Project Manual for the

Construction of the

T. A. BLAKELOCK H.S. RENOVATIONS - PHASE 1

at

1160 Rebecca Street
Oakville, Ontario

for

The Halton District School Board
2050 Guelph Line
Burlington, Ontario

Project No.: 2215A

HDSB RFT # 23-065-01

Snyder

1 General

1.1 OWNER

.1 Owner for the Project is:

The Halton District School Board
2050 Guelph Line
Burlington, Ontario
L7R 3Z2

1.2 CONSULTANTS

.1 Document Responsibility: Refer to Section 00 01 10 - Table of Contents for indication of document responsibility. Abbreviations for entity responsible for document preparation are as indicated below in parentheses.

.2 The following firms comprise the Consultant team for the Project:

.1 Architect (A)

Snyder Architects, Inc.
100 Broadview Avenue, Suite 301
Toronto, Ontario
M4M 3H3
Telephone: 416.966.5444

.2 Structural Engineer (S)

Kalos Engineering Inc.
300 York Boulevard
Hamilton, Ontario
L8R 3K6
Telephone: 905.333.9119

.3 Mechanical Engineer (M)

EXP Services, Inc.
1266 South Service Road, Unit C1-1
Stoney Creek, Ontario
L8E 5R9
Telephone: 905.573.4000

.4 Electrical Engineer (E)

EXP Services, Inc.
1266 South Service Road, Unit C1-1
Stoney Creek, Ontario
L8E 5R9
Telephone: 905.573.4000

.5 Designated Substance Abatement Consultant (DS)

Arcadis Canada Inc.
121 Granton Drive, Suite 12
Richmond Hill, Ontario
L4B 3N4
Telephone: 905.764.9380

END OF DOCUMENT

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1 Invitation

1.1 BID CALL

.1 Offers will be received electronically through the designated e-procurement services provider at:
https://snyderarchitects.bidsandtenders.ca.

.2 Offers to perform Contract C00 - Contractor will be received by Owner before 3:00:00 pm local time on the 6th day of April, 2023 (hereinafter referred to as 'bid closing time').

.3 Offers to perform Subcontracts will be received by Owner before 3:00:00 pm local time on the 6th day of April, 2023 (hereinafter referred to as 'bid closing time').

.4 The official bid closing time will be determined by the e-procurement services provider's web clock.

.5 Bids cannot be submitted after the specified bid closing time.

.6 Owner reserves the right to extend the bid closing time or cancel the bid call by addendum.

.7 Bids are by invitation only from a list of preselected Bidders. Bids received from unsolicited bidders will not be considered by Owner.

.8 Bidders must have an active bidding system vendor account and be registered as a plan taker with the designated e-procurement services provider for this bid opportunity, which will enable the Bidder to:
.1 Download Bid Documents,
.2 Receive email notifications,
.3 Download addenda, and
.4 Submit a bid electronically.

.9 To ensure receipt of latest information and updates via email regarding this Bid, or if a Bidder has obtained Bid Documents from a third party, it remains Bidder's responsibility to create a bidding system vendor account and register as a plan taker with the designated e-procurement services provider for this bid opportunity.

.10 Bids will not be opened publicly with Bidders present.

.11 Bid results will be disclosed promptly to all Bidders. Such disclosure will not imply that the bids received are compliant or that a contract will be awarded to the lowest or any Bidder.

1.2 INTENT

.1 The intent of this bid call is to obtain offers to perform identified portions of the Work to complete construction of the Construction of the T. A. BLAKELOCK H.S. RENOVATIONS - PHASE 1 located at 1160 Rebecca Street, Oakville, Ontario.

.2 Contract C00 is identified as a CCDC 3 Cost Plus a Fee Contract based on the Contract Documents.

.3 Subcontracts are identified as CCA 1 Stipulated Sum Subcontracts. Successful Subcontractors will enter into written agreements with successful Contractor holding Contract C00, based on Contract Documents.

1.3 CONTRACT DOCUMENTS IDENTIFICATION

.1 Contract Documents are identified as Project No.: 2215A as prepared by Consultant, Snyder Architects, Inc. located at 100 Broadview Avenue, Suite 301, Toronto, Ontario.

1.4 BID DOCUMENT AVAILABILITY

.1 Bid Documents are only available to registered plan takers in electronic form from the designated e-procurement services provider.

.2 Bid Documents are made available only for the purpose of obtaining offers for this Project. It does not confer a license to use the Bid Documents for any other purpose.

1.5 EXAMINATION OF BID DOCUMENTS

.1 Examine Bid Documents and promptly notify Consultant of any perceived errors, omissions, conflicts or discrepancies in Bid Documents.

1.6 SITE EXAMINATION

.1 Bidders shall visit Place of the Work and familiarize themselves with conditions affecting the Work before submitting a bid.

.2 Bidders' only opportunity to visit Place of the Work will be in conjunction with the specified pre-bid site meeting and site visit.

.3 Bidders visiting Place of the Work will be required to obtain a visitor badge. Upon completion of visit, sign out and return visitor badge to Owner.

.4 Bidders visiting Place of the Work shall provide their own personal protective equipment.

.5 Bidders visiting Place of the Work will be required to be accompanied at all times by a representative of Owner.

.6 Refer to Section 00 31 00 - Available Project Information which identifies available information pertaining to the Project.

.7 In accordance with General Conditions of the Contract, Bidders will include in their bid price for non-concealed and known conditions that are either visible or can be reasonably inferred from a site examination at Place of the Work and a review of available project information before bid submission.

1.7 PRE-BID MEETING AND SITE VISIT

.1 A pre-bid meeting and site visit at Place of the Work has been scheduled for 3:30 pm local time on March 20, 2023.

.2 Attendance by Contract C00 - Contractor Bidders is mandatory.

.3 Bidders will be required to sign an attendance sheet during the meeting. Failure of a Bidder's representative to attend and sign the attendance sheet will cause the bid to be rejected as non-compliant.

.4 Issues arising from the pre-bid meeting and site visit will be addressed as required in an addendum to the Bid Documents. No meeting minutes will be issued. Bidders may not rely upon any information given verbally or otherwise at the pre-bid meeting and site visit and that is not confirmed by addendum.

1.8 BID FORM SUPPLEMENTS

.1 Submit the following Bid Form Supplements together with the Bid Form:
  .1 All Bidders: WSIB Certificate.
  .2 C00 - Contractor Bidders: Consent of Surety Form.
  .3 Subcontract Bidders: List of Sub-subcontractors (as applicable).

.2 Owner may, after bid closing time and before contract award, require any Bidder to submit additional supplementary information about any aspect of the Bidder's bid to verify compliance with the Bid Documents.

1.9 CONTRACT SECURITY

.1 C00 - Contractor must submit with their bid a Consent of Surety, stating a reputable Canadian surety company is willing to issue contract security in accordance with Contract Documents.

.2 Include cost of Consent of Surety in bid price.

1.10 TAXES

.1 Include in bid price all taxes and customs duties in effect at the time of bid closing, except for Value Added Taxes as defined in the Contract.

1.11 WORKPLACE SAFETY & INSURANCE BOARD CERTIFICATE

.1 Submit a signed certificate from Workplace Safety & Insurance Board (WSIB), confirming that, at the date of the certificate, the Bidder maintains an account with WSIB, and is in good standing.

1.12 CONTRACT TIME

.1 The Bidder, in submitting a bid, agrees to attain Substantial Performance of the Work by the date specified in Section 01 12 00, which will become the Contract Time under the Contract.

1.13 SUBSTITUTIONS

.1 Where the Bid Documents specify particular Products by proprietary name, Consultant will consider Bidder requests for approval of substitutions during the bid period, as long as such requests are received, in writing, at least 7 days before the bid closing time and are in accordance with the requirements specified in Section 01 25 00 - Substitution Procedures. If Consultant accepts a substitution, the substitute Product will be named in an addendum. Otherwise Bidders shall consider the request for approval of the substitution to be rejected.

1.14 SUB-SUBCONTRACTORS

.1 Refer to CCDC 3, GC 3.8 - Subcontractor and Supplier; and CCA 1, SCC 3.4 - Sub-subcontractors.

.2 Indicating Sub-subcontractors as "OWN FORCES" is not considered acceptable and may be rejected by Owner, unless the Bidder can adequately prove they have sufficiently trained personnel and experience to undertake those portions of the Work.

.3 Owner reserves the right to reject a proposed Sub-subcontractor for reasonable cause. Upon such rejection, bidder will be required to propose an alternate Sub-subcontractor with a resulting change to submitted Bid Price. This change can effect the status of low bid, and may result in a different bid becoming low.

1.15 BID FORM SIGNING

.1 Electronic signatures for signing of requested documents are considered acceptable.

.2 Acceptable forms of electronic signature include, but are not limited to, typing of the bidder's authorized signing officer's name or inclusion of a graphic image of the bidder's authorized signing officer's signature, so long as the electronic signature is sufficient to identify the bidder's authorized signing officer.

.3 The bidder's authorized signing officer agrees that whatever form of electronic signature is used constitutes a signature for the purpose of executing requested documents.

1.16 BID SUBMISSION

.1 Bids will be received in electronic form only. Submit bid in compliance with the rules and procedures established by the designated e-procurement services provider.

.2 Verbal, telephone, fax, e-mail or text message bids will not be accepted or acknowledged.

.3 Bidders wishing to submit prices for more than one Contract or Subcontract may do so separately, in accordance with the rules and procedures described above. Do not combine information pertaining to multiple Contracts or Subcontracts in a single bid submission.

.4 Subcontract bids must include the appropriate reference to Subcontract number and title. Refer to Section 01 12 00 for summary of Subcontract numbers and titles.

1.17 BID MODIFICATION AND WITHDRAWAL

.1 Bidders shall comply with procedures for electronic bid modification and withdrawal established by the designated e-procurement services provider.

.2 If a bid is withdrawn, a new bid may be submitted in accordance with specified bidding requirements, as long as it is received before the bid closing time.

.3 Owner assumes no responsibility or liability for modifications or withdrawals that are, for any reason, delayed, illegible, unclear as to intent, ambiguous, contrary to these instructions, or otherwise improperly received. Owner may disregard improperly received modifications or withdrawals.

1.18 BIDDING IRREGULARITIES

.1 Bidders are cautioned that the timing of Bid submission is based on when their bid is received by the e-procurement services provider, and not when their Bid is submitted by bidder. Bid transmission can be delayed in an 'internet traffic jam' due to file transfer size, transmission speed and other electronic considerations. It is recommended that bidders allow sufficient time to upload their Bid with required attachments and to resolve any issues that may arise before bid closing time.

.2 The e-procurement services provider will send a confirmation email to bidder advising their Bid was submitted successfully. In the event a confirmation email is not received, bidder is urged to contact the designated e-procurement services provider's technical support department via email at:
support@bidsandtenders.ca.

.3 Bids with Bid Forms or required Bid Form Supplements that are improperly prepared, signed or submitted contrary to these Instructions to Bidders, or that contain added conditions or other irregularities of any kind, may, at Owner's discretion, be rejected as non-compliant.

.4 Owner may accept or waive a minor and inconsequential irregularity. The determination of what is, or is not, a minor and inconsequential irregularity, the determination of whether or not to accept or waive such an irregularity, and the final determination of whether the bid is compliant, will be at Owner's sole discretion.

.5 The following irregularities relate to what are considered mandatory bidding requirements. These will not be considered minor and inconsequential and will cause the bid to be rejected as non-compliant:
.1 Bid or Bid Form Supplement is received after the specified bid closing time.
.2 Required Bid Form or Bid Form Supplement is missing.
.3 Bid Form or Bid Form Supplement is not in the form provided or required.
.4 Bid price is illegible, ambiguous or unclear.
.5 One or more conditions are added to or submitted with the bid, the effect of which is a material modification of the Bid Documents.

.6 Failure to indicate in the Bid Form the addendum number(s) of all addenda received.
.7 Failure to comply with any other bidding requirement expressly characterized as mandatory elsewhere in the Bid Documents.

1.19 BID ACCEPTANCE PERIOD

.1 Bids shall remain open to acceptance by Owner and shall be irrevocable until another Bidder enters into a contract with Owner for performance of the Work or until expiry of the bid acceptance period stated in the Bid Form, whichever occurs first.

.2 After bid closing and before expiry of the bid acceptance period stated in the Bid Form, Owner may request all Bidders to agree to an extension of the originally specified bid acceptance period. In such case the bid acceptance period will be extended subject to the Bidder, whose bid the Owner wishes to accept, having agreed in writing to the extension.

1.20 BID ACCEPTANCE

.1 The lowest or any bid will not necessarily be accepted and Owner may reject any and all bids.

.2 Owner may award Contract C00 - Contractor and Subcontract SC01 - General to same Bidder. In this instance, lowest bidder will be determined by the aggregate sum of Contractor's Fee identified for Contract C00 and Subcontract Price for Subcontract SC01.

.3 The Contract will be established if and when the successful Bidder receives from Owner a written notification accepting the bid without any conditions. If Owner's written notification accepting the bid contains, or is subject to, any conditions, the Contract will be established if and when the Bidder accepts all such conditions in writing or when the parties execute the agreement.

.4 If the lowest compliant bid exceeds Owner's budget, and Owner is unwilling or unable to award a contract at the bid price, Owner may:
.1 Negotiate, with lowest compliant Bidder only, changes to the Bid Documents and a reduced bid price acceptable to Owner, or
.2 Invite the three lowest compliant Bidders to re-bid on modified Bid Documents under a new bid call.

1.21 INTERPRETATION AND MODIFICATION OF BID DOCUMENTS

.1 If an inquiry requires an interpretation or modification of the Bid Documents, the response to that inquiry will be issued in the form of a written addendum only, to ensure that all Bidders base their bids on the same information.

.2 Replies to inquiries or interpretations or modifications of the Bid Documents made by e-mail, verbally, or in any manner other than a written addendum, will not form part of the Bid Documents and will not be binding.

1.22 ADDENDA

.1 Addenda may be issued to modify the Bid Documents in response to inquiries or as may be considered necessary.

.2 Addenda issued during the bid period will become part of the Bid Documents.

.3 No addenda will be issued later than two Working Days before the bid closing time.

.4 Each Bidder shall ascertain before bid submission that it has received all addenda issued during the bid period. Bidders must acknowledge receipt of each addendum by checking a box for each addendum and any applicable attachments issued before they can submit their Bid.

1.23 INQUIRIES

.1 Inquiries must be submitted through the e-procurement services provider by selecting the "SUBMIT QUESTION" button.

.2 Submit inquiries as early as possible in the bid period and not less than 7 Working Days before the bid closing time. Inquiries received after this time may not receive a response.

END OF DOCUMENT

1 General

1.1 STATUS OF AVAILABLE PROJECT INFORMATION

.1 Available Project information means information of any type and in any form that is expressly identified as available project information relevant to Place of the Work, that have been prepared by third-parties, and are intended strictly as additional information for consideration by Bidders.

.2 No available Project information forms part of Contract Documents unless copied or transcribed into Drawings or Specifications, or is expressly listed in the agreement as a Contract Document.

1.2 USE AND RELIANCE UPON AVAILABLE PROJECT INFORMATION

.1 Available Project information is made available to Bidders to fulfill Owner's duty to disclose all relevant Project information to Bidders.

