluding taxes. If the actual cost is less than the Cash Allowance, the remainder shall be reverted to the Owner. If the actual cost exceeds the Cash Allowances, the Owner will reimburse the extra amount.

1.6 PERMITS AND FEES

- .1 Apply for, obtain, and pay for permits, licenses, certificates, connection charges and inspections required by authorities having jurisdiction. Include any premiums applicable due to requirements for after office hour inspections.
- .2 Submit all required documentation to the authorities for their approval and comments before starting any Work. Provide all additional drawings, details or information as may be required. Comply with any changes requested by Authorities as part of the Contract, but notify the Consultant immediately of such changes.

1.7 EXAMINATION OF SITE AND CONDITIONS

- .1 Examine the Site and local conditions prior to tender submission.
- .2 Examine carefully all Drawings and complete Specifications to ensure that Work and equipment will satisfy Site conditions and performance requirements as shown. The Drawings do not show all Site conditions and existing equipment. The Contract Price shall cover all existing Site conditions.
- .3 No allowance will be made later for any expense incurred through failure to make these examinations or to report any such discrepancies and omissions in writing, five Working Days prior to tender closing.
- .4 Examine the work of Other Contractors and report at once any defect or interference affecting the work, its completion or warranty.
- .5 Submission of a tender confirms that the Contract Documents and Site conditions are completely understood and accepted without qualifications unless exceptions are specifically indicated in the Bid Form.

1.8 CONTRACT DOCUMENTS

- .1 The Contract Drawings of this Division are performance drawings and indicate the scope and general arrangement of the Work. They are diagrammatic except where specific details are given.
- .2 They shall be read in conjunction with Architectural, Structural, Mechanical and all other Division Drawings of the Contract.
- .3 The Drawings do not show all conduits and/or wiring or all structural, mechanical and architectural details.

- .4 Obtain accurate dimensions from the architectural and structural Drawings, or by Site measurement. Locations and elevations of services are approximate and must be verified before construction is undertaken.
- .5 Make changes required to accommodate structural conditions, (beams, columns caps, etc.). Obtain the Consultant's approval before proceeding.
- .6 Adjust the location of materials and/or equipment up to 3 meters in any direction as instructed without adjustment to Contract Price, provided that the instructions are given before installation and rough-in.
- .7 Plan and install conduit runs respecting all applicable conditions including structural, mechanical and architectural details.

1.9 SHOP DRAWINGS

- .1 Prepare and submit shop drawings of all Products in accordance with Division 1-General Requirements as specified herein and in each Section of this Division.
- .2 PDF files are acceptable.
- .3 Shop drawings shall have a minimum 210 mm x 285 mm (8-1/2" x 11") clear space on the front sheet, suitable for stamping. The cover sheet shall include the project name, Contractor's name and Product description. Where multiple Products are submitted in one binding, include an index of all equipment as the front sheet.
- .4 Assume full responsibility for submission of shop drawings. Allow a minimum of 10 Working Days for the Consultant review.
- .5 The Consultant will only review shop drawings bearing the Electrical Division and Contractor's stamps of approval.
- .6 Submit shop drawings showing the following:
 - .1 Contract name
 - .2 Contract number
 - .3 Manufacturer's name and model number
 - .4 Supplier's name
 - .5 Approval agencies
 - .6 Shipping and working weight
 - .7 Performance characteristics
 - .8 Dimensions, including required clearances
 - .9 Electrical characteristics
 - .10 Bill of materials and finishes
 - .11 Time required to fabricate and deliver
 - .12 All variations from Contract Documents
 - .13 Construction and field connection details
 - .14 Installation requirements
- .7 The review shall not relieve the Contractor of its responsibility to provide Products in accordance with the design intent and Contract Documents.

- .8 Manufacturer's printed data sheets for standard items are acceptable providing pertinent characteristics are identified and relate to specified items.
- .9 Each shop drawing shall be checked and stamped as being correct, by trade purchasing item, and by the Contractor, before drawing is submitted.
- .10 Where applicable, provide wiring details, schematics, single line drawings, and wiring diagrams showing interconnection with the Work of other Divisions.
- .11 Verify and check dimensions to ensure proper installation of equipment in available space and without interference to the Work of other Divisions. Ensure that electrical and all other coordination is complete prior to submission of shop drawings.
- .12 Provide data sheets and samples for all wiring devices and wall plates prior to installation. Device and plate colours/finishes to be confirmed prior to ordering.
- .13 Where requested, submit samples of Products for review and approval.
- .14 Do not have equipment delivered to the Site until a shop drawing for the item has been reviewed.

1.10 EXISTING, INTERFERENCE AND DETAIL DRAWINGS

- .1 Submit complete existing electrical system drawings prior to construction work.
- .2 Existing drawings shall show complete and accurate existing electrical system conditions, location of all devices and equipment, conduits and wires, junction boxes and power suppliers to building loads.
- .3 Prepare Existing, Interference and Details Drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of piping and conduits through building structure. Drawings shall also show inserts, curbs, equipment bases, anchors, special hangers and weights on all load points.
- .4 Prepare fully dimensioned detail drawings of Products and services in electrical rooms, service and ceiling spaces, and all other critical locations. Coordinate the Work with all other Divisions. Base drawings on reviewed shop drawings and indicate all details pertaining to access, clearances, sleeves, electrical connections, and elevations of pipes, ducts and conduits. Include location of access doors provided under this Division.
- .5 Ensure that clearances required by jurisdictional authorities are indicated on the interference drawings.
- .6 The Owner will not consider any extra cost as a result of the Contractor's failure to prepare proper drawings. Submit drawings two (2) weeks after receipt of the Notice to Commence the Work.

1.11 RECORD DRAWINGS

- .1 Conform to the General Requirements. Maintain at least 2 sets of documents and clearly mark on same as the Work progresses, changes and deviations from Work shown.

- .2 The Contractor shall obtain a clean set of prints at the start of Contract Work and shall keep these prints up-to-date at the Site, accurately recording all changes made on the project and locating all services, equipment, etc. which may have been shown only diagrammatically on the Contract Documents.
- .3 The Contractor shall ensure that as-built information is accurately recorded and shall check same. Record drawings shall be reviewed at each Site meeting.
- .4 Prepare record drawings showing the following:
 - .1 All buried conduit runs are to be shown complete with dimension from building lines.
 - .2 Inverts of all services entering and leaving the building and at property lines
 - .3 Dimensions of underground services in relation to property lines at key points of every run
 - .4 Elevations of underground services in relation to ground floor level of the building
 - .5 Location of all services embedding in the structure, utilizing grid line references
 - .6 Dimensioned locations of all services left for future work
 - .7 All changes to the Work due to Change Orders and Site Instructions
 - .8 All changes to the Work during construction
 - .9 All changes to structural and architectural elements that affect the backgrounds of this record set
 - .10 Location and designation of all electrically supervised valves, flow switches and pressure switches
 - .11 Location and designation of all items requiring access or service in a hidden location
 - .12 Location of all access doors provided under Electrical Division
 - .13 All changes and revisions to Specifications, details and equipment schedules
 - .14 All homerun conduits, junction boxes for complete electrical systems
- .5 Upon completion of the Work, prior to the Substantial Performance inspection and after final review with, the Contractor shall neatly transfer recorded information and make a final As-Built submission for review.

1.12 OPERATION AND MAINTENANCE MANUAL

- .1 The Contractor will be responsible for collecting and organizing three (3) copies of all data, operating instructions, maintenance and trouble-shooting instructions, parts lists, parts diagrams, evidence of all tests and certifications, complete reviewed shop drawings, etc. and assembling them in neat manuals in hard cover. Identify cover "Operation and Maintenance Manual for NAME OF THE PROJECT". Manuals shall be separated with dividers in logical sections and volumes.
- .2 The Contractor shall also collect from Subcontractors and Suppliers all Guarantees/Warranties specified in the Contract Documents. Check that starting date (date of Total Performance of the Work) and extent of each guarantee/warranty are clearly indicated. Check also that all guarantees/warranties indicate the Supplier's Name or Subcontractor's Name as appropriate together with contact phone number. Assemble neatly in labelled section of each manual.

- .3 Prior to requesting the Substantial Performing inspection, submit one (1) copy for review. Make all corrections as requested and forward the corrected two (2) copies to the Owner.

1.13 SCHEDULING

- .1 Comply with the construction schedule. Conform to phasing of Work if applicable. Conform to interim and final completion dates.
- .2 Coordinate the Electrical schedule with general construction schedule.
- .3 Submit a bar chart schedule showing the start and completion dates for each activity based on a critical path analysis of the Work.
- .4 Include in the schedule for Electrical Work done by others, e.g. Power Supply Authority connection.

1.14 ALTERNATES AND SUBSTITUTIONS

- .1 Substitute Products will only be considered when tendered Products become unobtainable. State in the tender the proposed substitute and amount added or deducted.
- .2 It is the responsibility of the Contractor to ensure "Substitute Products" fit the space allotted and provides the performance specified in the Contract Documents.
- .3 If Products manufactured and/or specified by a manufacturer named as equivalent are used in lieu of the manufacturer specified, the Contractor shall be responsible for ensuring that the substituted Product is equivalent in performance and operating characteristics to the specified Product, and, it shall be understood that all costs for additional space, larger power feeders and changes to associated or adjacent Work will be borne by the Contractor offering the substitution. In addition, in Equipment Rooms where Products named as equivalent is used in lieu of specified Products and the dimensions of such Products differs from the specified Products, prepare and submit for approval, accurately dimensioned layouts of rooms affected.

1.15 VALUATION OF CHANGES

- .1 For each change submit a complete itemized breakdown of labour and material.
- .2 Only the net difference between an extra and a credit will be subject to overhead and profit mark up.
- .3 Material shall be valued at current trade prices incorporating all discounts and labour rates. Overhead and profit shall be as shown in the Tender Form.

1.16 WORKMANSHIP

- .1 Workmanship and method of installation shall conform to best standards and practice and be performed to approval. Work shall be done by tradesmen skilled in the type of work to be performed. Where required by local or other By-laws and Regulations, tradesmen shall be licensed in their trade. Install all Work and equipment according to the manufacturer's printed directions.

1.17 INSTALLATION REQUIREMENTS

- .1 Coordinate the Work of this Division with the Work of all other Divisions. Inform the Subcontractors for the Work of other Divisions of the locations of openings, chases, sleeves, supports, services, connections, etc., to be incorporated into the Work.
- .2 Check the locations of all expansion/building joints and ensure that all electrical installations, are at or crossing these locations, are as detailed and as required to compensate for the possible movement at the joint.
- .3 Confirm the exact location of outlets, fixtures and connections. Check architectural details and elevations for more requirements. Confirm location of connection points for equipment supplied under other Divisions or by the Owner.
- .4 Install neatly all equipment and apparatus to allow free access for maintenance, adjustment and eventual replacement.
- .5 Install metering and/or sensing devices to provide accurate and reliable sampling of quantities being measured. Install instruments to permit easy observation.
- .6 Provide suitable shielding and physical protection for devices.
- .7 Install all Products and services in accordance with the manufacturer's requirements and/or recommendations.
- .8 Provide all supports, hangers and fasteners. Secure all Products and services so as not to impose undue stresses on the structure and systems.
- .9 Ensure that the load onto structures does not exceed the maximum loading per square meter (foot) as shown on structural Drawings or as directed.
- .10 Do not use explosive activated tools.