.2 Bidders shall interpret and draw their own conclusions about available Project information, including consideration of the time when it was created. Available Project information may be time sensitive. Owner and Consultant assume no responsibility for such interpretations and conclusions.

.3 Available Project information, or any part thereof, shall not be construed as contract requirements unless also reflected in Drawings or Specifications, and in case of conflict, Drawings or Specifications shall govern.

.4 Bidders, acting reasonably, may rely on available Project information in preparing their bids, subject to any qualifications stated in such available Project information and unless expressly stated otherwise.

.5 Bidders are cautioned that such documents, by their nature, cannot reveal all conditions that exist or can occur at Place of the Work.

.6 Should conditions at Place of the Work, in Consultant's opinion, be found to substantially vary from those identified in available Project information, then changes in the Work may need to be made, with appropriate adjustments being made to Contract Price and Contract Time.

.7 Direct questions pertaining to available Project information by contacting issuing organization.

1.3 DESIGNATED SUBSTANCE SURVEYS AND AUDITS

.1 A copy of a designated substance audit report with respect to Place of the Work is being made available as part of Bid Documents; described as follows:
Titled: Pre-Renovation Designated Substances and Hazardous Materials Survey, Thomas A. Blakelock High School, 1160 Rebecca Street, Oakville, Ontario;
Ref. No.: 30167489;
Dated: February 8, 2023;
Prepared by: Arcadis.

.2 Such reports identify locations and types of designated substances found to be present at Place of the Work, and may include recommendations for their safe removal and disposal.

.3 Conditions at Place of the Work identified in the report are relevant only at time of survey.

.4 The condition of some building materials may have changed.

.5 Items discovered during execution of the Work that are not itemized within the report should be analytically tested by an accredited laboratory before further disturbance.

1.4 DOCUMENTS DESCRIBING EXISTING FACILITY

.1 Documents describing existing facility and Place of the Work are being made available as part of Bid Documents; as described on the Cover Sheet of the Drawings.

.2 These documents were prepared by others and neither Owner nor Consultant take responsibility for the accuracy of information, nor verify they represent actual conditions at Place of the Work.

END OF SECTION

1 General

1.1 AGREEMENT

.1 CCDC 3-2016 Cost Plus Contract, as amended below, forms the basis of Agreement between Owner and Contractor.

1.2 AMENDMENTS TO THE AGREEMENT

.1 Article A-4 - Cost of the Work
.1 Delete Paragraph A-4.1 in its entirety and replace with the following: *"The Cost of the Work, which excludes Value Added Taxes, shall be comprised of the stipulated sum costs of subsequently awarded Subcontracts, as nominated by the Owner, and the following:*
.1 deposits lost;
.2 the costs to the Contractor that result from any Subcontractor's or Supplier's insolvency or failure to perform;
.3 royalties, patent license fees and damages for infringement of patents and cost of defending suits therefor subject always to the Contractor's obligations to indemnify the Owner as provided in paragraph 10.3.1 of GC 10.3 - PATENT FEES;
.4 losses and expenses sustained by the Contractor for matters which are the subject of insurance under the policies prescribed in GC 11.1 - INSURANCE when such losses and expenses are not recoverable because the amounts are in excess of collectible amounts or within the deductible amounts;
.5 legal costs, incurred by the Contractor, in relation to the performance of the Work provided that they are not caused by negligent acts or omissions of the Contractor and the Work is performed in accordance with the Contract Documents; and
.6 the cost of auditing when requested by the Owner.
Notwithstanding the foregoing and any provisions contained in the General Conditions of the Contract, it is the intention of the parties that the Cost of the Work referred to herein shall cover and include any and all contingencies other than those which are the result of or occasioned by any failure on the part of the Contractor to exercise reasonable care and diligence in the Contractor's attention to the Work. Any cost due to failure on the part of the Contractor to exercise reasonable care and diligence in the Contractor's attention to the Work shall be borne by the Contractor."

.2 Article A-5 - Contractor’s Fee
.1 Delete Paragraph A-5.1.1 in its entirety.

.3 Article A-7 - Options
.1 Delete Paragraph A-7.2 in its entirety.
.2 Delete Paragraph A-7.3 in its entirety.

.4 Article A-8 - Payment
.1 Revise Subparagraph A-8.1.1 to insert the phrase *"... make progress payments to Contractor subject to GC 5.4 - Progress Payment...".*

END OF DOCUMENT

1 General

1.1 AGREEMENT

.1 CCA 1-2008 Stipulated Price Subcontract, as amended below, forms the basis of Agreement between Contractor and Subcontractor.

1.2 AMENDMENTS TO THE AGREEMENT

.1 Delete Article 1B in its entirety.

.2 Delete Article 2B in its entirety.

.3 Delete Article 3B in its entirety.

.4 Article 5 - SUBCONTRACT PRICE, delete Paragraph 5.5 in its entirety.

.5 Article 6 - PAYMENT, Paragraph 6.2, Third Sentence; revise to read as follows: *"The Contractor shall pay the Subcontractor, in accordance with the payment procedures required by the Contract Documents, no later than thirty (30) days after the date of the Consultant's certificate of payment, 90 percent of the amount applied for or such other amount as the Consultant determines to be properly due."*

.6 Article 6 - PAYMENT, Paragraph 6.4; revise to read as follows: *"... and for which the Contractor or Owner might in any way be held responsible ..."*

.7 Article 6 - PAYMENT, Paragraph 6.4; delete Subparagraph 6.4.2 in its entirety.

END OF DOCUMENT

1 General

1.1 AGREEMENT

.1 CCDC 3-2016 Cost Plus Contract, includes Definitions of specific words and terms.

1.2 SUPPLEMENTARY DEFINITIONS

.1 Amend the Definition of Contract Documents by inserting the words "*in writing*" after the words "*agreed upon*".

.2 Amend the Definition of Contractor's Fee by adding the following: *"... and including amounts for all overhead and profit, bond and insurance premiums, and any costs for labour and Products required by the Contractor to undertake portions of the Work identified in the Contract Documents and not included in an Owner-nominated Subcontract."*

.3 Delete the Definition of Guaranteed Maximum Price ("GMP") in its entirety.

.4 Delete the Definition of Target Contract Price in its entirety.

.5 Add a new Definition for Bid Documents, as follows: *"The Bid Documents shall consist of the Contract Documents, Instructions to Bidders, Bid Form and other available project information issued for the benefit of Bidders."*

END OF DOCUMENT

1 General

1.1 AGREEMENT

.1 CCA 1-2008 Stipulated Price Subcontract includes the Definitions of specific words and terms.

1.2 SUPPLEMENTARY SUBCONTRACT DEFINITIONS

.1 Add a new Definition for Bid Documents, as follows: *"The Bid Documents shall consist of the Contract Documents, Instructions to Bidders, Bid Form, and other available project information issued for the benefit of bidders."*

END OF DOCUMENT

1 General

1.1 GENERAL CONDITIONS

.1 CCDC 3-2016, The General Conditions of the Cost Plus Contract is the General Conditions between Owner and Contractor.

1.2 SUPPLEMENTARY CONDITIONS

.1 Refer to Supplementary Conditions for amendments and supplements to General Conditions.

.2 Where a General Condition of the Contract or a paragraph of the General Conditions of the Contract is deleted by Supplementary Condition, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

END OF DOCUMENT

1 General

1.1 SUBCONTRACT CONDITIONS

.1 CCA 1-2008, The Subcontract Conditions of the Stipulated Price Subcontract are the Subcontract Conditions between Contractor and Subcontractors.

1.2 SUPPLEMENTARY SUBCONTRACT CONDITIONS

.1 Refer to Supplementary Subcontract Conditions for amendments and supplements to Subcontract Conditions.

.2 Where a Subcontract Condition of the Contract or a paragraph of the Subcontract Conditions of the Contract is deleted by Supplementary Subcontract Condition, the numbering of the remaining Subcontract Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

END OF DOCUMENT

1 Supplements to General Conditions

1.1 GC 1.1 - CONTRACT DOCUMENTS

.1 Delete Paragraph 1.1.8 and replace with the following: *"The Contractor will be given one electronic-copy set of the Contract Documents without charge. The Contractor may produce as many hard-copy sets of the Contract Documents from the electronic-copy as they deem necessary to undertake the Work, at their own expense."*

.2 Add new Paragraph 1.1.11 as follows: *"The location of fixtures, outlets, conduit, piping and any other locations shown or specified but not dimensioned shall be considered approximate. The actual location shall be as approved by the Consultant and as required to suit job conditions."*

1.2 GC 2.2 - ROLE OF THE CONSULTANT

.1 Add new Subparagraph 2.2.7.1 as follows: *"Verbal instructions, regardless of the source, will not be binding on the parties to the Contract, unless otherwise confirmed in writing by the Owner or the Consultant ."*

1.3 GC 2.4 - DEFECTIVE WORK

.1 Add new Paragraph 2.4.3 as follows: *"Where defective work or work not performed as provided in the Contract Documents is the responsibility of a Subcontractor or Supplier, the Contractor shall require the responsible Subcontractor or Supplier to Make Good the defective work or work not performed as provided in the Contract Documents so as to conform with the Contract Documents."*

1.4 GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

.1 Delete Paragraph 3.2.2 in its entirety.

.2 Add new Subparagraph 3.2.2.5 as follows: *"Notify the Contractor no later than 2 Working Days prior to any other contractor or their own forces being on site. The Contractor will make all necessary arrangements to accommodate access and maintain compliance with applicable health and construction safety legislation at the Place of the Work"*.

.3 Revise Subparagraph 3.2.3.4 to read as follows: *"Assume overall responsibility for the separate contractors and Owner's own forces and for compliance with applicable health and construction safety legislation at the Place of the Work"*.

1.5 GC 3.5 - CONSTRUCTION SCHEDULE

.1 Add new Paragraph 3.5.2 as follows: *"Where portions of the Work are performed by Subcontractors or Suppliers, the Contractor shall coordinate with, and arrange for the Subcontractors and Suppliers to provide detailed construction schedules for their portion of the Work, to be submitted along with the construction schedule described herein."*

.2 Add new Paragraph 3.5.3 as follows: *"No change in Contract Time resulting from a change in the Work will be accepted, if, in the Consultant's opinion, such change in the Work can reasonably be accommodated within the approved schedule."*

.3 Amend Paragraph 3.5.1.1 by deleting the phrase *"... the first application for payment ..."* and replacing it with *"... commencing the work ..."*.

1.6 GC 3.7 - SUBCONTRACTORS AND SUPPLIERS

.1 Revise Subparagraph 3.7.1.1 to read as follows: *"enter into contracts or written agreements with Subcontractors or Suppliers, including those nominated by the Owner, to require them to perform their work as provided in the Contract Documents;*

.1 The Consultant will prepare the written agreements between the Contractor and each Subcontractor or Supplier, based upon a modified CCA 1-2008, Stipulated Price Subcontract, similar in content and intent of this Contract."

.2 Add new Subparagraph 3.7.1.4 as follows: *"immediately notify the Consultant of any acts or omissions of Subcontractors or Suppliers and of persons directly or indirectly employed by them."*

.3 Add new Subparagraph 3.7.2.1 as follows: *"The Contractor shall not change or terminate Subcontractors or Suppliers without the prior written permission of the Owner."*

.4 Add new Paragraph 3.7.6 as follows: *"The Owner may direct the Contractor to terminate the contract of a Subcontractor or Supplier and the Owner shall nominate a replacement Subcontractor or Supplier to complete that part or portion of the Work. The Contractor shall enter into a contract with the nominated Subcontractor or Supplier for the completion of that portion of the Work. In the event of such an instance, the Contract Time and the Contractor's Fee is to be adjusted by an appropriate amount. The Contractor may reasonably refuse to terminate the contract of a Subcontractor or Supplier if to comply with the Owner's direction would result in a breach of any of the Contractor's obligations under GC 9.4 - CONSTRUCTION SAFETY."*

.5 Add new Paragraph 3.7.7 as follows: *"The Contractor shall involve the Consultant in any communications with the Subcontractors or Suppliers related to GC 3.5 - CONSTRUCTION SCHEDULE and PART 6 - CHANGES IN THE WORK. The Consultant may discuss issues directly with the Subcontractors and Suppliers related to GC 3.5 - CONSTRUCTION SCHEDULE and PART 6 - CHANGES IN THE WORK , however, the Consultant shall not direct or supervise the Work."*

.6 Add new Paragraph 3.7.8 as follows: *"The Contractor shall enter into contracts or written agreements with Subcontractors for the Subcontracts identified in the Contract Documents. Such Subcontractors may be union or non-union affiliated. The Contractor shall not be party to any agreement that would prevent them from entering into such Subcontracts."*

1.7 GC 3.8 - LABOUR AND PRODUCTS

.1 Add new Paragraph 3.8.3 as follows: *"The Contractor will cooperate with the Owner to avoid labour complications and will employ workers whose presence and work will be acceptable to, and be in harmony with, other workers employed on the Work, and under conditions satisfactory to the Owner. In the event of labour difficulties resulting from the employment of workers by the Contractor or by the presence of the Contractor on the Project, the Contractor will make any necessary arrangements as required by the Owner in order to prevent delays and additional expense to the Owner."*

.2 Add new Paragraph 3.8.4 as follows: *"The Contractor is responsible for the safe on-site storage of Products and their protection (including Products supplied by the Owner) in such a way to avoid dangerous conditions or contamination to the Products or other person or property."*

1.8 GC 4.1 - CASH ALLOWANCES

.1 Delete Paragraph 4.1.1 in its entirety.

.2 Revise Paragraph 4.1.6 by deleting the phrase *"... and the Guaranteed Maximum Price ...".*

.3 Add new Paragraph 4.1.8 as follows: *"Unexpended Cash Allowances will be deducted from the Contract Price."*

1.9 GC 5.2 - ACCOUNTING AND AUDIT

.1 Revise Paragraph 5.2.1 by replacing the phrase "... Cost of the Work as in accordance with Article A-3 - CONTRACT DOCUMENTS." with *"... payments under the Contract."*

.2 Revise Paragraph 5.2.2 by replacing the phrase "... Cost of the Work ..." with *"... payments under the Contract ..."*.

1.10 GC 5.3 - APPLICATIONS FOR PROGRESS PAYMENT

.1 Revise Paragraph 5.3.1 to read as follows: *"The Contractor shall make monthly applications for payment on account as provided in Article A-8 of the Agreement - PAYMENT as the Work progresses."*

1.11 GC 5.4 - PROGRESS PAYMENT

.1 Revise Subparagraph 5.4.1.3 to read as follows: *"The Owner shall make payment to the Contractor on account as provided in Article A-8 of the Agreement - PAYMENT no later than fourteen calendar days after the date of a certificate for payment by the Consultant."*

.2 Add a new Paragraph 5.4.2 as follows: *"The Contractor shall make payments to the Subcontractors and Suppliers in the amounts certified as payable by the Consultant, no later than twenty calendar days after the date of the certificate for payment."*

1.12 GC 5.5 - SUBSTANTIAL PERFORMANCE OF THE WORK

.1 Add new Paragraph 5.5.4 as follows: *"The Contractor's application for a Certificate of Substantial Performance of the Work shall, without limiting the foregoing, include the following:*

.1 A written statement to the Owner and the Consultant stating that:
.1 The Contract is substantially performed,
.2 The performance of the balance of the Contract is in process, and identifying the date when this Work will be completed. Where portions of the Contract can not be completed forthwith for reasons beyond the Contractor's control, the Contractor shall indicate completion dates for each outstanding portion of the Work."

.2 A statement showing the amount of holdback monies due for release and payment following the issue of the Certificate of Substantial Performance of the Work.

.3 A statement of completion with the cost value of:
.1 the portion of the Work to be completed, including any defective work or work not performed as provided in the Contract Documents.
.2 portions of the Work which can not be performed for reasons beyond the control of the Contractor.

.4 The submission of all data, operating instructions, maintenance manuals, record drawings, spare parts and materials, evidence of all tests, instructions to Owner's representatives, warranties and any other such documents to enable the Owner to operate and maintain the Project."

.2 Add new Paragraph 5.5.5 as follows: *"When making an application for Substantial Performance of the Work, the Contractor shall submit to the Consultant all specified warranties, bonds, maintenance manuals, records, certificates and a Statutory Declaration in a form acceptable to the Consultant, signed by the Contractor, stating that all material, work and services in connection with the Contract have been paid in full, up to the holdback, and that no liens exist, including a receipt from each Subcontractor and Supplier, stating that it has been paid in full up to the holdback for all services and materials supplied in connection with this Contract, and such other statements as the Owner and Consultant may require."*

1.13 GC 5.8 - FINAL PAYMENT

.1 Revise Paragraph 5.8.4 by replacing the words *"... five calendar days ..."* to read *"... fourteen calendar days ..."*.

.2 Add new Paragraph 5.8.5 as follows: *"Subject to the lien legislation applicable to the Place of the Work, the Contractor shall make payments to the Subcontractors and Suppliers in the amounts certified as payable by the Consultant, no later than twenty calendar days after the date of the certificate for payment."*

1.14 GC 6.2 - CHANGE ORDER

.1 Revise Paragraph 6.2.1 by deleting the phrase *"... GMP or the Target Contract Price; ..."* and replacing it with *"... Contract Price; ..."*.

.2 Revise Paragraph 6.2.2 by deleting the phrase *"... GMP, Target Contract Price, ..."* and replacing it with *"... Contract Price ..."*.

.3 Add new Paragraph 6.2.3 as follows: *"The value of a change to the Contractor's Fee shall be charged as a percentage of the actual increase to the Cost of the Work, as follows:*
.1 On additional work performed by the Contractor's own forces: 5 percent;
.2 On additional work performed by Owner-Nominated Subcontractors and Suppliers: 0 percent; and
.3 On additional work performed by Contractor-appointed Subcontractors and Suppliers: 5 percent."

1.15 GC 6.3 - CHANGE DIRECTIVE

.1 Revise paragraph 6.3.1 by deleting the phrase *"... in the GMP, in the Target Contract Price, ..."* and replacing it with *"... in the Contract Price, ..."*.

.1 Revise paragraph 6.3.7 by deleting the phrase *"... to the GMP, to the Target Contract Price, ..."* and replacing it with *"... to the Contract Price, ..."*.

.2 Add new Paragraph 6.3.8 as follows: *"The value of a change to the Contractor's Fee shall be charged as a percentage of the actual increase to the Cost of the Work, as follows:*
.1 On additional work performed by the Contractor's own forces: 5 percent;
.2 On additional work performed by Owner-Nominated Subcontractors and Suppliers: 0 percent; and
.3 On additional work performed by Contractor-appointed Subcontractors and Suppliers: 5 percent."

1.16 GC 7.2 - CONTRACTOR'S RIGHT TO TERMINATE CONTRACT

.1 Add new Paragraph 7.2.6 as follows: *"If the Contractor stops the Work or terminates the Contract as provided for in the preceding paragraphs, he shall ensure that the Place of the Work and the Work are left and maintained in a secure and safe condition as required by authorities having jurisdiction and these Contract Documents."*

1.17 GC 9.1 - PROTECTION OF WORK AND PROPERTY

.1 Add new Paragraph 9.1.5 as follows: *"Should there be a stoppage of the Work, for any cause, the Contractor shall assume all responsibility for protecting the Work and Provide and maintain security to the Work and the Place of the Work during such periods, with appropriate adjustments being made to the Contractor's Fee and Contract Time when it can be proven that the stoppage of the Work was not caused by any action or lack of action on the part of the Contractor."*

1.18 GC 9.4 - CONSTRUCTION SAFETY

.1 Amend Paragraph 9.4.1 by deleting the phrase *"Subject to paragraph 3.2.3.4 of GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS"*.

.2 Add new Paragraph 9.4.2 as follows: *"The Contractor shall comply and cause all of its Subcontractors and Suppliers to comply with all applicable provisions, requirements, and safety standards of the Ontario Occupational Health and Safety Act and regulations thereto. The Contractor shall be designated and hereby accepts the responsibilities and designation as "constructor" under the Occupational Health and Safety Act on the project and hereby assumes all liabilities and obligations imposed on a "constructor" by the Occupational Health and Safety Act"*.

.3 Add new Paragraph 9.4.3 as follows: *"Prior to commencement of the Work, the Contractor shall submit to the Owner:*
.1 Documentation of a valid Workplace Safety and Insurance Board clearance certificate and confirmation of the Contractor's WSIB CAD-7 performance rating.
.2 Documentation of the Contractor's insurance coverage.
.3 Documentation of the Contractor's safety-related programs for the Project.
.4 A copy of the Notice of Project filed with the Ministry of Labour."

.4 Add new Paragraph 9.4.4 as follows: *"The Contractor hereby represents and warrants to the Owner that appropriate health and safety instruction and training has been provided and will be provided to the Contractor's employees before the Work is commenced and agrees to provide to the Owner and Consultant satisfactory proof of such instruction and training. The Contractor further undertakes to verify that other contractors and the Owner's own forces have received appropriate health and safety instruction and training in accordance with GC 3.2."*

.5 Add new Subparagraph 9.4.4.1 as follows: *"The Contractor shall require proof from the Subcontractors and Suppliers that appropriate health and safety instruction and training has been provided to the Subcontractor's and Supplier's employees before the Work is commenced. This information will be kept on file at the site."*

.6 Add new Paragraph 9.4.5 as follows: *"The Contractor shall tour the appropriate area to familiarize itself with the job site prior to the commencement of the Work"*,

.7 Add new Paragraph 9.4.6 as follows: *"The Contractor shall never work in a manner that may endanger anyone"*.

.8 Add new Paragraph 9.4.7 as follows: *"The Contractor shall indemnify and save harmless the Owner, together with the Owner's agents, officers, directors, employees, consultants, successors and assigns, from and against any and all safety infractions under the Ontario Occupational Health and Safety Act*, *and regulations thereto including the payment of all legal fees on a solicitor and client basis."*

.9 Add new Paragraph 9.4.8 as follows: *"The Contractor shall ensure that its employees, Subcontractors and Suppliers comply with the foregoing conditions".*

1.19 GC 10.1 - TAXES AND DUTIES

.1 Add new Paragraph 10.1.2 as follows: *"With respect to taxes and duties, the Contractor shall, at the request of the Owner, assist, join in, or at the Owner's expense, make application on behalf of the Owner for any exemption, recovery or refund. The Contractor shall provide the Owner with copies, or, where required original of records, invoices, purchase orders or other documentation as may be necessary to support such application."*

.2 Add new Paragraph 10.1.3 as follows: *"Any amount included in the Contract or any Subcontract for tax or duty, whether or not paid, which is found to be inapplicable or for which a refund is obtained shall become the sole and exclusive property of the Owner."*

1.20 GC 10.2 - LAWS, NOTICES, PERMITS & FEES

.1 Add to Paragraph 10.2.2 as follows: *"The Contractor shall take all necessary steps to obtain the occupancy permit, including delivering any notice of completion of the building required by the authorities having jurisdiction."*

.2 Add new Paragraph 10.2.8 as follows: *"The Contractor's or its Subcontractor's or Supplier's compliance with statutes or regulations made thereunder or by-laws shall not relieve them of obligations set out in the Contract Documents which may be more extensive than the requirements of those statutes, regulations or by-laws."*

1.21 GC 11.1 - INSURANCE

.1 Delete Subparagraph 11.1.1.1 in its entirety and replace with the following: *"General liability insurance shall be in the joint names of the Contractor, the Owner, the Consultant, and any and all Subcontractors and subconsultants involved in the Work, with limits not less than $10,000,000 per occurrence and with a property damage deductible not exceeding $10,000. The insurance coverage shall include at least the following extensions: Premises, Property and Operations; Occurrence basis, Owners/Contractors protective, Products and Completed Operations; Blanket Contractual; Employees as Additional Insureds; Broad Form Property Damage; Broad Form Loss of Use; Personal Injury; Incidental Malpractice; Contingent Employers Liability; Cross Liability/Severability of Interests; Non-Owned Automobile Liability including Endorsement Form 96; Intentional Injury to protect persons or property, X-plate/unlicensed/specially licensed vehicles; Attached Machinery; Hostile fire exception to any pollution exclusion; Voluntary Medical Payments. To achieve the desired limit, umbrella or excess liability insurance may be used. All liability coverage shall be maintained for the completed operations hazard from the date of Substantial Performance of the Work, for 24 months following. The Policy shall be endorsed to provide the named insureds with not less than 30 days notice in writing in advance of any cancellation or change or amendment restricting coverage."*

.2 Delete Subparagraph 11.1.1.2 in its entirety.

.3 Delete Subparagraph 11.1.1.3 in its entirety.

.4 Delete Subparagraph 11.1.1.4 in its entirety.

.5 Delete Subparagraph 11.1.1.5 in its entirety.

.6 Delete Subparagraph 11.1.1.6 in its entirety.

.7 Delete Subparagraph 11.1.1.7 in its entirety.

.8 Add new Paragraph 11.1.7 as follows: *"Notwithstanding the fact that a claim has been made under any insurance policy described in GC 11.1, the Contractor shall continue to perform its obligations under the Contract ."*

1.22 GC 11.2 - CONTRACT SECURITY

.1 Add new Paragraph 11.2.3 as follows: *"The Contractor shall obtain and submit a Performance Bond in the name of the Owner for Fifty Percent (50%) of the Contract Price, to assure the faithful performance of the Contract, including corrections to the Work required under GC 12.3 - Warranty; on Ontario Construction Act Form 32, Performance Bond Under Section 85.1 of the Act."*

.2 Add new Paragraph 11.2.4 as follows: *"The Contractor shall also obtain and submit a Labour and Material Payment Bond in the name of the Owner for Fifty Percent (50%) of the Contract Price, to assume faithful payment of monies to parties in contract with the Contract; on Ontario Construction Act Form 31, Labour and Material Payment Bond Under Section 85.1 of the Act."*

1.23 GC 12.3 - WARRANTY

.1 Add new Paragraph 12.3.7 as follows: *"Should the Work be delayed due to conditions beyond the control of the Contractor, the warranty period shall commence at the time of acceptance of the Work by the Owner."*

.2 Add new Paragraph 12.3.8 as follows: "*Where warranty repairs on such parts or portions of the Work become necessary, the Consultant will notify the Contractor which Subcontractor or Supplier is responsible to rectify the defective work or work not performed as provided in the Contract Documents."*

END OF DOCUMENT

1 Supplements to Subcontract Conditions

1.1 SCC 1.1 - DOCUMENTS

.1 Delete Subparagraph 1.1.7.2 in its entirety.

.2 Revise Paragraph 1.1.8 as follows: *"The Consultant shall provide the Subcontractors, without charge, ..."*

.3 Add new Paragraph 1.1.9 as follows: *"The location of fixtures, outlets, conduit, piping and any other locations shown or specified but not dimensioned shall be considered approximate. The actual location shall be as approved by the Consultant and as required to suit job conditions."*

1.2 SCC 2.2 - REVIEW AND INSPECTION OF THE WORK

.1 Revise Paragraph 2.2.2 as follows: *"... the Subcontractor shall give the Contractor and Consultant timely notice requesting inspection."*

1.3 SCC 2.3 - DEFECTIVE WORK

.1 Revise Paragraph 2.3.1 as follows: *"The Subcontractor shall within 5 Working Days remove from the Place of the Work and Make Good defective work that has been rejected by the Contractor or Consultant as failing to conform to the Contract Documents ...".*

1.4 SCC 3.4 - SUB-SUBCONTRACTORS

.1 Revise Subparagraph 3.4.1.3 as follows: *"be as fully responsible to the Contractor, Owner and Consultant for acts and omissions of Sub-Subcontractors and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by the Subcontractor."*

.2 Revise Paragraph 3.4.6 as follows: *"The Contractor or Consultant may provide to a Sub-Subcontractor information as to the percentage ...".*

1.5 SCC 3.5 - SHOP DRAWINGS

.1 Revise Paragraph 3.5.2 as follows: *"The Consultant shall determine the number of copies of Shop Drawings ...the Subcontractor shall notify the Contractor and Consultant in writing of any deviations ...".*

1.6 SCC 3.7 - CUTTING AND REMEDIAL WORK

.1 Revise Paragraph 3.7.3 as follows: *"... nor alter the work of any others without the Contractor's and Consultant's written consent, where such member, existing work or other work is apparent from the Subcontract Documents, reasonable examination or instruction of the Consultant."*

.2 Add a new Paragraph 3.7.6 as follows: *"Each Subcontractor shall make allowances in his own work to accommodate other Subcontractor's work. The Contractor shall coordinate the cutting and remedial work amongst Subcontractors such that all pieces come together properly."*

1.7 SCC 4.1 - CASH ALLOWANCES

.1 Revise Paragraph 4.1.3 to read as follows: *"Expenditures under cash allowances shall be authorized by the Consultant."*

1.8 SCC 5.1 - APPLICATIONS FOR PAYMENT

.1 Revise Paragraph 5.1.2 as follows: *"The Subcontractor shall submit to the Contractor for the Consultant's approval before the first application ..."*

.2 Revise Paragraph 5.1.3 as follows: *"... supported by such evidence as the Consultant may reasonably direct and when accepted by the Contractor, with the approval of the Consultant, shall ..."*

.3 Add new Paragraph 5.1.6 as follows: *"Each application for payment must include the Subcontractor's GST Registration number."*

.4 Add new Paragraph 5.1.7 as follows: *"The Subcontractor shall submit with every application for payment, a "Certificate of Standing" from the Workplace Safety & Insurance Board (WSIB) stating that the Subcontractor has complied with the requirements of the Workers' Compensation Act and is in good standing as of the date of the Certificate."*

1.9 SCC 6.1 - CONTRACTOR'S RIGHT TO MAKE CHANGES

.1 Revise Paragraph 6.1.1 as follows: *"The Contractor, with the approval of the Consultant, and without invalidating the Subcontract, may make changes ...".*

.2 Add new Paragraph 6.1.3 as follows: *"The Subcontractor shall respond to requests for information pertaining to Changes within 10 Working Days of receipt of such requests."*

1.10 SCC 6.2 - CHANGE ORDER

.1 Revise Paragraph 6.2.2 as follows: *"When the Contractor, with the approval of the Consultant, and the Subcontractor agree ..."*

.2 Add new Paragraph 6.2.3 as follows: *"The value of a change shall be determined by actual credits and cost to the Subcontractor. Where additional work is required, the value of the change shall be the actual cost plus a percentage covering overhead and profit, after all credits included in the change have been deducted. The following percentage fee for overhead and profit shall be applied to additional work:*

.1 On work performed by the Subcontractor's own forces: the Subcontractor may charge a maximum of 5 percent combined percentage for overhead and profit;

.2 On work performed by Sub-Subcontractors, the Sub-Subcontractors may charge a maximum of 5 percent combined percentage for overhead and profit; and

.3 On work performed by Sub-Subcontractors, the Subcontractor may charge a maximum of 5 percent combined percentage for overhead and profit on work performed by the Sub-Subcontractors."