1.18 FIELD REVIEW

- .1 The Owner and Consultant shall have access to the Site at all times for review of the Work during construction.
- .2 Arrange for review of Products during manufacturing.
- .3 Provide all gauges, instruments and other necessary measuring equipment required for review of the Work.
- .4 Maintain a complete set of Contract Documents at all times for field reference.
- .5 Correct any deficiencies as they are reported during the performance of the Work.

1.19 TEMPORARY SERVICES

- .1 Provide temporary office, workshop and tools and material storage space for the Work and assume responsibility for any loss or damage thereto. Buildings erected for this purpose shall conform in appearance to those erected for similar purposes under other Divisions of the Specifications.

- .2 Provide temporary lighting for whole construction area.
- .3 Provide scaffolding and shoring necessary for the Work of this Division. Scaffolding and shoring shall be adequate to protect the workmen according to Provincial and Local Regulations.
- .4 Provide rigging and mill-wrighting, labour and equipment necessary for the Work of this Division. Employ only workmen well experienced and skilled in such trades for this portion of the Work.
- .5 Provide hoisting machinery, operators, labour and materials necessary to lift and place equipment supplied under this Division.
- .6 The permanent systems or any part thereof shall not be used during construction for construction purposes, unless so permitted in advance by the Owner, in writing.

1.20 PROTECTION AND CLEANING

- .1 Securely plug or cap open ends of electrical raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice.
- .2 Equipment stored on Site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.
- .3 Protect all finished and unfinished Work of this and other Divisions from damage due to carrying out of this Work.
- .4 Make good any damage caused directly or indirectly to walls, floors, ceilings, woodwork, brickwork, finishes, etc.
- .5 Before energizing any systems, inspect and clean the inside of all panelboards, switchgear and cabinets to ensure that they are completely free from dust and debris.
- .6 Clean all polished, painted and plated Work. Clean all lighting fixtures. Remove all debris, surplus material and tools.
- .7 Carry out additional cleaning operations of systems as specified in other Sections of this Division and as Division 1 requires.

1.21 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling.
- .3 Divert unused wiring and metal materials to a metal recycling facility, or place in appropriate on-site bins for recycling.

1.22 MOCK-UPS AND TRIAL USAGE

- .1 Provide mock-ups in accordance with the conditions stated in the Contract Documents and Division 1 of the Specifications.

- .2 Trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to, or breaking of, any part of such Work which may be so used.

1.23 COMMISSIONING

- .1 Be responsible for commissioning of all Work provided under this Division. The total commissioning requirements of this Division involve:
 - .1 Complete activation of all systems
- .2 Commissioning shall commence with activation and verification of all systems in accordance with requirements of the Specifications. This will include, but not be limited to, the following items to be tested, adjusted and verified:
 - .1 Fire alarm system
 - .2 Lighting and emergency lighting system

1.24 TESTING

- .1 Carry out all tests specified in the Contract Documents and tests required by authorities having jurisdiction. The testing and adjusting is the responsibility of the Contractor.
- .2 Provide all equipment, labour, instruments, expenses of the manufacturer's representative, and incidentals, and pay for all power and fuel required to carry out the tests.
- .3 Submit the record of all tests signed by the Contractor's Superintendent and, where applicable the manufacturer's representative. Show in schedule form a record of the systems or parts of systems tested, the date of the test, the circumstances such as current, temperatures, etc., the duration of the test and any special remarks pertaining to events during the test. Note the test has been witnessed by authorities having jurisdiction.
- .4 Submit certification letters from the manufacturers of all equipment certifying that their technical representatives have inspected and tested their equipment and are satisfied with the methods of installation and operation. Where existing systems are extended, provide letters covering both new and existing equipment and connections. These letters shall state the names of persons present at testing, methods used and a list of functions performed with location and room numbers where applicable.
- .5 Conduct the following tests, at a minimum:
 - .1 Emergency lighting system test
 - .2 General operations: energize and operate electrical circuit and item
 - .3 Circuits originating from branch distribution panels
 - .4 Lighting and lighting control
 - .5 Demonstrate systems operation
 - .6 Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system

1.25 INSPECTION

- .1 Arrange for inspection of all Work by the authorities having jurisdiction. Upon completion of the Work furnish final unconditional certificates of approval by the inspection authorities.

- .2 Application for final review will be considered when the Work has been completed and written declarations submitted that all commissioning, testing adjustment, set up and documentation is complete. Final review shall be done when:
 - .1 All reported deficiencies have been corrected.
 - .2 All systems have been balanced, tested, commissioned and are operational.
 - .3 The Owner has been instructed in the operation and maintenance of all equipment.
 - .4 All reports have been submitted and reviewed.
 - .5 All maintenance manuals have been submitted and reviewed.
 - .6 All tags and nameplates are in place and all data submitted and reviewed.
 - .7 Cleaning up is finished in all respects.
 - .8 All certificates are furnished.
 - .9 All spare parts and replacement parts specified have been provided.
 - .10 All record drawings have been submitted and reviewed.

1.26 DEMONSTRATION AND INSTRUCTION

- .1 Provide personnel, equipment and tools to demonstrate and instruct the Owner's designated personnel in the operation, controlling, adjusting, trouble-shooting and servicing of all systems and equipment to satisfaction of the Owner. This Work shall take place during the Owner's regular business hours prior to acceptance.
- .2 Where specified elsewhere in this Division, manufacturers shall provide demonstration and instructions.
- .3 Where deemed necessary, the Owner's agent may record these demonstrations via video tape or other means for future reference.

1.27 WARRANTY

- .1 Provide a written guarantee stating that systems, equipment, components, etc. have been installed to manufacturer's instructions, that systems meet the Contract requirements and that all deficiencies in material and labour occurring within two (2) years after Substantial Performance of the work, will be corrected at no charge to the Owner.
- .2 Obtain Product warranties in excess of two (2) years from the manufacturer on behalf of the Owner. These Product warranties shall be issued by the manufacturer to the benefit of the Owner.
- .3 Instruct all manufacturers and suppliers that warranties on Products will commence upon the date of Total Performance of the Work and not from the date the Products are put into operation.
- .4 All corrections to deficiencies listed in field review reports and other correspondence, as well as but not limited to those indicated in testing, adjusting, balancing and commissioning, shall be completed prior to turn over.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Unless specified otherwise, this Section shall apply to all Sections of Electrical Divisions, 26, 27, & 28
- .4 Work to be done under this Section shall include furnishings of labour, materials, and equipment required for installation, testing and putting into proper operation complete electrical systems as specified in the Contract Documents, as shown on the Drawings and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.

1.2 SUBMITTALS

- .1 Submit shop drawings and Product data for Products specified in this Section in accordance with Section of Electrical General Requirements.

1.3 QUALITY ASSURANCE

- .1 Electrical Work shall be carried out by qualified, licensed electricians.

Part 2 Products

2.1 PRODUCTS

- .1 Products shall be new, of Canadian manufacture where available, first quality and uniform throughout. The Contractor shall submit in tender based on the use of Products specified in the Contract Documents, or on the listed acceptable alternate Products as further noted.
- .2 Electrical Products shall be CSA or ULC approved and be so labelled. Products not CSA/ULC approved shall receive acceptance by the Owner for installation, and modifications and charges required for such acceptance shall be included in the Work of this Section.
- .3 Products shall not be installed or connected to the source of electrical power until approval is obtained.
- .4 Where a manufacturer is not specified, provide Products of high commercial standard and quality consistent with the standards of these Specifications. Provide Products of the same manufacture for like applications unless noted otherwise in the Contract Documents.
- .5 Products shall be designed and manufactured in accordance with latest issue of applicable Standards or authorities when such are either mentioned herein, or have jurisdiction over

such materials or items of equipment. Confirm capacity, ratings and characteristics of Products being provided to supply power to equipment provided under other Sections of the Work. Resolve discrepancies before such items are purchased.

- .6 Acceptance of Products installed presumes that Products have not been damaged or exposed to conditions that would adversely affect performance and life expectancy. If in the opinion of the consultant, Products have sustained damage, or have been exposed to abnormal conditions it shall be the responsibility of the Contractor to have such tests performed as are deemed necessary by the Consultant to establish the condition and therefore, acceptability of installed Products.

2.2 ELECTRICAL IDENTIFICATION

.1 Cable and conduit

- .1 Identify conduits and cables for the various systems by the use of the following distinctive coloured labels. The labels shall comprise pressure sensitive plastic tape with printing labels indicating the system. Apply a small area of paint to the inside of each outlet box, pull box and panel as it is being installed. Identify junction boxes in suspended ceiling areas with colour on both inside and outside.
 - .1 Power system - yellow
 - .2 Emergency power - orange
 - .3 Fire alarm systems – red
 - .4 Cable TV systems – purple
 - .5 Telephone systems – blue
 - .6 Security/Intercom/CCTV systems – black
 - .7 Other telecommunication systems - grey
- .2 Locate identification labels as follows:
 - .1 Behind each access
 - .2 At each change of direction, at junction boxes, and at both ends of each run
 - .3 Not more than 15m apart in straight runs
 - .4 Where passing through a wall, partition, and floor; one on each side of the wall, partition, and floor

.2 Cable and conduit labels

- .1 For power and lighting system feeders, install labels at either end of the conductors where terminated inside of equipment to match wiring diagram conductor identification or panelboard circuit numbers. Typical identification Panel AA circuit - 21; use "AA-21". For a three phase circuit provide identification on phase A conductor only. For a single phase circuit provide identification on the phase conductor.
- .2 For lighting branch circuits identify circuit at panel and in outlet box connection to lighting fixture. Install label on phase conductor tap-off. Typical identification if fixture connected to Panel A, circuit 5; marker identification A-5.
- .3 For branch circuits supplying single phase and three phase devices such as receptacles and connections to equipment identify conductors at panel and in device outlet box. Install label on phase conductor inside outlet box. Typical

- identification if device is connected to Panel B - circuit 14, marker identification "B-14".
- .4 For switchboards identify all control conductors at terminal strips inside equipment and where terminated at all remote devices. Identification shall match the numbering system on the Drawings and "Reviewed" shop drawings.
- .5 For fire alarm systems, identify all conductors at terminal strips located in:
 - .1 Control panels.
 - .2 Annunciators.
 - .3 Printers.
 - .4 Local terminal cabinets.
 - .5 All remote devices.
 - .6 All connections in the system.
 - .7 Provide identification in accordance with the numbering system on the "Reviewed" shop drawings.
- .6 For miscellaneous systems identify all conductors at terminal strips located in:
 - .1 Control and/or monitoring panels.
 - .2 Control and/or monitoring stations.
 - .3 Local terminal cabinets.
 - .4 All remote devices.
 - .5 All connections in the system.
 - .6 Provide identification in accordance with the numbering system on the "Reviewed" shop drawings.
- .3 Equipment nameplates
 - .1 Provide lamaroid name plates, white background with black engraved letters 0.4" (10 mm) high, for electrical equipment but not limited to panels, switchboards, transformers, disconnect switches, breakers, contactors, relay panels, starters, TVSS, FACP and miscellaneous panels.
 - .2 Nameplates shall indicate voltage, capacity, upstream, and downstream equipment. Typical identification for panel: "Lighting Panel C, 230/415V, 3 phase, 4 W. Supplied from Panel BB".
 - .3 Switchboards - Plates to be mounted on face of switchboards. Typical identification for switchboard: "Switchboard AAA - 230/415V, 3 phase, 4 W". Typical identification for branch feeders: "Power Panel BB".
 - .4 Install plates after all painting has been completed. Secure with mechanical fastening devices except on the inside of panel doors where gluing will be acceptable.
- .4 Power system colour code
 - .1 Power system phase colour code:
 - .1 Red - Phase A
 - .2 Black - Phase B
 - .3 Blue - Phase C
 - .4 Neutral - White
 - .5 Ground - Green

- .2 Identify incoming utility service lines with enamel paint conforming to the above colour code.
- .3 Band buses in switch board and panels shall conform to the above colour code.
- .4 Provide branch conductor conforming to the above colour code.
- .5 Manufacturer's nameplates
 - .1 Have the manufacturer's nameplates affixed to each item of all equipment showing the size, name of equipment, serial number and all information usually provided, including voltage, cycle, phase, horsepower, etc., and the name of the manufacturer and its address. Ensure that all stamped, etched or engraved lettering on plates is perfectly legible. Ensure that nameplates are not painted over. Where apparatus is to be concealed, attach the nameplate in an approved location on the equipment support or frame.
 - .2 Ensure that panels and other apparatus which have exposed faces in finished areas do not have any visible trade marks or other identifying symbols. Mount nameplates behind doors.
- .6 Signage
 - .1 Provide signage to the local inspection authority on all equipment and electrical rooms.
 - .2 The suitable warning signs must be installed as per the Electrical Safety Code.
 - .3 Where applicable, provide warning signs for ground fault protection circuit as required by ESC.
 - .4 Where applicable, provide warning signs and marking for the power disconnect switches for fire pumps as per NFPA-20, section 9.3.
- .7 Single line distribution drawings
 - .1 Provide a clear acrylic covered framed, as-built single line distribution system drawing of the entire project in the main electrical room. Distribution system shall be CAD generated. Size shall be minimum 305 mm x 460 mm with all text legible. Provide interim drawings until such time that permanent as-built drawings are available for permanent installation.

2.3 WIRES AND CABLES

- .1 Comply with the requirements of the latest editions of the followings:
 - .1 CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables
 - .2 CAN/CSA-C22.2 No.131 – Type TECK 90 Cable
 - .3 CSA C22.2 No. 38, Thermoset Insulated Wires and Cables
 - .4 CSA C22.2 No. 75, Thermoplastic-Insulated Wires and Cables
 - .5 CSA C22.2 No. 65, Wire Connectors
- .2 Use copper conductors RW90XLPE and/or RWU90XLPE, 90°C rated insulation unless otherwise noted in the Contract Documents.
- .3 All wire and cable voltage rating shall be 600V. All outdoor wire and cable shall be -40 Deg. C rated.
- .4 Unless specified otherwise, direct burial cable is **not** acceptable. All wire and cable shall be run in conduit.

- .5 Solid conductors of #12AWG and smaller. Stranded conductors for #10 AWG and larger.
- .6 Except as indicated hereinafter, wire for lighting and receptacle branch circuits to be #12 AWG except that #10 minimum to be used where the home run exceeds 27m (90').
- .7 Wire for control circuits to be #12AWG minimum, and for 24 volt control circuits to be #16 AWG minimum.
- .8 Wire to ceiling outlet boxes on which a lighting fixture is or may be mounted, with conductors having insulation suitable for 90°C.
- .9 Cables located in plenum, ceiling or floor spaces shall be totally enclosed in non-combustible conduit or raceway or be armoured cable where permitted by the Ontario Building Code.
- .10 Unless specified otherwise in the Contract Documents, wire for branch circuits shall be 2#12 + Ground in 16mm conduit.
- .11 Wires and cables for outdoor locations shall be rated accordingly.
- .12 Armoured cables shall be complete with interlocked aluminum armour, approved fastening and connectors and meet the requirements of Vertical Flame Test-Cables in Cable Tray of CSA C22.2 No. 0.3. The PVC jacket cables (TECK 90 and ACWU90) shall be FT6 rated.
- .13 Install all wiring in raceways, unless indicated as armoured. Route wire and cable to meet project conditions. Use suitable cable fittings and connectors.
- .14 Use an approved lubricant to assist in pulling conductors through conduit. Neatly train and lace wiring inside boxes, equipment and panelboards.
- .15 Balance the loading on feeders so that unbalanced load is less than 10%.
- .16 Limit the voltage drop at the end of feeders and branch circuits to 2% at the rated load of the circuit.
- .17 Lighting fixture wiring in accessible ceiling spaces shall be run in conduit from the lighting panel to ceiling outlet boxes with armoured cable drops no longer than 2m permissible from the boxes to fixtures.
- .18 Protect all exposed non-armoured cables in manholes, pull pits and trenches with an approved fire protective fibreglass tape of '3M' manufacture or approved equal. Extend the protective wrapping on the cables where they leave pull pits or trenches below switchgear to the circuit breaker or fused switch terminals. Rack cables in manholes and pull pits to provide clear access for maintenance and servicing.
- .19 Splice wire, up to and including No. 6 gauge, with nylon insulated expandable spring pressure type connectors. Splice large conductors using compression type connections insulated with heat shrink sleeves.

2.4 RACEWAYS AND FITTING

- .1 Drawings do not show all raceways. Those shown are generally in diagrammatic form only.
- .2 Unless specified otherwise, surface raceways are **not permitted** in finished space.
- .3 Comply with the requirements of the latest editions of the following:
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
 - .4 CSA C22.2 No. 62, Surface Raceways and Lighting Fixture Raceways and Fittings
 - .5 CSA C22.2 No. 83, Electrical Metallic Tubing
 - .6 CSA C22.2 No. 126, Cable Tray System
 - .7 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit
 - .8 CAN/CSA C22.2 No. 227.3, Flexible Non-metallic Tubing
 - .9 CSA C22 No. 18, Outlet Boxes, Conduits Boxes, Fittings and Associated Hardware
- .4 Conduits
 - .1 Steel galvanized electrical metallic tubing (EMT) installed:
 - .1 In partitions;
 - .2 In ceiling spaces;
 - .3 In service spaces.
 - .4 In masonry walls.
 - .2 Rigid steel conduit hot dip galvanized inside and outside installed:
 - .1 On the exterior of building;
 - .2 Where exposed to mechanical damage;
 - .3 Where conduits turn up or turn down out of concrete slab;
 - .4 Damp and wet locations.
 - .3 Rigid PVC (unplasticized) conduit except for exit light, emergency lighting, and fire alarm system installed:
 - .1 In slabs with rigid steel galvanized turn-up;
 - .2 Underground with rigid steel galvanized turn-up;
 - .3 In concrete walls;
 - .4 Damp and wet locations.
 - .4 Flexible armoured conduit:
 - .1 In partitions;
 - .2 For lighting fixture drops;
 - .3 From ceiling junction boxes into wall outlets;
 - .4 Flexible armoured conduits shall be limited to 10'-0" lengths where run horizontally from take-off junction boxes.
 - .5 Liquid tight flexible conduit:

- .1 Final connection to motors.
- .2 Any equipment which vibrates or generates noise.
- .6 Provide green ground/bond wire in all conduits.
- .7 Provide bushings on the ends of all conduits in enclosure, boxes, panels and cabinets, to protect the conductor installation. Except where grounding bushings are specified, use all plastic insulated bushings with a temperature rating of 150°C with double locknuts.
- .8 For EMT use steel concrete tight set screw fittings as manufactured by T & B or equal. Die cast or pressure cast fittings are not acceptable.
- .9 For rigid steel conduit use only insulated throat set screw type fittings. Threadless, die cast or pressure cast fittings are not acceptable.
- .10 Use PVC conduit for all landscaping locations where conduit comes in contact with soil. Refer to the Landscape Drawings for the final elevation of planting soil. Co-ordinate and adjust electrical devices accordingly. Use epoxy glue coupling, and formed offsets. Approved manufacturers are Scepter Mfg. Co. Ltd and CGE "Cobocon".
- .11 Conceal all conduits except in service spaces, mechanical rooms, electrical rooms and ceiling spaces.
- .12 Install all locknuts and bushings to ensure a secure mechanical and electrical bond. Use Erickson couplings in lieu of running threads.
- .13 Where conduit joints occur in concrete, use silicone sealing compound to make water tight.
- .14 Lay out conduit to drain free of all moisture.
- .15 Securely hold conduits in place in concrete or masonry during pouring and construction operations; provide templates, forms and spacers as necessary.
- .16 Support multiple runs of conduit on channel or angle iron with rod hangers.
- .17 All exposed conduits shall be run parallel to building lines and to other conduits.
- .18 Secure all conduits in place with conduit clamps T & B or equal. Perforated pipe straps, wire lashings, wood screws or nails are not acceptable.
- .19 Provide conduit expansion joints where conduits cross building expansion joints, also in straight runs of conduit 30 m (100') or longer. Conduit expansion joints shall be telescoping sleeve type, with insulated bushings and ground jumper.
- .20 Make field bends and offsets uniform and symmetrical without flattening conduit. Minimum bending radius shall be ten (10) times the conduit diameter.
- .21 Ream conduit ends to remove burrs and sharp edges. Fit conduit stubs with waterproof plastic caps during installation to protect threads and to prevent entrance of moisture into conduit.
- .22 Test all conduits for clear bore using ball mandrel, brushes and snake. Clear any conduit which rejects the ball mandrel. Replace if necessary. Bear all costs involved in making all Work good, restoring all surfaces to their original pre-construction condition.
- .23 Install a continuous nylon cord 180 kg (400 lb) test in each conduit left empty.
- .24 Install a correctly sized green copper ground wire within each conduit.
- .25 Provide conduit seals in conduits which pass to the outside.
- .26 Provide pull boxes, fittings or junction boxes in conduit runs, on the basis of not more than two (2) right angle bends or their equivalent or not more than 30 m