1.11 SCC 6.3 - CHANGE DIRECTIVE

.1 Revise Paragraph 6.3.1 as follows: Insert *"... prior to the Contractor receiving the approval of the Consultant..."*

.2 Revise Paragraph 6.3.6 as follows: *"The value of a change shall be determined by actual credits and cost to the Subcontractor. Where additional work is required, the value of he change shall be the actual cost plus a percentage covering overhead and profit, after all credits included in the change have been deducted. The following percentage fee for overhead and profit shall be applied to additional work:*

.1 On work performed by the Subcontractor's own forces: the Subcontractor may charge a maximum of 5 percent combined percentage for overhead and profit;

.2 On work performed by Sub-Subcontractors, the Sub-Subcontractors may charge a maximum of 5 percent combined percentage for overhead and profit; and

.3 On work performed by Sub-Subcontractors, the Subcontractor may charge a maximum of 5 percent combined percentage for overhead and profit on work performed by the Sub-Subcontractors."

.3 Revise Subparagraph 6.3.7.1 as follows: *"... under a salary or wage schedule approved by the Contractor and the Consultant, or in the absence ..."*

.4 Revise Paragraph 6.3.12 as follows: *"If the Contractor, does not have the approval of the Consultant or the Contractor and the Subcontractor do not agree ..."*.

.5 Revise Paragraph 6.3.13 as follows: *"When the Contractor, with the approval of the Consultant, and the Subcontractor reach an agreement on the adjustment to the Subcontract Price and to the Subcontract Time...."*

1.12 SCC 6.4 - CONCEALED OR UNKNOWN CONDITIONS

.1 Revise Paragraph 6.4.1 as follows: *"... shall notify the other party and the Consultant ..."*.

.2 Revise Paragraph 6.4.2 as follows: *"The Contractor and the Consultant will promptly investigate such conditions and the Consultant will make a finding.... "*

.3 Revise Paragraph 6.4.3 as follows: *"If the Consultant finds that the conditions ... are not materially different ... the Consultant shall report the reasons for his finding to the Contractor and Subcontractor in writing."*

1.13 SCC 6.5 - DELAYS

.1 Revise Paragraph 6.5.1 as follows: *"... then the Subcontract Time shall be extended for such reasonable time as the Contractor, with the approval of the Consultant and the Subcontractor shall agree that the Subcontract Work was delayed. The Subcontractor shall be reimbursed for reasonable costs incurred by the Subcontractor as a result of such delay."*

.2 Revise Paragraph 6.5.2 as follows: *"... then the Subcontract Time shall be extended for such reasonable time as the Contractor, with the approval of the Consultant and Subcontractor shall agree that the Subcontract Work was delayed. The Subcontractor shall be reimbursed for reasonable costs incurred by the Subcontractor as a result of such delay."*

.3 Revise Paragraph 6.5.4 as follows: *"... unless notice in writing of claim is given to the Contractor and Consultant not later than ..."*.

.4 Revise Paragraph 6.5.5 as follows: *"... no request for extension shall be made as a result of failure of the Contractor or Consultant to furnish instructions ..."*.

1.14 SCC 7.2 - SUBCONTRACTOR'S RIGHT TO STOP THE SUBCONTRACTS WORK OR TERMINATE THE SUBCONTRACTS

.1 Revise Paragraph 7.2.1 as follows "...*terminate the Subcontract and such notice shall be provided to the Consultant.*"

.2 Revise Paragraph 7.2.2 as follows: "...*terminate the Subcontract and such notice shall be provided to the Consultant."*

.3 Revise Paragraph 7.2.3 to read as follows: *"The Subcontractor may notify the Contractor in writing that the Contractor is in default of their contractual obligation if payment is not received as stated in Article 4 of the Subcontract Agreement - PAYMENT and the Subcontractor shall provide a copy of such notice to the Consultant"*

.4 Revise Paragraph 7.2.4 by deleting the phrase *"... to the Contractor ..."*. Add a new Sentence to read as follows: *"The Owner may remedy the Contractor's default and the Subcontractor agrees to continue to complete the Subcontract Work for the Owner or a new Contractor nominated by the Owner"*.

1.15 SCC 9.2 - TOXIC OR HAZARDOUS SUBSTANCES AND MATERIALS

.1 Revise the last sentence in Paragraph 9.2.2 as follows: *"The expert's report shall be delivered to the Consultant, the Contractor and the Subcontractor."*

.2 Revise Subparagraph 9.2.3.3 as follows: *"extend the Subcontract Time for such reasonable time as the Contractor, with the approval of the Consultant, and in consultation with the Subcontractor ..."*.

1.16 SCC 9.4 - CONSTRUCTION SAFETY

.1 Add new Paragraph 9.4.2 as follows: *"Prior to commencement of the Work, the Subcontractor shall submit to the Contractor:*
.1 Documentation of a valid Workplace Safety and Insurance Board clearance certificate and confirmation of the Subcontractor's WSIB CAD-7 performance rating.
.2 Documentation of the Subcontractor's insurance coverage.
.3 Documentation of the Subcontractor's safety-related programs for the Project.
.4 A copy of the Subcontractor's Form of Notification."

1.17 SCC 9.5 - MOULD

.1 Revise the last sentence in Subparagraph 9.5.1.3 as follows: *"The expert's report shall be delivered to the Consultant, the Contractor and the Subcontractor."*

.2 Revise Subparagraph 9.5.2.3 as follows: *"extend the Subcontract Time for such reasonable time as the Contractor, with the approval of the Consultant, and in consultation with the Subcontractor ..."*.

1.18 SCC 10.1 - TAXES AND DUTIES

.1 Add new Paragraph 10.1.3 as follows: *"With respect to taxes and duties, the Subcontractor shall, at the request of the Contractor, assist, join in, or at the Contractor's expense, make application on behalf of the Contractor for any exemption, recovery or refund. The Subcontractor shall provide the Contractor with copies, or, where required original of records, invoices, purchase orders or other documentation as may be necessary to support such application."*

.2 Add new Paragraph 10.1.4 as follows: *"Any amount included in the Subcontract for tax or duty, whether or not paid, which is found to be inapplicable or for which a refund is obtained shall become the sole and exclusive property of the Contractor."*

1.19 SCC 10.2 - LAWS, NOTICES, PERMITS & FEES

.1 Revise Paragraph 10.2.5 as follows: *"... the Subcontractor shall notify the Contractor and Consultant in writing requesting direction immediately upon such variance or change becoming known. The Consultant will make the changes required to the Contract Documents..."*.

.2 Revise Paragraph 10.2.6 as follows: *"If the Subcontractor fails to notify the Contractor and the Consultant in writing; and ..."*.

.3 Add new Paragraph 10.2.8 as follows: *"The Contractor's and Subcontractor's compliance with statutes or regulations made thereunder or by-laws shall not relieve them of obligations set out in the Contract Documents which may be more extensive than the requirements of those statutes, regulations or by-laws."*

1.20 SCC 11.1 - INSURANCE

.1 Revise Paragraph 11.1.1 as follows: *"Without restricting the generality of SCC 12.1 - INDEMNIFICATION, the Contractor will arrange for a project specific 'Wrap-up Liability' policy*

in the amounts of not less than $10,000,000 per occurrence with a property damage deductible not exceeding $10,000 on behalf of, and indemnification of the Owner, the Consultants, the Contractor, the Subcontractors, and any other parties as instructed by the Owner. The Subcontractor shall be responsible for the following insurance policies:

.1 "Subcontractor's Equipment Insurance covering construction machinery and equipment used by the Subcontractor for the performance of the Work. Such insurance shall be on an 'all risks' basis and be endorsed to provide the Consultant and the Owner with not less than 30 days notice in writing in advance of any cancellation, and of any change or amendment restricting coverage.

.2 "Automobile liability insurance in respect of licensed vehicles with limits of not less than $10,000,000 inclusive per occurrence for bodily injury, death and damage to property, and covering all licensed vehicles owned or leased by the Subcontractor. This automobile liability insurance shall be endorsed to provide the Consultant and the Owner with not less than 30 days notice in writing in advance of any cancellation, and of any change or amendment restricting coverage. Where the policy has been issued pursuant to a government-operated automobile system, the Subcontractor shall provide the Owner with confirmation of automobile insurance coverage for all automobiles registered in the name of the Subcontractor."

1.21 SCC 12.1 - INDEMNIFICATION

.1 Add new Paragraph 12.1.7 as follows: "*The Subcontractor shall indemnify and hold harmless the Contractor, the Owner, and the Consultant, their agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings (hereinafter called "claims"), suffered or incurred on account of any obligation or a provision in the Subcontract Documents, or attributable to, the Subcontractor's performance of the Subcontract. The Subcontractor assumes towards the Contractor all the obligations and responsibilities that Contractor assumes towards Owner as set forth in the Contract Documents, insofar as applicable, generally or specifically, to the materials to be furnished and the Work to be performed under this Subcontract".*

1.22 SCC 12.3 - WARRANTY

.1 Add new Paragraph 12.3.7 as follows: *"Should the Work be delayed due to conditions beyond the control of the Subcontractor, the warranty period shall commence at the time of acceptance of the Work by the Owner."*

END OF DOCUMENT

1 General

1.1 PROJECT DESCRIPTION

.1 Work of Contractor package and several separate Subcontract packages to be performed under a single Cost Plus Contract comprises the Project, known as:

Construction of the
T. A. BLAKELOCK H.S. RENOVATIONS - PHASE 1
located at
1160 Rebecca Street,
Oakville, Ontario;
and further identified as
HDSB RFT # 23-065-01, and
SAi Project No.: 2215A.

1.2 CONTRACT DOCUMENTS

.1 Refer to CCDC 3, GC 1.1 and CCA 1, SCC 1.1.

.2 Contract Documents were prepared by Consultant for the account of Owner. Information contained herein reflects Consultant's best judgement in light of information available to Consultant at time of preparation. Any use which a third party makes of Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on Contract Documents.

.3 Specifications are written in imperative mood in an abbreviated form. Imperative language of the Specifications is directed to Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on Drawings. The words "shall be" will be supplied by inference where a colon (:) is used within sentences and phrases. Except where worded to the contrary, fulfil and perform indicated requirements whether stated imperatively or otherwise.

1.3 CONTRACT METHOD

.1 Single Construction Contract: Contractor shall construct the Work under a CCDC 3, Cost Plus contract.

.2 Throughout execution of the Project, Consultant may bid portions of the Project and nominate Subcontractors, whose parts or portions of the Project will be incorporated as part of this Contract to make up the Work.

.3 Consultant will prepare stipulated price CCA 1 Subcontracts for execution between Contractor and Subcontractors.

.4 Refer to Supplementary Conditions and Supplementary Subcontract Conditions for information pertaining to contractual relationship between Contractor and Subcontractors.

1.4 ADMINISTRATIVE / PROCEDURAL SECTIONS APPLICABLE TO ALL CONTRACTS AND SUBCONTRACTS

.1 Section 01 12 00 - Multiple Contract Summary

.2 Section 01 21 00 - Allowances

.3 Section 01 23 00 - Alternatives

.4 Section 01 25 00 - Substitution Procedures

.5 Section 01 26 00 - Contract Modification Procedures

.6 Section 01 31 00 - Project Management and Coordination

.7 Section 01 32 00 - Construction Progress Documentation

.8 Section 01 33 00 - Submittal Procedures

.9 Section 01 35 00 - Special Procedures

.10 Section 01 40 00 - Quality Requirements

.11 Section 01 60 00 - Product Requirements

.12 Section 01 71 00 - Examination and Preparation Procedures

.13 Section 01 73 00 - Execution

.14 Section 01 73 29 - Cutting and Patching

.15 Section 01 74 00 - Cleaning and Waste Management

.16 Section 01 75 00 - Starting and Adjusting

.17 Section 01 76 00 - Protecting Installed Construction

.18 Section 01 77 00 - Closeout Procedures

.19 Section 01 78 00 - Closeout Submittals

.20 Section 01 79 00 - Demonstration and Training

1.5 CONTRACT C00 - CONTRACTOR

.1 Assume total control of the Works of the Project. Be responsible for coordination, sequencing and scheduling of work of all Subcontracts, ensure conformity with Contract Documents.

.2 Assume sole responsibility for construction means, methods, techniques, sequences and procedures, including site usage; provision of temporary utilities, facilities and services; quality control and coordination of testing and inspection services; and site administration.

.3 Fulfill role of "constructor" as defined by Ontario Occupational Health and Safety Act (Construction Projects). File required Notice of Project and carry out and enforce the provisions of the Act and requirements of Project Health and Safety Policy.

.4 Report directly to Consultant.

.5 Conduct site management duties for duration of the Project, including field engineering services necessary to layout Project and ensure accurate working lines and levels for Subcontract Work. Refer to Section 01 71 00.

.6 Appoint a single supervisor for duration of Contract, until completion of Contract. Refer to GC 3.6 - Supervision.

.7 Arrange for minimum one labourer to be present at Place of the Work each Working Day until completion of Contract.

.8 Arrange and pay for publication of Project's Certificate of Substantial Performance of the Work.

.9 Monitor site cleanliness on a daily basis and ensure conformance to requirements of authorities having jurisdiction with respect to waste audits and waste reduction work plans. Provide waste containers at Place of the Work, and arrange for periodic waste removal as necessary until completion of Contract.

1.6 COMMON REQUIREMENTS APPLICABLE TO SUBCONTRACTORS

.1 Report directly to Contractor on matters pertaining to execution of the Work.

.2 Provide and perform the following:
- .1 Electrical extension cords from distribution sources, work lights and any special power required for Subcontract Work.
- .2 Separate telephone service required for Subcontract Work.
- .3 Water hoses required for Subcontract Work.
- .4 Field offices and sheds required for Subcontract Work.
- .5 Cleaning of Subcontract Work; delivery of debris to collection.

.3 Maintain site cleanliness on a daily basis as applicable to Subcontract and ensure conformance to requirements of authorities having jurisdiction with respect to waste audits and waste reduction work plans.

.4 Sections listed as part of a particular Subcontract package may include work described under other Sections. When referenced as a Related Section, include such portions of the Work as part of that particular Subcontract.

.5 Include the following:
- .1 Division 00 - Procurement and Contracting Requirements
  - .1 00 52 11 - Subcontract Agreement
  - .2 00 71 11 - Subcontracting Definitions
  - .3 00 72 11 - Subcontract Conditions
  - .4 00 73 11 - Supplementary Subcontract Conditions.
- .2 Division 01 - General Requirements
  - .1 Administrative / procedural sections applicable to all contracts as listed above.

1.7 SUBCONTRACT SC01 - GENERAL

.1 Provide and maintain Project temporary utilities, temporary facilities and temporary controls as specified in Section 01 50 00.

.2 Perform Project final cleaning as specified in Section 01 74 00.