- (100'), in straight runs between boxes. For outdoor direct buried conduit, up to 50m.
- .27 Size conduits to code requirements, provide larger sizes where noted in the Contract Documents.
- .28 Size conduits for low voltage wiring in accordance with the manufacturer's recommendations.
- .29 Provide conduit sealing fittings and correspond for hazardous application to Electrical Safety Code requirements.
- .30 Maximum conduit size permitted in a concrete slab shall be 35 mm. In any case verify with Structural Consultant for acceptability.
- .31 Where multi-conduits parallel run and/or crossover in concrete slab/wall, verify with Structural Consultant for acceptability.
- .5 Surface metal raceway
 - .1 The surface metal raceway systems shall consist of surface metal raceway, appropriate fittings and device brackets to complete installation.
 - .2 The raceway is to be utilized in dry interior locations only in accordance with the Ontario Electrical Safety Code.
 - .3 Submit drawings for approval showing the complete layout of all Products that make up the complete system for each floor prior to installation with raceway lengths, device type (power and data), locations and circuits identified, complete with data sheets and samples.
 - .4 The surface raceway system specified herein for branch circuit wiring and/or data network, voice, video and other low-voltage wiring shall be Hubbell HBL4750 series or Wiremold V4000 Series. The raceway shall be metal, two-piece design with a base and a snap-on cover. The raceway shall be complete with one integral barrier in the base for power/data separation. Power shall be in top; data in the bottom. Finish shall be ivory unless otherwise noted in the Contract Documents.
 - .5 Complete with power receptacles and telecommunication outlets as required.
 - .6 Receptacle / Data plates shall be Wiremold V4047 series, or equalled by Hubbell.
 - .7 For individual devices located on surfaces where conduit cannot be recessed in finished area, provide single or double channel raceway system Products: Wiremold V500/V700/V2400, ivory finish, or equalled by Hubbell.
- .6 Install raceways system complete with appropriate fittings such as connectors, bushings, elbows, couplings, locknuts, expansion fittings, fasteners and supports and accessories supplied as integral parts of assembly, as specified in the Contract Documents. Installation shall comply with Regulatory Authorities requirements.
- .7 Neatly install exposed raceway running parallel to, and at right angles to, building lines and equally spaced in groups.
- .8 Keep raceway ends parallel and on proper spacing to suit knockouts or raceway openings in equipment or enclosure.
- .9 Keep raceways at least 150 mm clear of heating pipes, flues and hot item surfaces. Where the required clearance cannot be provided, obtain written approval alter the layout or to reduce clearance.

- .10 Provide expansion couplings, with bonding jumper and ground clamps where raceways cross building control joints.
- .11 Use only metallic, enclosed raceway on installation that require shielding of electrical cables or where installed in ceiling used as return air plenum, as specified or indicated on Drawings.
- .12 Raceways shall have established positive low resistance paths to ground and effectively isolate conductors so that any short-circuit arc is confined.
- .13 Select appropriate fittings, such as grounding bushings, bonding and grounding straps, to maintain continuity and effectiveness of grounding of raceway system.
- .14 Provide necessary fasteners and supports acceptable for type and size of raceways, to ensure a rigid, complete assembly.
- .15 Provide suitable inserts or expansion type machine bolts for fastening raceways, fittings, boxes and equipment to concrete surfaces.
- .16 Do not use wood screws, lag screws, expansion shields, rawl plugs and nylon inserts.
- .17 Secure raceway and other associated Work to structure members. Raceway shall not be supported from the ceiling suspension system.
- .18 Thoroughly clean raceway and dry clear obstructions before pulling cable or wire.
- .19 Minimum raceway size: 16mm (1/2") conduit equivalent system.

2.5 OUTLET AND CONDUIT BOXES

- .1 Comply with the requirements of latest edition of the followings:
 - .1 CSA Standard C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings
 - .2 CSA Standard C22.2 No. 85, Rigid PVC Boxes and Fittings
- .2 Outlet and conduit boxes - general
 - .1 Size boxes in accordance with CSA C22.1.
 - .2 102mm square or larger outlet boxes as required for special devices.
 - .3 Gang boxes where wiring devices are grouped.
 - .4 Blank cover plates for boxes without wiring devices.
 - .5 347V outlet boxes for 347V switching devices.
 - .6 Combination ganged boxes with appropriate steel removable barriers where outlets for more than one system are grouped.
 - .7 Where standard make boxes are not suitable, provide boxes of special design to fit space and other requirements.
 - .8 Where vapour proof lighting is specified, provide matching vapour proof ceiling or wall junction boxes and fittings as required.
- .3 Sheet steel outlet boxes
 - .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76mm x 50mm x 38mm or as indicated in the

- Contract Documents. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102mm x 54mm x 48mm.
 - .3 102mm square or octagonal outlet boxes complete with steel fixture studs where supporting lighting fixtures. Die cast fittings are not permitted.
 - .4 102mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls.
- .4 Masonry boxes
- .1 Electro-galvanized stamped steel masonry single and multi gang boxes for devices flush mounted in exposed block walls, minimum size 95mm x 50mm x 64mm standard.
- .5 Concrete boxes
- .1 Electro-galvanized stamped steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
- .6 Conduit boxes
- .1 Cast FS or FD aluminum, or ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.
 - .2 PVC FS or FD boxes or PVC conduit where required in special corrosive areas as indicated on the Drawings.
- .7 Fittings - general
- .1 Bushing and connectors with nylon insulated throats.
 - .2 Knock-out fillers to prevent entry of debris.
 - .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits
 - .4 Double locknuts and insulated bushings on sheet metal boxes
- .8 Installation
- .1 Support boxes independently of connecting conduits. Install all boxes vertically plumb and securely fastened so associated trades will not cause the box to be misaligned.
 - .2 Where interior recessed boxes on exterior wall, a good vapour barrier continuity technique shall be employed such as Iberville or Mold Processors 1004-VB plastic backboxes.
 - .3 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of the Work.
 - .4 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
 - .5 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washer is not allowed.
 - .6 Size and install appropriate boxes and enclosures in accordance with applicable section(s) of Ontario Hydro Electrical Safety Code and the manufacturer's recommended procedures.
 - .7 Co-ordinate the location and installation of boxes so as to be accessible and clear from the building system equipment.

- .8 Install pull boxes in inconspicuous but accessible locations.
- .9 Use pull boxes for conduits larger than 35mm. Use conduit outlet bodies for conduit 35mm.
- .10 Provide approved hole plugs in unused conduit knockouts and openings.
- .11 Furnish boxes and enclosures with corrosion resistant machine screws.
- .12 Boxes and enclosures embedded in concrete for flush-mounted, shall be secured properly with connecting conduits and related Works set in place before concrete is poured. Forms, when used, shall be able to be removed without disturbing installed boxes or enclosures.
- .13 Ensure junction and outlet boxes mounted in ceiling cavities do not interfere with removal of ceiling tiles.
- .14 Use masonry boxes for flush mounting in exposed block walls, concrete boxes for flush mounting in concrete wall.
- .15 Furnish conduit boxes with neoprene gaskets for outdoor area or hazardous area application.
- .16 Install all wall boxes for door security access devices, fire alarm devices, etc., adjacent to lock side of door openings unless otherwise shown on the Drawings. Check door swing before installing any switch.
- .17 Install all boxes in walls so that tapped holes for mounting wiring devices or fixtures will be aligned vertically or horizontally, as required. Where boxes are grouped at one location with common and varying mounting heights, align boxes horizontally and vertically from centre line unless otherwise indicated in the Contract Documents.
- .18 Offset outlet boxes in sound attenuating partitions to avoid undue transmission of sound between the partition elements. Use flexible conduit connections where wiring is required between outlet boxes on opposite sides of partition.
- .19 Offset outlet boxes where installed on either side of a fire separation.
- .20 Where steel supports are required for outlet boxes, wood supports are not acceptable.
- .21 Maintain integrity of vapour barriers along building perimeter wall where flush outlet boxes are required.

2.6 ACCESS PANELS AND DOORS

- .1 All access panels and doors shall be Milcor or Bel, 12 gauge with concealed hinges.
- .2 In glazed tile walls provide #304 alloy stainless steel with #4 finish recessed frame and secured with stainless steel countersunk flush head screws.
- .3 In plaster surfaces provide dished steel door for plaster finish with welded metal lath and plastic grommet for keyhole.
- .4 In other finishes use plain steel door with lock and anchor straps, complete with factory prime coat.
- .5 In lay-in ceilings, tiles properly marked may serve as access panels.
- .6 Provide the appropriate Subcontractors for other Divisions of the Work with panels and doors, complete with frames and all pertinent information for installation. Ensure that all

panels and doors are flush mounted and properly aligned with building modules and grids. Indicate locations on record drawings.

- .7 Select all access panels and doors to provide adequate access, and to suit appropriate architectural finish, minimum size 150 mm x 150 mm (6" x 6"). Where necessary for persons to enter, provide minimum 600 mm x 450 mm (24" x 18") size doors.

2.7 METALS

- .1 Provide all other electrical Work such as, but not limited to, equipment bases, supports, catwalks, framework to support checker plates and electrical equipment above trenches and cable pits, ladders, pit and trench covers, etc. Have such Work carried out in accordance with the requirements of Division of Metals.

2.8 SLEEVES AND CURBS

- .1 Provide conduit sleeves of galvanized steel for conduit and cable runs passing through concrete walls, beams, slabs and floor. Cut flush with finished surface.
- .2 Extend galvanized conduit sleeves for conduit rising through slabs a minimum of 4" above finished floors.
- .3 Through exterior walls below grade waterproofed floors, and other waterproof walls use heavy weight cast iron pipes machine cut. Extend sleeves 100 mm (4") above finished floors, and cut flush with underside of floor.
- .4 For rectangular duct openings for bus ducts and cable tray use minimum 18 gauge galvanized steel sleeves or provide a removable wood box-out of the required size. Brace sleeves to retain their position and shape during the pouring of concrete and other work.
- .5 Seal sleeves and openings to maintain fire rating. Use 3M™ Fire Barrier Sealant CP 25WB+, Dow-Corning #3-6548 'Silicone RTV' foam, Thomas & Betts 'Flamesafe' firestop system, installed in accordance with the manufacturer's specifications and recommendations.
- .6 Seal all openings and sleeves after installation of equipment:
 - .1 With an approved material to maintain fire rating where sleeves and openings pass through fire separations and floors.
 - .2 With an approved material to maintain fire rating for sleeves and openings provided for future equipment.
- .7 Size sleeves to provide 13 mm (1/2") clearance all around.
- .8 Provide all flashing and waterproofing for sleeves through the roof and exterior walls in accordance with the requirements of Division of Thermal and Moisture Protection.
- .9 Except where furred in, provide watertight concrete curbs, 100 mm (4") high by 100 mm (4") wide with 19 mm (3/4") chamfered edges around all sleeves and openings passing through waterproof floors.

2.9 SPARE PARTS

- .1 Furnish spare parts and maintenance materials as recommended by the equipment manufacturer for the warranty period.

Part 3 Execution

3.1 NEUTRALS AND PHASING

- .1 Provide one (1) identified grounded neutral conductor for each set of branch circuits connected to different mains of each panel.
- .2 For circuits identified as computer dedicated (D) or isolated ground (IG), provide individual neutral per identified circuit.
- .3 Install a separate neutral for each GFCI circuit when the GFCI is located at the panelboard.
- .4 Connect two or three (2 or 3) circuits sharing a common neutral to different mains or phases.
- .5 Balance the connected loads across the mains of each panel to within 15%.
- .6 Circuit numbers on the panels must correspond to the numbers on the Drawings.
- .7 Connections in all equipment to be Phase A, B and C from left to right, and front to back when viewing from the front or accessible direction.

3.2 MOUNTING HEIGHTS

- .1 Mounting heights are from floor level to centre line of device outlet, unless noted otherwise in the Contract Documents. Confirm all locations before installation. In all areas accessible to persons in wheelchairs, the mounting heights of all switches, thermostats, intercom switches, pull stations, etc., shall comply with the Ontario Building Code "Barrier Free" requirements.
- .2 The mounting heights of all power and lighting devices shall comply with Ontario Electrical Safety Code requirements. The mounting heights of all fire alarm devices shall comply with CSA requirements.
- .3 If mounting height of equipment is not specified or indicated in the Contract Documents, verify before proceeding with installation.
- .4 Install electrical equipment at the following heights (centre of device) unless indicated otherwise in the Contract Documents.
 - .1 Wall switches, dimmers, timers, speed controllers, speaker volume controllers, thermostats and hand dryers: 1100 mm.

3.3 CUTTING AND PATCHING

- .1 Provide all cutting and patching required for the Work of Electrical Division. Work shall be carried out in conformance with the requirements of Concrete Division. Include any

radiography required to locate concealed services before penetrating into inaccessible locations.

- .2 Any modifications to building shall be done so as not to diminish structural, fire resistance, or smoke barrier integrity.
- .3 Proposed modifications to the structure shall require acceptance by the Structural Engineer.
- .4 The Consultant shall be afforded the opportunity to review the intent prior to any major cutting.

3.4 PAINTING

- .1 Provide all exposed ferrous metal Work, and Products, except conduit, with at least one (1) factory prime coat or paint one prime coat on Site. Clean up or wire brush all equipment before painting. The primer shall be rust inhibiting primer in accordance with CGSB-GB-40d.
- .2 Unless otherwise noted in the Contract Documents, finish painting will be done under Division 9 of these Specifications.
- .3 Do not paint galvanized supports and hangers.
- .4 Repaint or refinish all damaged factory applied finishes.

3.5 WORK IN EXISTING BUILDING AND SITE

- .1 Maintain the existing life safety systems in existing building in full operation at all times during construction, unless otherwise noted in the Contract Documents.
- .2 Maintain all existing systems in full operation during normal occupancy and operation hours, unless otherwise noted in the Contract Documents.
- .3 Maintain all systems adjacent to the construction area in full operation at all times during construction, unless otherwise noted in the Contract Documents.
- .4 All noise generating works that disrupt the building operations shall be carried out before/after normal occupancy hours and shall be coordinated with Owner.
- .5 Co-ordinate with the Owner for scheduling of Works required to be done before/after normal occupancy hours, including but not limit to: drilling through slab; power shutdown; interference to life safety system. All costs involved with this Work shall be included in Contract Price.
- .6 The Contractor shall assume responsibility for any disruption caused by its forces to operational building services. Repair any system damaged during the execution of the Work.
- .7 Scan (X-ray or ultrasound) for unknown existing concealed conduits, pipes, cables/wires, before excavating ground and drilling slabs.
- .8 Provide temporary lights in the construction area to carry out the Work.

- .9 Provide temporary power connections to temporary services during construction.
- .10 Disconnect and remove materials and equipment as shown and as specified in the Contract Documents.
- .11 The existing electrical conduits/wiring to remain in ceiling spaces, interfering with new installation, shall be raised or re-mounted.
- .12 All new conduit installations in ceiling shall be fastened tight to the ceiling structure or rod suspended at high level to the underside of the ceiling slab.
- .13 Where circuits to be removed which are fed from panels outside of the construction area, remove feeder back to panel, make safe circuit and update panel directories.
- .14 Make safe all circuits to be cut off.
- .15 Maintain continuity of existing services for other circuits/devices serving areas outside the construction area. Provide additional wiring/conduits/boxes etc. to suit existing services to be maintained and also implement new Work as detailed in the Contract Documents.
- .16 Check and inspect existing distribution equipment to be re-used (i.e., panel breakers, disconnect switches, etc.) for abnormal thermo-graphic scan under actual loads in operation and submit scan results indicating problems have been corrected.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide all grounding to comply with the Ontario Electrical Safety Code and the latest instructions of the Inspection Authority, with any further requirements as noted herein.

Part 2 Products

2.1 MATERIALS

- .1 All grounding conductors shall be stranded copper, bare or insulated as required, in conduit sized to meet electrical safety requirements unless otherwise noted in the Contract Documents.

2.2 Execution

2.3 INSTALLATION

- .1 Bond all conduit, and all non-current carrying metal parts, equipment cases, frames, bases, brackets, etc.
- .2 Bond each piece of fixed equipment back to the switchboard or panel feeding that equipment, by one of the following methods:
 - .1 Where equipment is fed by a steel conduit, provided sizing is adequate, utilize conduit for the ground return conductor. At switchboard provide a grounding bushing, and strap such conduits to the ground bus (size per Code).
 - .2 Where the size of the conduit is inadequate (per Code), or if the conduit is flexible, install a separate insulated copper ground inside the conduit. At the switchboard or distribution panel, provide a grounding bushing, loop the ground conductor through the bushing, and connect to the switchboard ground bus. At the fixed equipment, connect to an internal ground bus, or connect to the inside of the metal enclosure utilizing approved screws and connectors (remove all paint).
 - .3 For branch circuits, the conduits may be used for grounding, provided seamless steel fittings are used on EMT and threaded fittings are used on rigid conduit. At each receptacle connect a stranded copper ground wire from the outlet box to the grounding terminal on the receptacle. Install a separate grounding conductor in all PVC conduits.
 - .4 Where equipment is fed by a multi-conductor power cable, provide a ground conductor in the cable. At the switchboard or panel, connect to the ground bus. Use a grounding connector on the cable for positive grounding of the metallic sheath. Loop the ground wire to the grounding connector.

- .3 Run a separate ground wire in all flexible conduits. Connect each end to ground bus or lug or connector.
- .4 Where mechanical protection is required for insulated grounding conductors install in rigid conduit.

END OF SECTION

1.1 General

1.2 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide factory assembled power distribution equipment as herein specified and as shown on the Electrical Drawings.
- .4 Refer to the Electrical Drawings for more requirements on: voltage; phase; size and type of mains; size, type and quantity of the branch devices; location; surface or flush mounting.

1.3 REFERENCE

- .1 Comply with the requirements of the latest edition of the following:
 - .1 CSA C22.2 No. 31, Switchgear Assemblies
 - .2 CSA C22.2 No. 29, Panelboards
 - .3 CSA C22.2 No. 5, Molded Case Circuit Breakers
 - .4 CAN/CSA C22.2 No.47, Air-Cooled Transformers (Dry-Type)
 - .5 CSA C9, Dry Type Transformers
 - .6 CAN/CSA-C802.2, Minimum Efficiency Values for Dry-Type Transformers
 - .7 CAN/CSA-C802.3, Maximum Losses for Power Transformers
 - .8 CSA C22.2 No. 4, Enclosed and Dead-Front Switches
 - .9 CSA C22.2 No. 39, Fuseholder Assemblies
 - .10 CSA C22.2 No. 248 (Part 1 to Part 16), Low Voltage Fuses
 - .11 CSA C22.2 No. 190, Capacitors for Power Factor Correction

1.4 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements.
- .2 Shop drawings shall include electrical details, dimensions, ratings, types, and quantity.

1.5 APPROVED MANUFACTURERS

- .1 The manufacturer shall be the manufacturer of the major components within the assembly, including circuit breakers and fusible switches.
- .2 Use the Products of one manufacturer for the entire project. Acceptable manufacturers are:
 - .1 Cutler-Hammer
 - .2 Schneider
 - .3 Siemens
 - .4 GE

.5 Approved equal

1.6 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section of Basic Materials and Methods.
- .2 Identify circuits controlled by each breaker on directory cards provided with panels. Directories shall be typed and mounted in metal frame with clear plastic cover.
- .3 **Modify existing power panel directory.**

Part 2 Products

2.1 BREAKERS

- .1 Provide new breakers to match existing in existing power panel.

2.2 ENCLOSURES FOR ALL PRODUCTS

- .1 Indoor dry locations: CSA type 1.
- .2 Indoor sprinkler locations: CSA type 2.
- .3 Outdoor locations: CSA type 3R.

2.3 PANELBOARDS

- .1 Panelboards rated 120/208 volt AC shall have short-circuit rating as shown on the Drawings, but not less than 14 kA RMS symmetrical.
- .2 Panelboards rated 347/600 volt AC shall have short-circuit rating as shown on the Drawings, but not less than 18 kA RMS symmetrical.
- .3 Panelboards shall be labeled with the short-circuit rating.
- .4 Where series ratings are applied, provide the labels in accordance with the requirements of Electrical Safety Code. The labels shall state the following, at a minimum:
 - .1 Size and type of upstream devices;
 - .2 Branch devices that can be used;
 - .3 Short-circuit rating.
- .5 Interiors shall be completely factory assembled devices.
- .6 Enclosure:
 - .1 Indoor dry locations: CSA type 1.
 - .2 Indoor sprinkler locations: CSA type 2.
 - .3 Outdoor locations: CSA type 3R.

- .7 Provide doors with concealed hinges, combined locks and latches for all panelboards except fusible disconnect switch type distribution panelboards.
- .8 Two (2) keys for each panelboard and key all panelboards alike.
- .9 Interior trim shall be dead-front construction to shield users from energized parts.
- .10 Main bus shall be tin finished high quality copper and extend the full length of the panel. Ground bus shall be sized to accommodate branch circuit grounding conductors. 200% neutral as required.
- .11 Sequence phase bussing with odd numbered sections on the left and even on the right, with each section identified by permanent number identification as to circuit number and phase.
- .12 Provide bolt-on type circuit breakers and/or disconnect switch units.
- .13 Means of locking off shall meet CSA requirements of elevator power supplies
- .14 Minimum circuits shall be 42, unless otherwise noted in the Contract Documents.
- .15 Trims and doors shall be painted ANSI 61 grey. Factory applied paint finish on all exterior surfaces.
- .16 All required lugs.
- .17 Connectors for future breakers and switches. Drill and tap bus work.
- .18 Custom built panelboard assemblies:
 - .1 Double stack panels as indicated
 - .2 Contactors and/or relays as indicated
 - .3 Feed-through and/or sub-feed lugs as indicated
 - .4 Special ground buses as indicated
 - .5 Special neutrals as indicated
 - .6 Connectors for future branch devices as indicated
 - .7 TVSS as indicated
 - .8 Isolated ground bus as indicated
- .19 Circuit breakers shall be quick-make, quick-break type, for manual and automatic operation, with over centre toggle handle. The handle shall reside in a position between "ON" and "OFF".
- .20 Circuit breakers shall have thermal and magnetic trip mechanism, to provide inverse time current tripping and instantaneous tripping, trip-free and trip indicating. Circuit breakers rated at 125A and larger shall have thermal and adjustable magnetic trip mechanism.
- .21 Multi-pole breakers shall be common trip type and have a common handle. Tie handles are not acceptable.