.3 Include the following:
- .1 Division 03 - Concrete
  - .1 03 10 00 - Concrete Formwork
  - .2 03 20 00 - Concrete Reinforcement
  - .3 03 33 00 - Cast-in-Place Concrete
  - .4 03 35 46 - Concrete Topical Treatments
- .2 Division 04 - Masonry
  - .1 04 00 00 - Masonry
- .3 Division 05 - Metals
  - .1 05 12 00 - Structural Steel
  - .2 05 30 00 - Steel Deck
  - .3 05 50 00 - Metal Fabrications
- .4 Division 06 - Wood, Plastics and Composites
  - .1 06 10 00 - Rough Carpentry
  - .2 06 20 00 - Finish Carpentry
  - .3 06 24 00 - High Pressure Decorative Laminate (excluding architectural woodwork)

.5 Division 07 - Thermal and Moisture Protection
.1 07 21 00 - Thermal Insulation
.2 07 26 00 - Vapour Retarders
.3 07 27 00 - Air Barriers
.4 07 27 36 - Sprayed Foam Air Barrier
.5 07 52 00 - Modified Bituminous Membrane Roofing
.6 07 62 00 - Sheet Metal Flashing and Trim
.7 07 84 00 - Firestopping
.8 07 92 00 - Joint Sealants
.6 Division 08 - Openings
.1 08 12 13 - Hollow Metal Frames
.2 08 13 13 - Hollow Metal Doors
.3 08 31 00 - Access Doors and Panels
.4 08 33 23 - Coiling Overhead Doors
.5 08 51 13 - Aluminum Windows
.6 08 62 26 - Flat Glass Unit Skylights
.7 08 71 00 - Door Hardware
.8 08 80 00 - Glazing
.9 08 90 00 - Louvers and Vents
.7 Division 09 - Finishes
.1 09 90 00 - Painting and Coating
.2 09 96 46 - Intumescent Painting
.8 Division 10 - Specialties
.1 10 11 00 - Visual Display Surfaces
.2 10 14 00 - Signage
.3 10 21 13.13 - Metal Toilet Compartments
.4 10 22 26 - Operable Partitions
.5 10 28 13 - Toilet Accessories
.6 10 51 13 - Metal Lockers
.9 Division 11 - Equipment
.1 11 61 43 - Stage Curtains
.10 Division 12 - Furnishings
.1 12 24 13.16 - Manual Roller Window Shades.

1.8 SUBCONTRACT SC02 - DEMOLITION AND ABATEMENT

.1 Include the following:
.1 Division 02 - Existing Conditions
.1 02 41 19 - Selective Demolition
.2 02 82 13 - Asbestos Abatement.

.2 Subcontract SC02 has already been awarded by Owner to Schouten Environmental.

.3 Subcontract Price is identified as a stipulated sum cash Allowance in Section 01 21 00.

1.9 SUBCONTRACT SC03 - MECHANICAL

.1 Mechanical Subcontract scope of work is noted on Drawings.

1.10 SUBCONTRACT SC04 - ELECTRICAL

.1 Include the following:
.1 Division 26 - Electrical
.1 26 05 00 - Electrical Basic Materials and Methods
.2 26 05 19 - Low Voltage Cables
.3 26 05 19.01 - Appendix to Low Voltage Cables
.4 26 05 26 - Grounding and Bonding
.5 26 05 46 - Vibration Isolation and Seismic Restraints
.6 26 05 70 - Electrical Work Analysis and Testing

.7 26 09 00 - Lighting Control
.8 26 24 17 - Branch Circuit Panelboard
.9 26 27 19 - Surface Raceways
.10 26 27 26 - Wiring Devices
.11 26 28 00 - Low Voltage Circuit Protective Devices
.12 26 50 00 - Lighting
.2 Division 27 - Communications
.1 27 10 00 - Structured Cabling
.2 27 51 25 - Emergency Call
.3 Division 28 - Electronic Safety and Security
.1 28 31 00 - Existing Fire Alarm Work

1.11 SUBCONTRACT SC05 - FLOORING

.1 Include the following:
.1 Division 09 - Finishes
.1 09 30 00 - Tiling
.2 09 65 13 - Resilient Base and Accessories
.3 09 65 00 - Resilient Tile Flooring
.4 09 68 13 - Tile Carpeting.

1.12 SUBCONTRACT SC06 - DRYWALL AND ACOUSTICS

.1 Include the following:
.1 Division 09 - Finishes
.1 09 21 16 - Gypsum Board Assemblies
.2 09 51 23 - Acoustical Tile Ceilings
.3 09 72 35 - Dry Erase Wall Coverings
.4 09 81 00 - Acoustic Insulation
.5 09 84 13.13 - Fixed Sound-Absorptive Cementitious Panels.

1.13 SUBCONTRACT SC07 - MILLWORK

.1 Include the following:
.1 Division 06 - Wood and Plastics
.1 06 20 00 - Finish Carpentry (excluding door hardware installation).
.2 06 24 00 - High Pressure Decorative Laminate
.3 06 40 00 - Architectural Woodwork
.2 Division 08 - Openings
.1 08 71 00 - Door Hardware (install teacher closet locks).

1.14 WORK SEQUENCE

.1 Construct the Work in stages to accommodate Owner's continued use of premises during construction.

.2 Each construction stage must be completed and ready for Owner occupancy before the next stage may commence.

.3 Coordinate construction progress schedule and coordinate with Owner occupancy during construction.

.4 Required Stages: As indicated on Drawings.

1.15 CONTRACTOR ACCESS TO AND USE OF PLACE OF THE WORK

.1 Contractor shall limit use of existing facility, including Place of the Work, for execution of the Work, for storage and for access, to allow:
.1 Owner occupancy,
.2 Work by other contractors, and
.3 Public usage.

1.16 OWNER OCCUPANCY OF EXISTING FACILITIES

.1 Owner will occupy existing facilities during entire construction period for execution of normal operations.

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.17 PARTIAL OWNER OCCUPANCY OF THE WORK

.1 Owner may temporarily occupy designated areas of the Work for purpose of storing furnishings and equipment, and installing equipment.

.2 In accordance with GC 5.10 - Non-Conforming Work, partial Owner occupancy will not be considered an acceptance of the Work, nor in any way relieve Contractor of responsibility to complete the Work.

1.18 SUBSTANTIAL PERFORMANCE OF THE WORK

.1 Refer to GC 5.5 - Substantial Performance of the Work.

.2 Substantial Performance of the Work is required on or before August 25, 2023.

END OF SECTION

1 General

1.1 CASH ALLOWANCES

.1 Refer to GC 4.1 - Cash Allowances.

.2 Upon request, submit to Consultant before submission of final application for payment, certified copies of invoices and statements from Suppliers and Sub-subcontractors furnishing Products or services under a cash allowance.

.3 When a cash allowance is described as including supply only of a Product, affected Subcontractor is responsible for ensuring cost of installation, including connections to facility services, has been included in Subcontract Price.

.4 Amount of each allowance, for Work specified in respective specification Sections:
.1 Subcontract SC01: Include the stipulated sum of $32,000 for the following parts of the Work:
.1 Inspection and testing services as described in Section 01 40 00.
.2 Completion of architectural CAD as-built drawings as described in Section 01 78 00.
.3 Supply and installation of signage as described in Section 10 14 00.
.2 Subcontract SC02: Include the stipulated sum of $105,000 for selective demolition and designated substance abatement to be performed by Schouten Environmental.

1.2 CONTINGENCY ALLOWANCE

.1 A Subcontract Price may include a contingency allowance when stated in the Contract Documents.

.2 A contingency allowance includes a Subcontractor's overhead and profit in connection with such contingency allowance.

.3 Expenditures under a contingency allowance shall be authorized and valued as provided in SCC 6.1 - Contractor's Right to Make Changes, SCC 6.2 - Change Order and SCC 6.3 - Change Directive.

.4 A Subcontract Price shall be adjusted by Change Order to provide for any difference between the authorized expenditures and the contingency allowance.

.5 Subcontract SC01: Include in Subcontract Price a contingency allowance in the amount of $225,000.

END OF SECTION

1 General

1.1 INSTRUCTIONS

.1 Drawings stipulate pertinent requirements for Products and methods to achieve work stipulated under each alternative.

.2 Coordinate affected parts of the Work and modify surrounding construction to integrate each alternative.

1.2 DEFINITIONS

.1 In accordance with CCDC 23-2018 - A Guide to Calling Bids and Awarding Construction Contracts, the following terms are defined as follows:
  .1 Alternate Price: The amount stipulated by the bidder for an alternative, which can be stated as an addition, a deduction, or no change to the base Bid Price. Unless incorporated by written agreement prior to the execution of the Agreement, an Alternate Price is not included in the Contract Price.
  .2 Itemized Price: The bidder's price for a specific item of the Work included in the base Bid Price, and is identified for information purposes only. An Itemized Price will not be used to modify the scope of the Work or adjust the base Bid Price.

.2 The out-dated term "Separate Price" is considered synonymous with Alternate Price.

1.3 AWARD / SELECTION OF ALTERNATIVES

.1 Indicate variation to Bid Price for alternatives described below on the bid form supplements. Note that this form requests a difference in cost by adding to or deducting from the Bid Price.

.2 Do not include Value Added Taxes in alternatives.

.3 Owner may accept any of the alternatives and corresponding alternate prices in any order or combination, including all or none.

.4 Alternatives and corresponding alternate prices are open for acceptance by Owner for same period of time as Bid Price.

.5 In accordance with CCDC 23-2018 - A Guide to Calling Bids and Awarding Construction Contracts, the low bid will be determined by adjusting each bidder's Bid Price by the identified amounts to incorporate those alternatives for which prices have been invited and which are to be incorporated in the Work.

END OF SECTION

1 General

1.1 PRODUCT SUBSTITUTION PROCEDURES

.1 Requests for substitution will only be considered when submitted in sufficient time to permit proper evaluation by Consultant.

.2 When requesting Consultant review of a proposed Product substitution, demonstrate the proposed substitute will perform equally as well or better as the specified Product.

.3 Accompany each request for substitution with a list of properties for both the specified Product and the proposed substitute, including the following information:
- .1 Product identification, including manufacturer's name, address, telephone and fax numbers, and web site address where available.
- .2 Manufacturer's Product data sheets, including material descriptions, compliance with applicable reference standards, and performance and test data.
- .3 A summarized comparison of physical properties and performance characteristics for the specified Product and the proposed substitution, and clearly highlighting significant variations.
- .4 Indication of availability of maintenance services and sources of replacement materials and parts, including associated costs and time frames.
- .5 Indication of cost savings and reduction of construction schedule.
- .6 Verification that the substitute will not result in additional costs or a reduction in performance to other portions of the Work.
- .7 Reason for requesting the substitution.

.4 The clauses "or equal", "or approved equal", or other similar clauses, will not be construed as an invitation to submit requests for substitution or to unilaterally substitute Products in place of specified Products and systems.

.5 The abbreviation "eg." means "for example", and a Product listed thereafter is named as an example of the Product upon which the Specification is based. Similar Products from other listed manufacturers are acceptable for use, provided they meet specified criteria.

.6 Failure to order specified Products in adequate time to meet the approved construction schedule will not be a valid reason to submit a request for substitution. In accordance with GC 6.5 - Delays, such delays remain the responsibility of Contractor, and will not result in an extension to Contract Time or be subject to reimbursement by Owner.

.7 Owner is under no obligation to consider Product or system substitutions recommended by Contractor.

.8 Remove and replace substitutions incorporated into the Work without Consultant's written approval.

END OF SECTION

1 General

1.1 CLARIFICATIONS

.1 Request written clarifications when meaning of Contract Documents is unclear.

.2 Do not proceed with related parts of the Work until clarification is received.

.3 Failure to notify Consultant when Contract Documents are unclear or inconsistent will result in Contractor incurring responsibility for resulting deficiencies and additional costs.

.4 Clarifications issued by Consultant are deemed to supercede the relevant parts of Contract Documents, regardless whether those documents are cited in the written clarification.

1.2 REQUESTS FOR INTERPRETATION

.1 Contractor may, after exercising due diligence to locate the required information, request from Consultant clarification or interpretation of Contract Documents, hereinafter referred to as a request for interpretation (RFI).

.2 Submit RFI on a form acceptable in content to Consultant, including a detailed description of Contractor's review of Contract Documents leading up to issuance of RFI. Requests for interpretation that fail to include a detailed review description, or whose description is insufficient in Consultant's opinion, may not be considered and may be rejected.

.3 Maintain a log of RFI sent to and responses received from Consultant, complete with corresponding dates. Submit updated RFI log with each application for payment.

.4 Submit RFI to Consultant sufficiently in advance of affected parts of the Work so as not to cause delay in the Work. Additional costs incurred as a result of failure to submit RFI in sufficient time will not be reimbursed by Owner.

.5 Submit one RFI per RFI form, numbered consecutively in a single sequence, in order submitted.

.6 Consultant will review and respond to RFI with reasonable promptness.

.7 Consultant's response to RFI will not be considered a Changer Order or Change Directive, nor does it authorize changes in the Work, Contract Price and Contract Time.

.8 If, at any time, Contractor submits a large quantity of RFI, such that Consultant cannot process them within a reasonable period of time, then Consultant will notify Contractor of such in writing. In this event, Contractor and Consultant will jointly prepare an estimate of time necessary for processing RFI, as well as determining an order of priority among submitted RFI. Contractor will accommodate such necessary time at no increase in Contract Time and Contract Price.

.9 If information requested in an RFI is apparent from field observations, is contained in Contract Documents or is reasonably inferable from them, Contractor shall be responsible to Owner for reasonable costs charged by Consultant for additional services required to prepare and issue such information.

.10 A request for interpretation (RFI) will not constitute a notice of claim for a delay.

1.3 CONTRACT MODIFICATION PROCEDURES

.1 Refer to GC 6.1 - Owner's Right to Make Changes, GC 6.2 - Change Order and GC 6.3 - Change Directive.

.2 Once a Proposed Change has been issued by Consultant, ensure that no work is carried out that may increase the cost of the contemplated variation.

.3 Consultant will assess the fair market cost of each change before issuing a Change Order. Assist Consultant with this task by quoting variations in a complete manner, listing:
- .1 Quantity of each material,
- .2 Unit cost of each material,
- .3 Man hours involved,
- .4 Cost per hour, and
- .5 Subcontractor quotations.

.4 Consultant may require further quotations in order to show a breakdown of costs.

.5 Owner and Consultant will not be responsible for delays to the Work resulting from late, incomplete or inadequately broken down valuations submitted by Contractor.

.6 Minor variations may be made in the Project from time to time as approved by Consultant. Such alterations or adjustments shall not constitute a change in cost unless a request is made at that time. No extra will be contemplated except where a clear indication is made that extra payment is claimed, in which case a Proposed Change or Change Directive will be issued by Consultant in accordance with GC 6.1 - Owner's Right to Make Changes, or GC 6.3 - Change Directive. Unless this procedure is followed, no claims for extras will be allowed.

END OF SECTION

1 General

1.1 COORDINATION

.1 Coordinate the Work to ensure Project proceeds safely and expeditiously.

.2 Ensure adequate communication among involved parties.

.3 Allocate mobilization areas at Place of the Work; for field offices and sheds, for access, for traffic and for parking facilities.

.4 Coordinate use of Place of the Work and facilities through procedures for submittals, reports and records, schedules, coordination of Drawings, recommendations, and resolution of ambiguities and conflicts.

.5 Submit information required for preparation of coordination and interference drawings. Review and approve revised drawings for submission to Consultant.