- .22 Clearly marked with their rated ampacity and respective trip rating and visible without removing bolted covers.
- .23 Provide handle locking devices on all branch circuit breakers controlling communication equipment, lighting control, exit signs, emergency lighting, fire alarm system and other life safety equipment.
- .24 Circuit breakers feeding unswitched lighting circuits shall be “switching duty” type.
- .25 Provide class ‘A’ ground fault protection with the circuit breaker, where required by the Electrical Safety Code.

2.4 DISCONNECT SWITCHES

- .1 Provide all disconnect switches, whether an integral part of equipment or separately mounted.
- .2 Enclosure:
 - .1 Indoor dry locations: CSA Type 1.
 - .2 Indoor sprinkler locations: CSA Type 2.
 - .3 Outdoor locations: CSA Type 3R.
- .3 Provision for padlocking in off switch position by locks
- .4 Mechanically interlocked door to prevent opening when handle in ON position.
- .5 Fuses: size as indicated in the Contract Documents.
- .6 Fuse holders: suitable without adaptors, for type and size of fuse indicated.
- .7 Heavy-duty horsepower rated, quick-make, quick-break action, front operation, with integral handle mechanism and visible contacts in “OFF” position.
- .8 ON-OFF switch position indication on switch enclosure cover
- .9 Switches identified for use as service equipment are to be labeled for this application
- .10 Furnish solid neutral assembly and equipment ground bar.
- .11 Lugs suitable for copper and/or aluminum conductors
- .12 Identify name of load controlled.

2.5 FUSES

- .1 Fuses up to 600 volts and over 600amps:
 - .1 Where used in motor, transformer and other circuits with an inrush: Class L time delay. Ferraz Shawmut type A4BT or approved equal by Bussman.
 - .2 All remaining fuses: Class L non-time delay. Ferraz Shawmut A4BY or approved equal by Bussman.

- .2 Fuses up to 600 volts and up to and including 600amps:
 - .1 Where used in motor, transformer and other circuits with an inrush: Class J time delay. Ferraz Shawmut type AJT or approved equal by Bussman.
 - .2 All remaining fuses: Class J non-time delay. Ferraz Shawmut type A4J or approved equal by Bussman.
- .3 Fuse storage cabinet: Wall-mounted sheet metal cabinet with shelves, suitable size to store spare fuses and fuse pullers, complete with hinged door.

2.6 CONTACTORS

- .1 Conform to the requirements of latest edition of CSA C22.2, No. 14 – Industrial Control Equipment.
- .2 The contactors shall be fully rated and withstand the large initial in-rush currents of lamps without contact welding.
- .3 Contactors shall be NEMA rated, magnetic, electrically operated, electrically held, and complete with suitable type enclosure and 120V coil.
- .4 Fail open: contacts shall open upon the supply voltage drop below 75% of the rated voltage.
- .5 Accessories
 - .1 Pilot lights (ON/OFF).
 - .2 On/Off/Auto selector switch for lighting control panel.
 - .3 Auxiliary contacts (NO and NC) and relays to match control function.
 - .4 Control circuit fuse-holders and fuses.
 - .5 Control transformers in each 347/600V enclosed contactor. Transformer shall be 120V secondary and furnished with primary and secondary fuses. Bond unfused leg of secondary to enclosure.
- .6 Mount contactors in lighting control panel at 1500 mm AFF to operating handle/pushbutton.
- .7 Mount power control contactors above power panels.

Part 3 Execution

3.1 GENERAL

- .1 **Modify existing power panel directory.**
- .2 Install disconnect switches complete with fuses if applicable.
- .3 In finished areas, where disconnecting devices are required, provide a circuit breaker in flush mounted enclosure.
- .4 Provide three spare fuses of each type and size used above 600 amp and six spare fuses of each type and size used up to and including 600amp.

- .5 Install fuses in mounting devices immediately before energizing circuit.
- .6 Ensure correct fuses fit to physically match mounting devices.

3.2 PANELBOARDS

- .1 Install panelboards securely, plumb, true and square, to adjoining surface.
- .2 Provide three (2) empty 35 mm (1 ¼") conduits from all recessed lighting and receptacle panelboards, terminated in ceiling space above.
- .3 Provide three (3) empty 53 mm (2") conduits from all recessed distribution panelboards, terminated in ceiling space above.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide all switches, receptacles, wiring devices and cover plates as required to complete the installation.

1.2 REFERENCES

- .1 Comply with the requirements of the latest editions of the following:
 - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Wiring Devices
 - .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices
 - .3 CSA-C22.2 No.55, Special Use Switches
 - .4 CSA-C22.2 No.111, General-Use Snap Switches
 - .5 CSA-C22.2 No. 144, Ground Fault Circuit Interrupters

1.3 SUBMITTALS

- .1 Submit shop drawings and Product data in accordance with Section OF Electrical General Requirements.

1.4 MANUFACTURER

- .1 Wiring devices shall be manufactured by 1) Hubbell; 2) Pass & Seymour; 3) Watt Stopper; 4) Lutron. Leviton is not acceptable. Catalogue numbers are referred to below to indicate quality standard.

Part 2 Products

2.1 SWITCHES

- .1 White premium specification grade, quite type.
- .2 Terminal holes approved for No. 10 AWG wire
- .3 Silver alloy contacts
- .4 Urea or melamine moulding for parts subject to carbon tracking
- .5 Suitable for back and side wiring
- .6 In all finished spaces, switches shall be decorator type, for 120 Volt lighting circuits shall be Hubbell DS120STW, DS320STW and DS420STW, 20 ampere for single pole, three-way and four-way switching as required for the application.

- .7 In service spaces, switches shall be toggle switches, for 120 Volt lighting circuits shall be Hubbell CSB120W, CSB320W and CSB420W, 20 ampere for single pole, three-way and four-way switching as required for the application.
- .8 347 Volt lighting circuits shall be Hubbell HBL18221WCN, HBL18223WCN, 20 ampere for single pole, three-way switching as required for the application. Provide key operated switches where shown of the same series.
- .9 Switches for motor or other control applications shall be heavy duty, industrial series, horsepower rated:
 - .1 600V, 30A, Hubbell, HBL7832D and HBL7810D for double-pole and three-pole application.
 - .2 120/277V, 20A, with LED pilot light, Hubbell, HBL1221PL and HBL1221PL for single-pole and double-pole application.

2.2 RECEPTACLES

- .1 White premium specification grade, urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring
- .3 Break off links for use as split receptacles
- .4 Eight back wired entrances, four side wiring screws
- .5 Triple wipe contacts and riveted grounding contacts
- .6 Impact-resistant nylon face
- .7 U-ground
- .8 GFCI receptacles shall meet UL 943 requirements and be complete with test and reset buttons, and LED indication light
- .9 Duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR15WHI (CSA 5-15R)
- .10 Duplex receptacle, 20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR20WHI (CSA 5-20RA)
- .11 GFCI duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, GFST15W (CSA 5-15R)
- .12 GFCI duplex receptacle, 20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, GF20STW (CSA 5-20RA)
- .13 TVSS duplex receptacle, gray, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, HBL5262GYWSA (CSA5-15R)
- .14 Weather-resistant duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR15WHIWR (CSA5-15R)

- .15 Temper-resistant duplex receptacle, 15 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR15WHITR (CSA5-15R)
- .16 Temper-resistant duplex receptacle, 20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, BR20WHITR (CSA5-20R)
- .17 Temper-resistant GFCI duplex receptacle, 15/20 amp, 120 volt, 1 phase, 2 pole, 3 wire, Hubbell, GFTRST15W/20W (CSA5-15R/20R)

2.3 COVER PLATES

- .1 Stainless steel type 302, complete with matching screw or snap on type
- .2 Weatherproof covers shall be while-in-use type polycarbonate body, cover and plates, conforming to NEMA3R. Hubbell # WP826MP
- .3 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes
- .4 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches

2.4 DIMMERS

- .1 Lutron # Pico PJ2-2BRL-L01 series, wireless control, battery-operated dimmers.
- .2 2 buttons with raise/lower, white finish.
- .3 Wireless communicates with Lutron line-voltage dimming module.
- .4 Complete with wall mounting kit, and stainless steel cover plate.

2.5 CEILING OCCUPANCY SENSORS

- .1 Ceiling occupancy sensors shall be Lutron #LRF series, wireless type, battery-operated, passive infrared ceiling sensors.
- .2 Occupancy and vacancy, Auto-On/Auto-Off.
- .3 Adjustment for time delay off, setting to be 5 minutes.
- .4 360° coverage up to 650 square feet.
- .5 Wireless communicates with Lutron line-voltage control and dimming module.
- .6 White finish, 10-year battery, 5-year warranty.
- .7 Complete with suitable mounting adaptor for the application:
 - .1 Recess in drop ceiling, T-bar or drywall
 - .2 Surface on solid ceiling, plaster, concrete, or wood.
- .8 Locate sensor minimum 4' away from ceiling supply diffuser, and wireless router.

2.6 LINE-VOLTAGE CONTROL AND DIMMING MODULES

- .1 Receive wireless inputs from remote occupancy sensors and dimmers.
- .2 Lutron #PowPak, RMJS series.
- .3 Control and operating voltage: 120/277VAC, 8A switching, 0-10V dimming. Provide separate dimming wires.
- .4 Wireless communication coverage with dimmers/occupancy sensors: 30'.
- .5 Mount modules to manufacturer specifications, but must **not** inside metallic enclosure:
 - .1 In ceiling space, T-bar or drywall. Provide success panel where in drywall ceiling space.
 - .2 Surface on solid ceiling, plaster, concrete, or wood.

2.7 WALL SENSOR SWITCHES

- .1 Adaptive technology for time delay
- .2 No minimum load requirement
- .3 180° coverage up to 900 square feet
- .4 Dual technology, ultrasonic and passive infrared
- .5 Manual override for both on and off
- .6 Compatible with all electronic/magnetic ballast and incandescent lamp
- .7 Built-in photocell
- .8 120VAC or 347VAC to suit application, 800W, dual switching circuits to suit application
- .9 Installed in recessed single gang box, white finish and cover plate shall match wall lighting switch
- .10 Watt Stopper #DW-100 series

Part 3 Execution

3.1 INSTALLATION

- .1 All wiring devices to be flush mounted in finished space. Surface installation is permitted in unfinished and/or service space.
- .2 Install single throw switches with the handle in "UP" position when switch closed.
- .3 Install devices in gang type outlet box when more than one switch is required in one location. When supplied from different voltages or power sources, provide metal barriers in the ganged box.
- .4 Permanently identify '347V' on each 347V switch cover plate.

- .5 For dimming control, provide control wires in conduits as per manufacturer requirements.
- .6 Clean debris from outlet boxes.
- .7 Install devices plumb and level. Adjust devices and wall plates to be flush and level.
- .8 Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- .9 Clean exposed surfaces to remove splatters and restore finish.
- .10 Test each receptacle device for proper polarity.
- .11 Test each GFCI receptacle device for proper operation.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide all lighting fixtures with lamps, ballasts and accessories as specified herein and as shown on the Electrical Drawings.

1.2 REFERENCE

- .1 Comply with all requirements of the latest edition of CSA Standards.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements.
- .2 Include fixture catalogue data sheets with shop drawings. Arrange the fixture catalogue data sheets and identify in the same sequence as the specified fixture list. Fixture catalogue data sheets shall indicate the following:
 - .1 Dimensions, weight, material, finish and mounting details
 - .2 Performance: Candle power distribution curves in two planes, C.V. chart of indoor fixtures and lumen output chart of outdoor fixtures and flood lights.
 - .3 Pole wind loading, weight, dimension, anchoring details and finish
 - .4 Lamps: type and base, burning hours, CRI, CCT and lumens
 - .5 Ballasts: type, wiring diagram, watts, voltage, P.F., sound rating, starting temperature, efficiency and other required characteristics
- .3 Submit photometric IES file for all substituted fixtures. Where requested, submit an electronic lighting level calculation analysis for the area with substituted fixtures.
- .4 Where requested, submit fixture samples of each substituted fixtures.
- .5 Submit a colour/finish chart for all lighting fixtures for final selection/approval.
- .6 Where requested, submit certified heat-run test data for each type of ballast mounting.
- .7 Where requested, within four (4) weeks of Contract award, provide information on the electronic ballast operating frequency for Owner's co-ordination with Owner supplied equipment operating at high frequencies.

1.4 WARRANTY

- .1 Warrant LED lamps and drivers for a minimum of 5 years from the date of Substantial Completion of the Work. Include labour for replacing lamps and drivers in the warranty.

Part 2 Products

2.1 LAMPS AND DRIVERS

- .1 LED
 - .1 Minimum lamp and driver life of 50,000 burning hours
 - .2 4100°K CCT for indoor application. 5000°K CCT for outdoor application.
 - .3 Quietest electronic driver
 - .4 Dimming drivers shall dim continuously between 100% and 10% light output.
- .2 Manufacturers
 - .1 Philips
 - .2 Osram-Sylvania
 - .3 G.E.

2.2 LIGHTING FIXTURES

- .1 Fixtures shall have CSA labels and shall be complete with lamps, ballasts and necessary accessories for installation.
- .2 Unless otherwise indicated in the Contract Documents, lighting fixture bodies shall be minimum 20 gauge, cold rolled prime steel of rigid construction with knockout as required. Fixture rigidity shall permit any suspension method without sag. Fixtures shall be suitable for either individual or continuous mounting. Fixture sockets shall apply continuous holding pressure on lamps.
- .3 All fixture types shall be designed with adequate heat sinks to dissipate the generated heat in order to prevent ballast and lamps from overheating with the resulting decrease in their rated life expectancy and/or light output. Fixtures shall be wired with type GTF fixture wire.
- .4 All fixtures shall be complete with required safety disconnect means.
- .5 Plastic lenses shall be 100% virgin acrylic not less than 3 mm thick.
- .6 Include the cost of all necessary accessories for a complete installation in the Contract Price. No extras will be entertained as a result of the supplier or Contractor failing to provide such accessories.
- .7 Where fixtures are recess mounted on fire rated ceiling, provide fire rated enclosure for all fixtures. Global NGineering #FF series fire rated enclosures are permit to be used plus suitable for the application.

Part 3 Execution

3.1 INSTALLATION

- .1 Install all fixtures in the standard manner for the type of fixture and in accordance with the manufacturer's instructions. Support all fixtures from building structural members. The drop ceiling supports are not acceptable.

- .2 In non-accessible ceilings, wire with not less than 1220 mm of AC90 or RW90 wire in flexible conduit to adjacent outlet boxes placed above the finished ceiling within reach of the fixture openings.
- .3 In accessible ceilings wire with 1830 mm of AC90 or RW90 wire in flexible conduit to adjacent outlet boxes.
- .4 Where fixtures are not installed in the approved ceiling system, provide steel fixture studs, brackets and hangers. Where fixtures are hung on chain hangers, provide chain of closed link type capable of supporting ten times the fixture weight. Use U-bolts for chain ends; S-hooks are not acceptable.
- .5 Provide suitable trim for all fixtures installed in drywall ceiling or within lay in or snap in tiles.
- .6 Provide I.C. frame/enclosure for all fixtures installed in insulated ceiling. Confirm the insulated ceiling areas.
- .7 Provide fire rated boxes for all recessed fixtures in the fire rated ceiling area.
- .8 Provide plaster frames for all fixtures recessed in plaster ceilings. Coordinate plaster frames installation with ceiling contractor and ensure that they are located correctly.
- .9 Protect fixtures from dirt and damage during construction and clean when the installation is completed. Replace fixtures showing marks or scratches due to handling or tool marks.
- .10 Align fixtures shown in continuous rows or broken lines so that all rows appear as straight lines. Crooked lines and misplaced fixtures will not be accepted.
- .11 Where luminaires are surface mounted on inverted T-bar ceilings, they shall be supported directly from the building structure. Where this is not possible due to presence of mechanical ducts or other obstruction, supply and install galvanized steel channel, Unistrut or approved equal, above the ceiling, securely attached to the structure and not from the suspension system for the ceiling, and fasten the luminaires to the channel with clamping nut, bolt, flat washers and lock washer to the satisfaction of the Consultant. Provide bolts at least every 1.2m of the length of the fixture (i.e., 3 bolts for 2.4m fixture).
- .12 Fixtures are shown on the Electrical Drawings in approximate locations only. Install fixtures in accordance with reflected ceiling plans, details and/or field instructions.
- .13 Install lighting fixtures in service areas, underground parking areas, unfinished areas, mechanical and electrical rooms after the mechanical and electrical equipment is in place. Locate fixtures on Site to clear all obstructions to the approval of the Consultant. Provide auxiliary steel members for hanging fixtures below ducts and other equipment.
- .14 Where the ceiling height is less than 3 metres, suspend ceiling surface mounted fixtures at 3 metres AFF. Where the ceiling height is more than 3 metres, suspend ceiling surface mounted fixtures at 3 metres AFF.
- .15 Provide all mounting hardware for all fixtures.

- .16 Check the latest ceiling finishes in all areas where recessed fixtures are specified to ensure that fixtures are purchased with suitable ceiling trim for the particular ceiling finish. Replace fixtures which are sent to the Site with the wrong ceiling trim or flanges with fixtures having the correct trims, flanges, etc. as required, at no cost to the Owner.
- .17 Provide safety chains for all HID fixtures with integral ballasts. Attach chain to the fixture and building structure. Safety chain shall be designed and secured so as to sustain the sudden weight of the fixture.
- .18 In stairs, provide a fixture on every main and half landing level. Coordinate with Architectural Drawings for number of landings.
- .19 Fixtures shall be installed in accordance with the reflected ceiling layouts with due consideration for mechanical diffusers, bulkheads, sprinkler heads, and other obstructions. Check the Mechanical and Architectural Drawings before roughing-in to avoid any possible conflict.
- .20 Fixtures connected to ground fault interruptor circuits shall have separate neutrals (common neutrals for 2 or 3 circuits are not acceptable).
- .21 Exterior wall mounted lighting fixtures shall be mounted on recessed boxes except where fixtures with integral outlet boxes are specified, in which case the recessed outlet box is not required. Outlet boxes shall be firmly anchored to the wall.
- .22 Unless otherwise indicated in the Contract Documents, supply and install concrete bases for lighting standards. Concrete bases shall be trowel finished with all exposed corners bevelled at 45 degrees. Junction boxes shall be carefully set and anchored to ensure flush fit of junction box cover. Concrete bases shall be constructed of 20 Mpa concrete air entrained and steel reinforced as shown on the Drawings.
- .23 Include third party functional testing of all lighting control devices and systems. Submit test report.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide an emergency lighting system including exit signs, remote heads, and battery units, as shown on the Drawings, as specified herein and as otherwise required.

1.2 REFERENCE

- .1 Comply with the requirements of the latest edition of the following:
 - .1 CSA-C22.2 No. 9, General Requirements for Luminaires
 - .2 CSA-C22.2 No. 141, Unit Equipment for Emergency Lighting
 - .3 CSA-C22.2 C860, Performance of Internally Lighting Exit Signs
 - .4 CSA-C282, Emergency Electrical Power Supply for Buildings

1.3 SUBMITTALS

- .1 Submit shop drawings and Product data in accordance with Section of Electrical General Requirements.
- .2 Include fixture catalogue data sheets with shop drawings indicating dimensions, components, electrical characteristics and performance data for each fixture and device. Arrange the fixture catalogue data sheets and identify in the same sequence as the specified fixture list.
- .3 Submit test report and verifications following the completion of testing.

1.4 WARRANTY

- .1 For the complete system, provide a 2-year, no-charge, unconditional guarantee, and 5-year pro-rated charge guarantee on workmanship and parts.
- .2 For batteries, on the second 5-year, provide a pro-rated charge guarantee on workmanship and parts.

1.5 MANUFACTURERS

- .1 Emergi-Lite
- .2 Lumacell
- .3 Beghelli

Part 2 Products

2.1 STANDARD EXIT SIGNS

- .1 Pictogram exit signs meet or exceed CSA 22.2 No.141-10 standard for pictogram exit signs
- .2 The housing shall be constructed of rugged extruded aluminum
- .3 The faceplate(s) shall be constructed of extruded Aluminum and shall incorporate a protective clear poly-carbonate panel.
- .4 Each face plate shall come standard with two legend films for pictogram and directional indicators.
- .5 Lamps: Less than 2.5W, LED.
- .6 Inputs:
 - .1 DC: 12V as shown on the Drawings.
 - .2 AC: Universal: 120V/347V.
- .7 Directional arrows: universal type for field adjustment.
- .8 Mounting: universal for field selection of ceiling surface, wall surface, and/or pendent
- .9 Provide white metal wire guard in rough areas and as required.

2.2 WEATHER-PROOF EXIT SIGNS

- .1 Same as standard exit signs, except:
 - .1 Housing to be industrial grade polyvinyl chloride fully gasketed around lens and canopy.
 - .2 The sealed face plate shall be constructed of heavy duty vandal-resistant polycarbonate.

2.3 STANDARD REMOTE HEADS

- .1 Single or double cast aluminum head(s), complete with mounting plates, 300 degree horizontal and 80 degree vertical minimum adjustment.
- .2 Lamps: LED Narrow beam, 6W or as shown on the Drawings.
- .3 Input: 12VDC as shown on the Drawings.
- .4 Mounting: ceiling or wall as shown on the Drawings.
- .5 Finish: white painted.
- .6 Provide white metal wire guard as required.

2.4 BATTERY UNIT

- .1 Supply voltage: as indicated on the Electrical Drawings.