1.2 DOCUMENTS AT PLACE OF THE WORK

.1 Maintain an up-to-date copy of the following documents at Place of the Work:
- .1 Contract Documents, including Drawings, Specifications, addenda, bid revisions, Notices in Writing, Supplemental Instructions, proposed changes, Change Orders, Change Directives, and other modifications to the Contract.
- .2 Accepted Shop Drawings, Product data and samples.
- .3 Quality control submittals, including test and evaluation reports.
- .4 Manufacturer's instructions, including installation and maintenance guidelines.
- .5 Construction progress schedule.
- .6 Additional requested schedules.
- .7 Consultant's field review reports and deficiency reports.
- .8 Reports from authorities having jurisdiction.
- .9 Permits.
- .10 Construction daily log.
- .11 Record as-built documents as described in Section 01 78 00.

.2 Make documents available to Consultant for review at Place of the Work.

.3 Construction Daily Log: Maintain a construction log, recording on a daily basis the following information:
- .1 Number of workers actively working at Place of the Work, organized on a Subcontract basis.
- .2 Subcontractors working at Place of the Work.
- .3 Identify the parts of the Work being worked on.
- .4 Identify the working hours being kept at Place of the Work.
- .5 Activities with intermittent progress.
- .6 Time lost with an explanation as to cause.
- .7 Difficulties encountered, such as construction activity delays, labour inefficiencies, labour shortages, etc.
- .8 Product deliveries.
- .9 Equipment mobilization and de-mobilization.
- .10 Demolition conditions.
- .11 Start and finish dates for each part of the Work.

1.3 OTHER CONTRACTORS

.1 Cooperate with any separate contractor employed by Owner and, if necessary, co-ordinate with their work.

.2 Submit necessary information to Owner to assist in required scheduling of other contractors.

1.4 CONTINUANCE OF OWNER OPERATIONS IN OCCUPIED FACILITIES

.1 Coordinate and schedule the Work to minimize disruption of normal functions at existing facility.

.2 Changes to traditional scheduling of construction may be required and certain portions of the Work may not be able to proceed in continuous sequence.

.3 Every reasonable effort will be made to cooperate with the construction process.

.4 Owner may modify proposed scheduling where such changes are in Owner's best interests regarding operation of existing facility.

1.5 GENERAL REQUIREMENTS FOR PROJECT MEETINGS

.1 Schedule and administer project meetings in consultation with Consultant, throughout progress of the Work.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting 4 days in advance of meeting date to Consultant and Owner.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record meeting minutes. Include significant proceedings and decisions. Identify required actions by affected parties.

.7 Reproduce and distribute copies of minutes within 5 days after meeting and transmit to meeting participants, affected parties not in attendance, Consultant and Owner.

.8 Representative of Contractor, Subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the party each represents.

.9 Schedule meetings at regular 14 day intervals, on a day that is determined to be convenient by Contractor and Consultant.

1.6 PRE-CONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting with Owner to discuss and resolve administrative procedures and responsibilities.

.2 Conduct meetings with Subcontractors and Suppliers to discuss and resolve administrative procedures and responsibilities.

.3 Owner, Consultant, Contractor, Subcontractors, field inspectors and supervisors will be in attendance.

.4 Establish time and location of meeting and notify parties concerned a minimum of 5 days before meeting date.

.5 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.6 Pre-construction Meeting Agenda: include the following:
.1 Appointment of official representative of participants in the Work;
.2 Schedule of Work, progress scheduling;
.3 Schedule of submissions of Shop Drawings, samples, colour chips;
.4 Requirements for temporary facilities, Project identification sign, field offices, storage sheds, utilities, fences and protective enclosures;

.5 Delivery schedule of specified equipment;
.6 Site security;
.7 Proposed changes, Change Orders, Change Directives, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements;
.8 Owner-furnished Products;
.9 As-built drawings;
.10 Operation and maintenance manuals;
.11 Take-over procedures, acceptance, warranties, extra stock materials;
.12 Monthly progress claims, administrative procedures, photographs, holdbacks;
.13 Procedures for publishing Certificate of Substantial Performance of the Work, including identification of publisher, and notification of Subcontractors and Suppliers;
.14 Appointment of inspection and testing agencies or firms; and
.15 Insurances, transcripts of policies.

1.7 PREINSTALLATION MEETINGS

.1 During course of the Work, schedule preinstallation meetings as required by Contract Documents.

.2 Wherever possible, schedule preinstallation meetings on same date as regularly scheduled progress meetings.

.3 Contractor, affected Subcontractors and Suppliers, manufacturer's representatives, field inspectors and supervisors, Consultant and any other specified parties are to be in attendance.

.4 Preinstallation Meeting Agenda: Include the following:
.1 Review of existing conditions and affected parts of the Work, and any testing thereof;
.2 Review of installation procedures and requirements;
.3 Review of environmental and field condition requirements;
.4 Schedule of the applicable parts of the Work;
.5 Schedule of submission for samples and other items requiring Consultant's selection;
.6 Requirements for Temporary Work;
.7 Requirements for notification for reviews. Allow a minimum of 48 hours notice for Consultant to review the affected parts of the Work;
.8 Requirements for inspections and tests as applicable. Schedule and undertake inspections and tests;
.9 Delivery schedule for Products; and
.10 Special safety requirements and procedures.

1.8 PROGRESS AND PROGRESS DRAW MEETINGS

.1 During course of the Work and two weeks prior to completion of the Contract, schedule progress meetings biweekly.

.2 During course of the Work, schedule progress draw meetings monthly.

.3 Submit to Consultant a copy of the application for payment not less than two Working Days before scheduled progress draw meeting. Consultant may require changes to the application for payment prior to progress draw meeting.

.4 Contractor, major Subcontractors involved in Work, Consultant, and Owner are to be in attendance.

.5 Progress Meeting Agenda: include the following:
.1 Review, approval of minutes of previous meeting;
.2 Review of Work progress since previous meeting;
.3 Field observations, problems, conflicts;
.4 Problems impeding construction schedule;
.5 Review of off-site fabrication delivery schedules;

.6 Corrective measuring and procedures to regain project schedule;
.7 Revision of construction schedule;
.8 Progress, schedule, during succeeding work period;
.9 Review submittal schedules, record drawings: expedite as required;
.10 Maintenance of quality standards;
.11 Review of proposed changes for affect on construction schedule and on completion date;
.12 Other business.

END OF SECTION

1 General

1.1 SUBMISSION REQUIREMENTS

.1 Submit initial schedules within 15 days after award of Contract.

.2 Re-submit updated schedules with each application for payment.

.3 Submit schedules electronically in the form of Adobe Acrobat (.pdf) files.

1.2 CONSTRUCTION PROGRESS SCHEDULE

.1 Prepare construction progress schedule using critical path method.

.2 Include complete sequence of construction activities.

.3 Include dates for commencement and completion of each major element of construction.

.4 Show projected percentage of completion of each item as of first day of month.

.5 Indicate progress of each activity to date of submission of the schedule.

.6 Update schedule monthly and resubmit with each application for progress payment. Consultant will not review an application for payment that does not include an updated construction progress schedule.

.7 Show changes occurring since previous submission of schedule:
.1 Major changes in scope.
.2 Activities modified since previous submission.
.3 Revised projections of progress and completion.
.4 Other identifiable changes.

.8 Provide a narrative report to define:
.1 Problem areas, anticipated delays, and impact on schedule.
.2 Corrective action recommended and its effect.
.3 Effect of changes on schedules of other contractors.

1.3 ADDITIONAL SCHEDULES

.1 Concurrently with construction progress schedule, prepare and submit a schedule of values, a cash flow schedule, a submittal schedule, an inspection and testing schedule, and an equipment delivery schedule; prepared in formats acceptable to Consultant.

.2 Schedule of Values: To CCDC 24-2016, A Guide to Model Forms and Support Documents.

.3 Cash Flow Schedule: Broken down on a monthly basis, indicating anticipated monthly progress billings for duration of Contract.

.4 Submittal Schedule:
.1 Refer to GC 3.10 - Shop Drawings.
.2 Indicate anticipated submission dates and review periods for Shop Drawings, samples, lists of materials and other documentation.
.3 Highlight critical items, including latest date for submittal review by Consultant.
.4 Design sequence of submissions to reflect requirements of construction schedule.

.5 Inspection and Testing Schedule:
.1 Schedule inspection and testing in consultation with Owner's appointed inspection and testing agency.
.2 Identify time required for the performance of tests and inspections, and for the preparation and distribution of reports.

.6 Equipment Delivery Schedule: Indicate list of manufactured equipment complete with order dates and anticipated delivery dates.

1.4 PROGRESS PHOTOGRAPHS

.1 Concurrently with each monthly application for payment and with final application for payment, submit sufficient quantity of colour photographs, clearly illustrating progress of the Work.

.2 Format photographs as bitmap (bmp) or JPEG (jpg) image files, with minimum resolution of 10 megapixels.

.3 Ensure photographs are taken by a person experienced in photography.

.4 Submit additional photographs showing special conditions when requested by Consultant.

.5 Photographs will be properly exposed and in focus, with unobstructed views.

.6 Identify each photograph with:
.1 Name of Project,
.2 Name of photographer,
.3 Description of view, and
.4 Date photograph was taken.

END OF SECTION

1 General

1.1 ADMINISTRATIVE

.1 Collect Submittals requested by Contract Documents, as required by authorities having jurisdiction and as may be reasonably requested by Consultant from relevant Subcontractors, Suppliers and manufacturers.

.2 Make submissions with reasonable promptness and in an orderly sequence so as not to delay the Work. Be responsible for delays and pay additional costs as a result of failure to make submissions in due time to allow proper reviews.

.3 Submittals containing unauthorized substitutions will be rejected. Refer to Section 01 25 00 for substitution procedures.

.4 Ensure submissions are complete for each particular Submittal required.

.5 Where submissions are not complete, indicate which Submittal components are not included, and stating when they will be made available. Consultant reserves the right to delay their review of the Submittal until submission is complete.

.6 Do not proceed with parts of the Work affected by a Submittal, including ordering Products, until relevant Submittal has been reviewed and accepted by Consultant.

.7 Prepare Submittals in units of measurement consistent with those used on Drawings.

.8 Digital files are to be electronically created from original files. Scanned images will be rejected.

1.2 SUBMISSION PROCEDURES

.1 Coordinate each Submittal with Contract Documents.

.2 Include with each submission a duplicate transmittal document indicating:
.1 Date of initial submission,
.2 Date of each resubmission, and
.3 Project title and Consultant's Project number.

.3 Indicate on each submission, the following information:
.1 Name of Contractor,
.2 Name of Subcontractor,
.3 Name of Supplier (as applicable),
.4 Name of manufacturer (as applicable),
.5 Name of person responsible for preparation of submission, and
.6 Relevant specification Section numbers.

.4 Identify Submittals numerically by Section number, numeric indicator, revision number and a brief worded description. For example, a Submittal for masonry wall ties might be identified as "04 05 19-01-R0-Wall Ties".

.5 When required by Consultant's review, make necessary changes to Submittal and resubmit for final acceptance.

.6 Notify Consultant in writing of any additional revisions made to Submittal beyond those required by Consultant's review.

.7 Upon acceptance of Submittal by Consultant, distribute copies to affected parties.

1.3 REVIEW BY CONTRACTOR

.1 Before making submissions to Consultant, review Submittals for conformity to Contract Documents.

.2 Contractor's review of Submittals must be conducted by the authorized representative familiar with the Work.

.3 Check each Submittal and make necessary notations before forwarding Submittals to Consultant.

.4 Distribute copies of Submittals to affected Subcontractors for their comment prior to submitting them to Consultant.

.5 Verify noted dimensions with actual constructed measurements at Place of the Work.

.6 Confirm fabrication techniques and installation means and methods.

.7 Where Submittal does not conform to Contract Documents, reject Submittal and return to source for revisions. Do not forward rejected Submittals to Consultant.

.8 Contractor assumes sole responsibility for conflicts that may arise in execution of the Work as a result of failure to properly review and coordinate Submittals.

.9 Submittals forwarded to Consultant must bear Contractor's review stamp, signed and dated by authorized representative.

.10 Submittals received by Consultant that fail to include Contractor's review stamp, date and signature will be returned without review.

.11 Notify Consultant in writing of changes made on Submittals to Contract Documents. Consultant's review of Submittals does not relieve Contractor of responsibility for unauthorized changes made to Contract Documents.

.12 Keep copies of accepted Submittals at Place of the Work in a neat, orderly condition.

.13 Perform the Work in conformance with accepted Submittals. Remove and replace Products not matching accepted Submittals.

1.4 REVIEW BY CONSULTANT

.1 Review of Submittals by Consultant is only for general conformity to Contract Documents.

.2 Consultant review does not imply approval of construction means, methods, techniques or detailing, responsibility for which remains with Contractor.

.3 Consultant review does not relieve Contractor of responsibility for errors or omissions in Submittals, or responsibility for meeting requirements of Contract Documents.

.4 Consultant markings on Submittals and resulting required actions:
- .1 Submittals requiring no changes will be marked 'REVIEWED', and will be submitted for as-built purposes.
- .2 Submittals requiring some minor changes will be marked 'REVIEWED AS NOTED', and will be revised and submitted for as-built purposes.
- .3 Submittals requiring substantial changes will be marked as 'REVISE AND RESUBMIT' and will be revised and resubmitted until Consultant subsequently marks them as 'REVIEWED' or 'REVIEWED AS NOTED'.

.5 Consultant's review and markings on Submittals do not authorize changes in the Work.

.6 If, in Contractor's opinion, Consultant's review of a Submittal constitutes a change in the Work, then Contractor will notify Consultant in writing and request an interpretation as specified in Section 01 26 00.

.7 If Consultant determines that a change in the Work is justified, then a Change Order itemizing the change in Contract Price and Contract Time will be issued.

.8 Submittals not requested by Contract Documents or Consultant, or not required by authorities having jurisdiction, will not be reviewed by Consultant, and will be returned marked as NOT REVIEWED.

1.5 ENGINEERED SUBMITTALS

.1 Submittals required to be sealed by a professional engineer are to be prepared, sealed, signed and dated under the direct control and supervision of a qualified professional engineer licensed to practice at Place of the Work.

.2 Include proof of professional liability insurance with minimum limit of liability of $5,000,000 per claim, and identifying insurer, policy number, and policy term on duly signed certificate of insurance.

.3 Design includes life safety, sizing of supports, anchors, framing, connections, spans and as additionally required to meet or exceed requirements of applicable codes, standards, regulations, authorities having jurisdiction and design requirements of Contract Documents.

.4 Engineered Submittals are to include design calculations, complete with references to codes and standards used in such calculations, supporting the proposed design represented in the Submittal. Prepare calculations in a clear and comprehensive manner so that they can be properly reviewed.

.5 Submittal engineer shall undertake periodic field review, including review of associated mock-ups when applicable. Such reviews will include review during fabrication at the point of manufacture, and during installation at Place of the Work. Prepare and submit a field review report for each review undertaken.

.6 Conduct field reviews at intervals appropriate to the progress of the parts of the Work relevant to engineered Submittal. Report on progress and quality of the affected parts of the Work. Determine if installation is in general conformity with Contract Documents and in strict conformance with accepted engineered Submittal.