- .2 Output voltage: 12V DC.
- .3 Operating time: 1/2 hour minimum.
- .4 Battery: sealed, maintenance free, long-time lead with rated life of ten (10) years.
- .5 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations capable of restoring a discharged battery to the fully-charged state within twenty-four (24) hours, and switched to a float charge when not in full charge mode.
- .6 Solid state transfer circuit
- .7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .8 Signal lights: solid state, for "AC Power ON" and "High Charge".
- .9 Lamp heads: integral on unit and remote, 345° horizontal and 180° vertical adjustment, white painted cast aluminum head. Lamp type: wide beam flat MR16 LED, 2-6W, unless noted otherwise in the Contract Documents.
- .10 Cabinet: suitable for direct or shelf mounting to wall and complete with knockouts for conduits. Removable or hinged front panel for easy access to batteries.
- .11 Finish: standard factory finish.
- .12 Auxiliary equipment:
 - .1 Advanced diagnostic printed circuit board with auto self test and time delay
 - .2 Test switch and LED trouble indicator
 - .3 Battery disconnect device
 - .4 AC input and DC output terminal blocks inside cabinet
 - .5 Mounting shelf
 - .6 Transient voltage surge suppressor on the supply side of power to the unit

2.5 WIRING

- .1 Refer to Section of Basic Materials and Methods.

Part 3 Execution

3.1 INSTALLATION

- .1 Pendant mount exit signs in service rooms and other areas where necessary to clear obstructions. Install suspended exit signs using pendants supported from swivel hangers.
- .2 Install all unit equipment, remote heads, exit signs, and accessories in accordance with the manufacturer's instruction.
- .3 Direct heads for illumination to meet OBC requirements.

3.2 TESTING AND VERIFICATION

- .1 Arrange with the manufacturer to conduct a complete commission, inspection and test of all installed emergency lighting system.
- .2 The manufacturer's representative shall be responsible for properly aiming remote heads, recording the light level readings, recording battery full load operation time, issuing a verification indicating that lighting levels meet CNBC requirements, and the system has been installed properly.
- .3 Submit the report and verification to Consultant.
- .4 Correct all deficiencies.
- .5 Shall be witnessed by Consultant.
- .6 All costs involved in the testing, verification, and corrections shall be included in the Contract Price.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This section of specification is an integral part of the contract documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide the following electric heating assemblies and system complete with all components/accessories and controls.
- .4 Electric duct mounted heaters are excluded.

1.2 REFERENCE

- .1 Comply with the requirements of the latest editions of the following:
 - .1 CSA C22.2 No. 130, Requirements for Electrical Resistance Heating Cables and Heating Device Sets
 - .2 CSA C22.2 No. 46, Electric Air Heaters
 - .3 CSA C22.2 No. 72, Heater Elements
 - .4 CAN/CSA C273.4, Performance Requirements for Electric Heating Line-Voltage Wall Thermostats
 - .5 CAN/CSA C828, Performance Requirements for Thermostats Used with Individual Room Electric Space Heating Devices

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements.
- .2 Product Data: dimensions, mounting methods, characteristics, performance criteria, materials, accessories, mechanical and electrical data, product characteristics and limitations.
- .3 Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.
- .4 Submit color/finish chart for all lighting fixtures for final selection/approval.

1.4 QUALIFICATIONS

- .1 Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

Part 2 Products

2.1 ELECTRIC CEILING RADIANT HEATING PANELS

- .1 Assembly: ULC listed and labeled assembly with terminal box, covers, controls and all mounting accessories.

- .2 Refer to drawings for size & wattage/voltage.
- .3 Heating Elements: encapsulated cassette element.
- .4 22 (& 24) gauge galvanized steel panel. Minimum 1 inch, 1-pound density, high temperature fiberglass insulation. Crystalline surface.
- .5 Finish: white.
- .6 Provide line voltage wall mounted thermostat to control heating panel. Thermostat shall be programmable electronic thermostat, white finish. Temperature range: 0 - 30°C. Resolution and precision: 0.5°C. Digital display of ambient and set point temperature. temperature setting recorded permanently; 4-settings per week, and 4-setings per weekend. Switching rating: 20A, 2-pole, 240V.
- .7 Qmark #CP series or equal.

Part 3 Execution

3.1 INSTALLATION OF HEATERS

- .1 For recessed units, verify recess dimensions are correct size.
- .2 Verify wall construction is ready for installation.
- .3 Verify concealed blocking and supports are in place and connections are correctly located.
- .4 Install the electric heaters in accordance with the manufacturer's instructions.
- .5 Use wire in electric heaters, which is specifically approved for electric heater use.
- .6 Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- .7 Protection: Provide finished cabinet units with protective covers during remainder of construction.
- .8 Unit Heaters: Provide at locations as indicated on Drawings. Coordinate to assure correct recess size for recessed units.
- .9 Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.
- .10 The installation shall be inspected by the manufacturer's approval for the completed installation.
- .11 Perform the heater tests to ensure that all heaters, fans and heating controls are operating properly. Submit the test reports.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Related Sections:
 - .1 Section 27 05 00 - Telecommunication Raceway Systems

1.2 WORK INCLUDED

- .1 Retain an approved P.A. System Contractor (supplier) to upgrade existing P.A. system as specified herein and as required on drawings.
- .2 Electrical Contractor and System Contractor shall also co-operate in every respect with each other.
- .3 The System Contractor shall meet with Owner's representative(s) throughout the project to ensure that all their requirements are met.
- .4 System contractor: RJ Winters, (905) 424-8804, Attn: Bob Winters.

1.3 REFERENCES

- .1 Comply with the latest edition of the following:
 - .1 EIA/TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces
 - .2 J-STD-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications
 - .3 EIA/TIA-568-B series, Commercial Building Telecommunication Cabling Standard and Subsequent Addendums and Revisions
 - .4 EIA/TIA-606-A, Administration Standard for Commercial telecommunications Infrastructure

1.4 SUBMITTALS

- .1 Shop drawings
 - .1 PA speakers
 - .2 Detailed data and specification cut-sheets

Part 2 Products

2.1 INTERIOR CEILING SPEAKERS

- .1 8" (203mm) dual cone 10 oz with max power handling of 20 watts.
- .2 4 watt multi-tap transformer, 12.75" square baffle.
- .3 95dB (1W/m) sensitivity. 80 to 12KHz frequency response.
- .4 Built-in 25/70 volt transformer.
- .5 Speakers shall be in a white steel, acoustically treated back box with fire-resistant ABS resin baffle and Rim.
- .6 Speakers shall be flush ceiling and flush wall mounted and shall be complete with TH20 back box and white finish coated grilled baffle.
- .7 Tortech #TT81070TS series.

2.2 P. A. CABLES

- .1 Speaker cabling shall be Grey FT6, 1 pair twisted, 18 AWG as specified by the equipment manufacturer. All speakers shall be looped as per zones and/or locations back to central equipment rack.

Part 3 Execution

3.1 INSTALLATION

- .1 All cabling shall be installed to conform to the requirements of the Canadian Electrical Code and applicable Provincial Codes. Cabling shall be sized in accordance with Class 2 requirements, but shall be protected from mechanical injury or other injurious conditions such as moisture, excessive heat or corrosive action in accordance with Class 1 requirements.

3.2 IDENTIFICATION

- .1 All cables shall be color coded and individually labeled with the speaker location, such as room number, exterior, etc.

3.3 TESTING

- .1 Test all cables for correct continuity and polarity.
- .2 All speakers must be tested. Sound level uniformity over the speakers shall be plus or minus 4dB in the 4kHz octave band throughout the entire coverage area.
- .3 The work will not be considered complete until the Owner is satisfied with the system operations, configurations, and the training of staff.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section of the Specifications is an integral part of the Contract Documents and shall be read accordingly.
- .2 Comply with Section of Electrical General Requirements.
- .3 Provide labour, materials, and equipment for modification, testing, and commissioning of existing fire alarm system as specified herein, indicated on drawings, add/or required otherwise. The system shall be left ready for continuous and efficient satisfactory operation.
- .4 Scope of work including:
 1. Remove and re-installed fire alarm devices.
 2. Replace fire alarm devices.
 3. Provide new fire alarm devices.

1.2 REFERENCES

- .1 Comply with the requirements of the latest edition of the following:
 - .1 CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems
 - .2 CAN/ULC-S525, Audible Signal Device for Fire Alarm Systems
 - .3 CAN/ULC-S526, Visual Signal Devices for Fire Alarm Systems
 - .4 CAN/ULC-S527, Control Units for Fire Alarm Systems
 - .5 CAN/ULC-S528, Manual Pull Stations for Fire Alarm Systems
 - .6 CAN/ULC-S529, Smoke Detectors for Fire Alarm Systems
 - .7 CAN/ULC-S530, Heat Actuated Fire Detectors for Fire Alarm Systems
 - .8 CAN/ULC-S531, Standard for Smoke Alarms
 - .9 CAN/ULC-S533, Egress Door Security and Releasing Devices
 - .10 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems
 - .11 CAN/ULC-S537, Standard for the Verification of Fire Alarm System Installations
 - .12 CAN/ULC-S541, Speakers for Fire Alarm Systems
 - .13 CAN/ULC-S553, Installation for Smoke Alarms

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section of Electrical General Requirements. Shop drawing shall include:
 - .1 Details for devices

- .2 Following completion of verification, and of acceptance of the installation by local fire department, submit the certification of the Fire Alarm system, together with detailed verification record sheets showing location of each device and all verification results.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person Certified in fire alarm system installations with 5-years documented experience.

Part 2 Products

2.1 SYSTEM DEVICES

- .1 Where required, new devices shall match existing.

2.2 WIRING

- .1 Install all new wiring in conduit.
- .2 Fire alarm system wiring shall be run in separate conduit.
- .3 Provide shielded wiring when recommended by the manufacturer's specifications.
- .4 Wires shall be CSA-FAS Type 105 copper conductor, 105°C rating, not less than 300V. Wiring shall be sized not less than requirement of Section 32-100 of the Electrical Safety Code, Class 1 or Class 2 circuits as required, with screw-terminal wiring connections.
- .5 Stranded conductors with more than 7 strands shall be bunched-tinned or terminated in compression connectors.

2.3 SPECIAL ENVIRONMENT

- .1 Devices shall be moisture-proof type, where located in moisture area. Devices shall be weather-proof where located outside.
- .2 Provide tamper proof wire guard where required.

Part 3 Execution

3.1 INSTALLATION

- .1 Install all equipment in accordance with CAN/ULC-S524 "Standard for the Installation of Fire Alarm Systems", the manufacturer's instructions, Ontario Building Code, Underwriter's Laboratory of Canada, Electrical Safety Code, these Documents and requirements of Local Authority Having Jurisdiction. This shall include appropriate settings for speaker transformer taps.
- .2 In the event that the information given in the Specification and/or shown on the Drawings is in conflict with the Code and/or the requirement of authorities having jurisdiction,

bring this to the attention of the Consultant, and do not proceed with the work until the matter is clarified.

3.2 TESTING AND CERTIFICATION

- .1 Conduct a complete inspection and test of all installed fire alarm devices including all components such as manual stations, signaling devices, heat detectors, smoke detectors, speakers, controls, etc.
- .2 Test and verify the system in conformance with latest version of CAN/ULC-S536 and CAN/ULC-S537, "Standard for the Verification of Fire Alarm System Installations".
- .3 All costs involved in the testing and certification shall be included in the Tender Price.

END OF SECTION