.7 Upon completion of the parts of the Work affected by engineered Submittal, Submittal engineer shall prepare and submit a Letter of General Conformity to Contractor, Consultant and authorities having jurisdiction. Certify that the parts of the Work affected by engineered Submittal have been designed, fabricated and installed in accordance with Contract Documents and applicable regulatory requirements.

.8 Include costs of Submittal engineer's services in Contract Price.

1.6 SUBMITTALS PRIOR TO START OF WORK

.1 Submit the following documents within the time stipulated, or, if not stipulated, prior to first application for payment:
.1 Insurance certificates,
.2 Surety Bonds (as applicable),
.3 Workplace Safety and Insurance Board certificates,
.4 Construction progress schedule,
.5 Interference drawings,
.6 Schedule of values,
.7 Cash flow schedule,
.8 Submittal schedule,
.9 Inspection and testing schedule, and
.10 Equipment delivery schedule.

1.7 PRODUCT DATA

.1 Submit Product data sheets and brochures electronically in the form of Adobe Acrobat (.pdf) files for requirements requested in Specifications and as Consultant may reasonably request where Shop Drawings will not be prepared due to standardized manufacture of Product.

.2 Include sufficient space for application of review stamps by Contractor and Consultant.

.3 After review, Consultant will return marked-up Product data sheets to Contractor. Produce and distribute necessary copies to affected parties.

.4 Retain one set of accepted Product data sheets for inclusion in operation and maintenance manuals. Refer to Section 01 78 00.

1.8 SHOP DRAWINGS

.1 Refer to GC 3.10 - Shop Drawings.

.2 Unless specified otherwise, submit Shop Drawings electronically in the form of Adobe Acrobat (.pdf) files for each requirement requested in Specifications and as Consultant may reasonably request.

.3 Include sufficient space for application of review stamps by Contractor and Consultant.

.4 Shop Drawings are to be legible, and basically include the following information:
- .1 Fabrication and erection dimensions.
- .2 Plans, Sections, Elevations, arrangements and sufficient full-size details indicating complete construction, components, methods of assembly and interconnections with adjacent parts of the Work.
- .3 Design and engineering calculations, substantiating member sizes and connections, based on design loads.
- .4 Clear assignment of responsibility for the parts of the Work described thereon. Do not include phrases such as; "by others" or "by purchaser". Shop Drawings marked in this manner will be rejected.
- .5 Location and type of exposed anchors and fasteners, including any concealed reinforcements for attachment of same.
- .6 Adhesives, joinery methods and bonding agents.
- .7 Grades and Types of Products, including their physical characteristics, finishes and other fabrication information.
- .8 Configurations, sizes, and styles of Product required.
- .9 Mechanical and electrical characteristics of equipment.
- .10 Data verifying superimposed loads will not affect function, appearance or safety of installed components and adjacent construction.
- .11 Chases, sleeves, cuts and holes required, including those required in adjacent structural building elements.
- .12 Locations and types of welded connections. Include AWS symbols and indicate net weld lengths and sizes.
- .13 Product and manufacturer names, complete with model numbers.
- .14 Installation guidelines.
- .15 Operation and maintenance guidelines.

.5 Refer to Specifications for Product-specific requirements of Shop Drawings.

.6 After review, Consultant will return marked-up Shop Drawings to Contractor. Produce and distribute necessary copies to affected parties.

.7 Retain one set of accepted Shop Drawings for inclusion in operation and maintenance manuals. Refer to Section 01 78 00.

1.9 SAMPLES

.1 Submit samples to Consultant as requested in Contract Documents.

.2 Deliver samples prepaid to Consultant's business office.

.3 Identify samples with Project name and number, Consultant's name, Contractor's name, Subcontractor's name, date of submission, specification Section number, manufacturer's name, Product name and model number, and colour name and number.

.4 Upon request of Consultant, prepare representative panels of Products, illustrating selected textures, patterns and colours.

1.10 INTERFERENCE DRAWINGS

.1 Prepare a set of interference drawings, identifying and resolving potential conflicts among various parts of the Work, including sprinkler systems, HVAC ductwork, plumbing and drainage lines, lighting, and electrical systems.

.2 Submit interference drawings electronically to Consultant in the form of Adobe Acrobat (.pdf) files prior to commencement of the Work.

.3 Coordinate and review interference drawings with affected Subcontractors prior to commencement of their portions of the Work.

1.11 CERTIFICATES AND CERTIFICATION SUBMITTALS

.1 Submit written statements, as requested in Contract Documents, certifying installed Products meet specified criteria.

.2 Include signature of person responsible for preparing certification.

1.12 TEST AND EVALUATION REPORTS

.1 Submit manufacturers' test and evaluation reports electronically in the form of Adobe Acrobat (.pdf) files for requirements requested in Specifications and as Consultant may reasonably request.

.2 Ensure results are expressed in SI Metric units of measurement. Test and evaluation reports recording results only in imperial units of measurement may be rejected.

.3 Clearly indicate compliance with specified performance criteria, tested in accordance with specified test methods, and conducted by independent testing agency.

.4 Test results achieved through the use of alternative test methods will be rejected.

END OF SECTION

1 General

1.1 CONSTRUCTION SAFETY

.1 Refer to GC 9.4 - Construction Safety.

.2 Assume role of "Constructor" as defined by applicable regulatory requirements.

.3 Prepare and submit one copy of Registration Forms of Construction and Employers of Workers to authority having jurisdiction.

.4 Hold regular, scheduled safety meetings.

1.2 SPECIAL PROCEDURES FOR INFECTION CONTROL

.1 Conform to latest edition of CCA COVID-19 - Standardized Protocols for All Canadian Construction Sites.

1.3 PROPER CONDUCT OF WORKERS

.1 Ensure workers conduct themselves in a proper and civilized manner at all times.

.2 Workers are required to be properly attired at all times.

.3 Workers wearing clothing exhibiting hateful or offensive images or language will be required to replace or cover such clothing. Workers refusing to do so will be required to leave Place of the Work and will be replaced by Contractor.

.4 Workers using improper language, cat calls, lewd comments or improper behaviour will be required to leave Place of the Work and will be replaced by Contractor.

.5 Smoking or vaping of any substance is not permitted at Place of the Work.

.6 Consumption of alcohol and use of controlled substances is not permitted at Place of the Work.

1.4 LABOUR CONDITIONS

.1 Ensure rates of wages, working hours and working conditions at Place of the Work are in accordance with applicable regulatory requirements.

1.5 EMERGENCY CONTACT INFORMATION

.1 Submit emergency contact information for site superintendent to authority having jurisdiction, for their use 24 hours a day, 7 days a week, 52 weeks a year.

.2 Immediately notify authority having jurisdiction when emergency contact information changes.

1.6 NOISY WORK RESTRICTIONS

.1 Conform to applicable noise regulations and legislation.

.2 Schedule noisy work, or work requiring use of pneumatic tools, in a manner to avoid disturbance to existing facility occupants.

.3 This may require portions of the Work to be performed outside normal working hours.

1.7 SPECIAL PROCEDURES FOR CONTRACTORS WORKING IN EXISTING FACILITY

.1 Comply with Owner's procedures and requirements for construction personnel working in existing facilities.

.2 Conform to latest edition of "Guidelines For Maintaining Fire Safety During Construction in Existing Buildings", as issued by Office of the Fire Marshal.

.3 Coordinate requirements with local fire department. Discuss fire safety planning issues and alternative measures.

1.8 TIME OF WORK RESTRICTIONS IN EXISTING FACILITY

.1 When performing portions of the Work within existing facility, coordinate with Owner's representative to ensure operational program of existing facility is not disrupted. Conduct such coordination not less than 48 hours prior to commencing such portions of the Work.

.2 Work performed within existing facility is restricted to the following times:
.1 July 1 to August 31: Mondays to Fridays, between the hours of 7:30 am and 4:00 pm.
.2 September 1 to June 30: Mondays to Fridays, between the hours of 4:00 pm and 10:30 pm.

.3 Make special arrangements with Owner to perform any parts of the Work in existing facility outside of these hours. Submit requests for special arrangements not less than 48 hours in advance.

.4 Submit written notice to Owner and Owner's representative within 24 hours of any potential disruptions to continuing operations of existing facility.

.5 Schedule the Work so as to avoid potential disruptions to continuing operations of existing facility. Notify Owner in writing at least 24 hours in advance of any potential disruption to any adjoining areas to Place of the Work. Cooperate with Owner when scheduling such portions of the Work.

1.9 FOOD AND BEVERAGE RESTRICTIONS IN EXISTING FACILITY

.1 There shall be no food or beverages allowed within existing facility.

.2 Only water will be permitted to be consumed within existing facility.

.3 No sunflower seeds, peanuts, nuts, or similar foods are permitted at Place of the Work.

.4 Workers found to be in violation of this requirement will be required to leave Place of the Work and will be replaced by Contractor.

1.10 FIRE ALARMS IN EXISTING FACILITY

.1 Fire and smoke sensors are installed throughout existing facility. These devices may be triggered by jarring either directly or indirectly while working in adjacent areas.

.2 Determine nature and exact locations of existing fire and smoke sensors prior to commencement of the Work.

.3 Notify Owner prior to commencement of any part of the Work in the vicinity of fire and smoke sensor devices.

.4 Owner reserves the right to charge Contractor for costs incurred as a result of false fire alarms activated as a result of execution of the Work.

1.11 SPILL RESPONSE

.1 Prepare and initiate spill response procedure in accordance with appropriate regulatory requirements prior to commencing the Work.

.2 Supply and maintain spill kit at Place of the Work.

1.12 SPECIAL PROCEDURES FOR WORKING IN CONFINED SPACES

.1 Perform work in confined spaces in accordance with applicable legislation.

.2 Work in confined spaces must be supervised and performed by licenced confined space and hazardous materials personnel.

1.13 SPECIAL PROCEDURES FOR WORKING WITH DESIGNATED SUBSTANCES

.1 Prepare and initiate a Health and Safety Plan in accordance with authorities having jurisdiction prior to commencing work involving excavating and transporting or handling potentially contaminated materials.

.2 Keep an up-to-date copy of Health and Safety Plan at Place of the Work.

.3 Adhere to Health and Safety Plan for duration of removal and disposal of contaminated material from Place of the Work.

.4 Provide and maintain a safe working environment for on-site personnel and minimize the impact of construction activities on the general public and surrounding environment.

.5 Verify workers and visitors to Place of the Work have and are adequately trained in the use of appropriate personal protective equipment.

.6 Should any unforeseen, or site-peculiar safety related factor, hazard, or condition become evident during performance of the Work, notify authority having jurisdiction and Consultant immediately, and take prudent temporary action to establish and maintain safe working conditions until suitable permanent action can be implemented. Safeguard workers, the public and surrounding area from contamination.

.7 Perform routine air monitoring at Place of the Work, testing for organic vapours, explosive conditions and oxygen deficient conditions. Evacuate affected areas immediately and implement corrective measures if unsatisfactory conditions are discovered.

.8 Silica Precautions: Conform to Silica on Construction Projects guideline issued by Province of Ontario.

.9 In the event of injury to on-site personnel, contact designated hospital and describe injury prior to or during transport of injured personnel. Transport injured personnel to defined medical facility along predefined route.

.10 Take appropriate measures to minimize contact of vehicles and equipment with potentially contaminated materials. Vehicles, equipment and workers which do contact contaminated materials shall be decontaminated in an approved manner prior to leaving Place of the Work.

1.14 SECURITY DEPOSITS

.1 When Owner has submitted security deposits to authorities having jurisdiction prior to award of a particular Subcontract, responsible Subcontractor shall reimburse deposit amount to Owner. Failure to reimburse Owner the required amount will result in postponement of payment of Subcontractor's first application for payment.

END OF SECTION

1 General

1.1 REGULATORY REQUIREMENTS

.1 Perform the Work in accordance with latest editions of applicable regulatory requirements.

.2 Conform to requirements of authorities having jurisdiction.

.3 Nothing contained in Contract Documents shall be construed to be in conflict with any law, by-law or regulation of municipal, regional, provincial, federal or other authority having jurisdiction.

1.2 PERMITS AND FEES

.1 Refer to GC 10.2 - Laws, Notices, Permits and Fees.

.2 Determine detailed requirements of authorities having jurisdiction.

.3 Pay construction damage deposits levied by municipality in connection with issuing a building permit.

1.3 REFERENCES

.1 Where edition date is not specified, consider references to manufacturer's data, and published codes, standards and specifications are made to latest edition or revision, approved by issuing organization.

.2 Reference standards and specifications are quoted to establish minimum standards. Work which in quality exceeds the specified minimum will be considered to conform.

.3 Requirements of Contract Documents govern over requirements of reference standards and specifications.

.4 Specifications refer to standards writing, testing and certification organizations by their acronyms or initialisms, as follows:

.1	AA	The Aluminum Association;
.2	AABC	Associated Air Balance Council;
.3	AAMA	American Architectural Manufacturers Association;
.4	ACI	American Concrete Institute;
.5	AISC	American Iron and Steel Construction;
.6	AMCA	Air Movement and Air Control Association;
.7	ANSI	American National Standards Institute;
.8	ARI	Air Conditioning and Refrigeration Institute;
.9	ASCC	American Society of Concrete Contractors;
.10	ASME	American Society of Mechanical Engineers;
.11	ASTM	American Society for Testing and Materials;
.12	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.;
.13	AWMAC	Architectural Woodwork Manufacturers' Association of Canada;
.14	AWPA	American Wire Producers Association;
.15	BHMA	Builders Hardware Manufacturers Association;
.16	BIA	Brick Industry Association;
.17	CaGBC	Canadian Green Building Council;
.18	CCMPA	Canadian Concrete Masonry Producers Association;
.19	CFCA	Concrete Floor Contractors Association of Canada;
.20	CGA	Canadian Gas Association;
.21	CGSB	Canadian General Standards Board;
.22	CHPVA	Canadian Hardwood Plywood and Veneer Association;
.23	CISC	Canadian Institute of Steel Construction;
.24	CISCA	Ceiling & Interior Systems Construction Association;

.25 CKCA Canadian Kitchen Cabinet Association;
.26 CLFMI Chain Link Fence Manufacturers' Institute;
.27 CPC Concrete Polishing Council;
.28 CPCI Canadian Precast Concrete Institute;
.29 CPCQA Canadian Precast Concrete Quality Assurance;
.30 CPSC Consumer Product Safety Commission;
.31 CRCA Canadian Roofing Contractors' Association;
.32 CRI Carpet and Rug Institute;
.33 CSA Canadian Standards Association;
.34 CSC Construction Specifications Canada;
.35 CSDMA Canadian Steel Door Manufacturers' Association;
.36 CSSBI Canadian Sheet Steel Building Institute;
.37 CUFCA Canadian Urethane Foam Contractors Association Inc.;
.38 CWB Canadian Welding Bureau;
.39 CWC Canadian Wood Council;
.40 CWTA Canadian Wood Truss Association;
.41 DASMA Door & Access Systems Manufacturers' Association, International;
.42 DHI Door and Hardware Institute;
.43 DIN Deutsches Institut für Normung E.V.;
.44 GA Gypsum Association;
.45 GANA Glass Association of North America;
.46 HPVA Hardwood Plywood and Veneer Association;
.47 ICEA Insulated Cable Engineers Association;
.48 ICRI International Concrete Repair Institute;
.49 IEEE Institute of Electrical and Electronics Engineers;
.50 IGMAC Insulated Glass Manufacturers' Association of Canada;
.51 ISCA Interior Systems Contractors Association of Ontario;
.52 IWFA International Window Film Association;
.53 LEED Leadership in Energy and Environmental Design;
.54 MPI Master Painters' Institute;
.55 MSS Manufacturers Standardization Society of the Valve and Fittings Industry;
.56 NAAMM National Association of Architectural Metal Manufacturers;
.57 NCMA National Concrete Masonry Association;
.58 NEMA National Electrical Manufacturers Association;
.59 NFPA National Fire Protection Association;
.60 NFRC National Fenestration Rating Council Incorporated;
.61 NHLA National Hardwood Lumber Association;
.62 NLGA National Lumber Grades Authority;
.63 OIRCA Ontario Industrial Roofing Contractors' Association;
.64 OMCA Ontario Masonry Contractors' Association;
.65 OWTFA Ontario Wood Truss Fabricators Association;
.66 PCI Precast Concrete Institute;
.67 PEI Porcelain Enamel Institute;
.68 RSIC Reinforcing Steel Institute of Canada;
.69 SEFA Scientific Equipment & Furniture Association;
.70 SMACNA Sheet Metal and Air Conditioning Contractors' National Association;
.71 SSPC The Society for Protective Coatings;
.72 SWI Sealant and Waterproofer's Institute;
.73 TPIC Truss Plate Institute of Canada;
.74 TTMAC Terrazzo, Tile and Marble Association of Canada;
.75 ULC Underwriters' Laboratories of Canada;
.76 ULI Underwriters' Laboratories Incorporated;
.77 WDMA Window and Door Manufacturers' Association; and
.78 WHI Warnock-Hersey International.

1.4 QUALITY ASSURANCE

.1 Quality of work shall be best quality, executed by workers experienced and skilled in the respective duties for which they are employed.

.2 Maintain good order and discipline among workers engaged on Project. Do not employ on the Work anyone not skilled in their assigned tasks.

.3 Immediately notify Consultant if required Work is such as to make it impractical to produce required results.

.4 Decisions as to the quality or fitness of work in cases of dispute rest solely with Consultant, whose decision is final.

1.5 QUALITY CONTROL

.1 Refer to GC 2.3 - Review and Inspection of the Work.

1.6 TESTING AND INSPECTION SERVICES

.1 Independent inspection and testing agencies will be engaged by Owner for the purpose of inspecting and testing portions of the Work.

.2 Cost of testing and inspection by inspection and testing agencies shall be paid from the stipulated sum cash allowances specified in Section 01 21 00.

.3 Supply equipment required for executing inspection and testing by appointed agencies.

.4 Employment of inspection and testing agencies does not relax the responsibility to perform Work in accordance with Contract Documents.

.5 If defects are revealed during inspection and testing, the appointed agency will request additional inspection and testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no additional cost to Owner. Pay costs for retesting and reinspection.

.6 Allow inspection and testing agencies access to the Work, off-site manufacturing and fabrication plants.

.7 Cooperate to provide reasonable facilities for such access.

.8 Notify appropriate agency and Consultant in advance of the requirement for tests, in order that attendance arrangements can be made.

.9 Submit samples or materials required for testing, as specifically requested in Specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.

.10 Provide labour and facilities to obtain and handle samples and materials at Place of the Work. Provide sufficient space to store and cure test samples.

1.7 DEFECTIVE WORK

.1 Refer to GC 2.4 - Defective Work.

1.8 QUALITY CONTROL REPORTS

.1 Submit identified quantity of quality control reports promptly to each of the following:
- .1 Consultant: Two copies.
- .2 Owner: One copy.
- .3 Authorities having jurisdiction: One copy each.

.2 Forward copies of quality control reports promptly to each affected Subcontractor.

1.9 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as may be required.

.2 Costs of tests and mix designs beyond those called for in Contract Documents or beyond those required by laws at Place of Work shall be appraised by Consultant and may be authorized as recoverable.

1.10 MANUFACTURER FIELD REVIEW

.1 When required by Contract Documents, arrange for a qualified manufacturer's representative to review relevant parts of the Work and verify those portions of the Work are being executed in accordance with manufacturer's written recommendations and installation guidelines.

.2 Manufacturer field review services are intended to ensure specified Products are being used and are being installed on substrates that have been prepared in accordance with manufacturer's written recommendations.

.3 Unless specified otherwise, manufacturer's representative will undertake minimum one field review, with additional reviews being conducted as deemed necessary by manufacturer.

.4 Within two Working Days of a field review, manufacturer will submit a field review report recording manufacturer representative's observations and recommendations.

.5 Distribute copies of manufacturer's field review reports to affected Subcontractors, Consultant and authorities having jurisdiction.

1.11 MOCK-UPS

.1 Prepare mock-ups for portions of the Work specifically requested in Contract Documents. Include all Product and labour necessary to construct each mock-up.

.2 Construct mock-ups in locations acceptable to Consultant.

.3 Prepare mock-up for Consultant review with reasonable promptness and in an orderly sequence, so as not to cause delay in the Work.

.4 Failure to prepare mock-up in ample time is not considered sufficient reason for an 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 a schedule fixing the dates for preparation.

.6 Specifications identify whether mock-up may remain as part of the Work or must be removed.

1.12 MILL TESTS

.1 Submit mill tests certificates as may be requested.

1.13 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for facility services.

.2 Refer to facility services Sections for definitive requirements.

END OF SECTION

1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Provide temporary utilities, facilities and controls in order to execute the Work expeditiously.

.2 Maintain temporary utilities, facilities and controls in a neat and tidy condition.

.3 Remove temporary utilities, facilities and controls from Place of the Work when no longer required.

1.2 TEMPORARY WORK

.1 Refer to GC 3.3 - Temporary Supports, Structures and Facilities.

1.3 TEMPORARY UTILITIES

.1 Temporary Electricity
- .1 Owner will designate an existing source, and pay usage costs for temporary power during construction to ensure adequate temporary lighting; operation of power tools; temporary heating and ventilation; and to ensure proper completion of the Work.
- .2 Arrange for connection to designated source, and pay costs for installation, maintenance and removal.
- .3 Ensure use of existing power source does not interrupt or affect continuing operations of existing facility.
- .4 Provide and maintain temporary electrical systems to CSA C22.1:21, Canadian Electrical Code, Part 1 - Safety Standard for Electrical Installations.

.2 Temporary Heating, Cooling and Ventilating
- .1 Provide temporary heating and cooling required during construction period, including attendance, maintenance and fuel.
- .2 Unless specified otherwise, maintain temperatures between 10 degrees C and 35 degrees C in areas where construction is in-progress.
- .3 Temporary heaters will be forced hot air type, operated in a well ventilated location. Vent direct fired heaters directly to exterior and extend vent beyond wall face to avoid staining. Open flame heaters or salamanders are not permitted.
- .4 Uniformly distribute heat to avoid hot and cold areas and to prevent excessive drying.
- .5 Upon approval of Owner, the existing permanent heating system, or portions thereof, may be used when available. Be responsible for damage thereto.
- .6 On completion of the Work, replace filters in permanent heating system and clean ducts.
- .7 Ventilation: Provide minimum one air change per hour for enclosed areas receiving architectural finishes.
- .8 Ensure adequate ventilation whenever using hazardous or volatile adhesives, coatings or substances.
- .9 Do not allow excessive build up of moisture in the Work.

.3 Temporary Lighting: Provide and maintain suitable lighting during hours of darkness at danger points.

.4 Temporary Communications: Provide temporary telephones, and wireless internet service at Place of the Work, for own use and use of the Consultant.

.5 Temporary Water:
- .1 Owner will designate an existing source, and pay the usage costs, for a continuous supply of potable water for construction use.
- .2 Arrange for connection to designated source, and pay costs for installation, maintenance and removal.
- .3 Ensure use of existing water sources does not interrupt or affect continuing operations of existing facility.

1.4 CONSTRUCTION FACILITIES

.1 Field Offices
.1 Provide and maintain in clean condition during progress of Work, an adequately lighted, heated and ventilated construction office with sufficient space and furnishings to accommodate holding meetings, filing documents and laying out Contract Documents.
.2 Subcontractors may provide their own field offices as necessary. Direct location of Subcontractor field offices.

.2 Storage Facilities
.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of Products and Construction Equipment.
.2 Do not store Products or Construction Equipment in field office.

.3 First Aid
.1 Provide appropriate emergency and first aid equipment in accordance with authorities having jurisdiction.
.2 Mount emergency and first aid equipment in a prominent and easily accessible location with easily identifiable labels.
.3 A minimum of one person trained in basic first aid must be present at Place of the Work at all times during execution of the Work. This person may perform other duties, but must be immediately available to render first aid when needed.

.4 Sanitary Facilities
.1 Provide sufficient quantity of separate temporary sanitary facilities for male and female workers in accordance with authorities having jurisdiction.
.2 Keep sanitary facilities clean and fully stocked with necessary supplies.
.3 New and existing permanent sanitary facilities may not be used.
.4 Except where connected to municipal sewer system, periodically remove wastes from Place of the Work.

1.5 TEMPORARY HOISTS AND CRANES

.1 Provide, operate and maintain temporary hoists and cranes required for moving of workers, Products and Construction Equipment.

.2 Make financial arrangements with Subcontractors for use thereof.

.3 Temporary hoists and cranes must be operated by properly trained and qualified operators.

1.6 CONSTRUCTION PARKING

.1 Limited parking will be permitted at Place of the Work, as long as it does not disrupt continuing operations of existing facility.

1.7 VEHICULAR ACCESS

.1 Provide and maintain adequate access to Place of the Work, ensuring continuous access by emergency vehicles.

.2 Construct and maintain temporary access roads as required or where indicated on Drawings.

.3 Existing private roadways at Place of the Work may be used for access to Place of the Work. Contractor assumes responsibility for any damage caused by construction traffic and agrees to prevent or promptly clean up mud tracking or material spillage.

.4 Clean municipal roadways located immediately adjacent to Place of the Work, regardless of cause, as follows:
.1 At least once per week on Friday afternoons, just before end of Working Day,
.2 After construction equipment or vehicles have left Place of the Work, resulting in soil or debris being deposited on roadway surfaces,

.3 As directed by authorities having jurisdiction, and
.4 As directed by Consultant.

.5 Municipal Road Closures: Conform to requirements of authorities having jurisdiction.

1.8 TEMPORARY BARRIERS AND ENCLOSURES

.1 Protective Enclosures:
.1 Erect 1 800 mm high temporary modular metal fencing system around Place of the Work.
.2 Protect public and workers from injury.
.3 Protect public and private property from damage.
.4 Provide locking gates to restrict access to only authorized personnel and vehicles.
.5 Provide and maintain full safety protection at open shafts in floors, roof decks and other working surfaces.
.6 Provide and maintain suitable warning signs as required by applicable regulatory requirements.

.2 Weather Enclosures:
.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Dust Barriers:
.1 Provide dust tight screens or partitions to localize dust generating activities, and for the protection of workers, finished areas of Work and existing facility occupants.
.2 Maintain and relocate protection until such Work is complete.

.4 Security Measures:
.1 Maintain security at Place of the Work by controlling access through enclosing fences, barricades and hoardings during times the Work is in progress, and by locking hardware otherwise.
.2 After the Work is enclosed, maintain its security by adequate barriers to entry, and by temporary doors equipped with locking hardware.
.3 Maintain security at all times construction is shut down due to strikes or lockouts.
.4 Make Good damage resulting from vandalism or other breaches of security.
.5 Replace stolen and damaged Products resulting from breaches of security.

.5 Existing Building Entrances and Exits:
.1 Maintain existing building entrances and exits to ensure public safety.
.2 Where existing entrances and exits are blocked or adversely affected by construction activities, Provide temporary entrances and exits in accordance with regulatory requirements.

1.9 TEMPORARY CONTROLS

.1 Erosion and Sediment Control: Provide erosion and sedimentation fencing with filter mat as required by authorities having jurisdiction.

.2 Temporary Dewatering:
.1 Provide temporary drainage and pumping as necessary to keep excavations and Place of the Work free from water.
.2 Dispose of water containing silt-in-suspension in accordance with authorities having jurisdiction.
.3 Maintain existing drainage, above ground and underground, adjacent to the Work or affected by the Work.

.4 Before commencing any portion of the Work likely to affect the drainage of water from existing facility or Place of the Work, Provide necessary alternative drainage systems to ensure water will be conducted to alternative outlets. Do not block or impede any drain, roof outlet or rainwater leader after such safety precautions have been made.

.3 Clean catch basins and storm lines at Place of the Work as required to ensure their continuous operation during execution of the Work.

1.10 PROJECT IDENTIFICATION

.1 Owner will supply and install a Project identification sign.

.2 Project identification sign will be approximately 2 440 x 6 100 mm in size; constructed of wood framing and plywood, and mounted to 4 wooden posts set in concrete pier foundations.

.3 Maintain Owner's Project identification sign in clean condition for duration of the Contract.

.4 Remove and dispose of Owner's Project identification sign, including concrete pier foundations, when directed by Consultant.

.5 Make Good surrounding landscaping to match.

END OF SECTION

1 General

1.1 DEFINITIONS

.1 Not In Contract (NIC) means an item that requires coordination for its later installation, and which is not Provided as part of the Work.

.2 Owner-supplied Products means an item that will be supplied by Owner to SC01 - General Subcontractor for installation as part of the Work.

1.2 BASIC PRODUCT REQUIREMENTS

.1 Refer to GC 3.8 - Labour and Products.

.2 Products referred to in the singular implies the supply and installation of as many Products as necessary to complete the Work.

.3 Unless specified otherwise, Consultant may select colours from manufacturer's complete range of available colours, textures and patterns, including those considered to be premium.

.4 Conceal trademarks and labels, including applied labels, in finished areas of the Work. Trademarks and labels that are essential for identifying Products for maintenance purposes, and for identifying life safety, fire resistance and temperature rise ratings may remain visible.

1.3 OWNER-SUPPLIED PRODUCTS

.1 Owner Responsibilities
- .1 Order and pay for Owner-supplied Products not already in Owner's possession.
- .2 Arrange and pay for delivery of Owner-supplied Products F.O.B. Place of the Work, within time frames required by Contractor's construction progress schedule. If delivered sooner than required by Contractor's latest construction progress schedule submitted to Owner, arrange and pay for delivery to a temporary storage location and subsequent delivery to Place of the Work.
- .3 Advise Contractor in writing of the value of Owner-supplied Products for Contractor's insurance purposes.
- .4 Arrange and pay for delivery to Contractor of reviewed Shop Drawings, Product data, samples, and manufacturer's instructions and certificates.
- .5 Inspect deliveries jointly with Contractor.
- .6 Submit claims for transportation damage.
- .7 Arrange for replacement of damaged, defective or missing items identified at time of delivery.
- .8 Arrange for manufacturer's field services.
- .9 Arrange for delivery of manufacturer's warranties to Contractor for inclusion in operation and maintenance manuals.

.2 Contractor Responsibilities
- .1 Designate in construction progress schedule, time frames for delivery of Owner-supplied Products to Place of the Work and for receipt of related submittals. If Place of the Work is not ready to receive delivery of Owner-supplied Products within the time frame indicated in the latest construction progress schedule submitted to Owner, arrange and pay for delivery to a temporary storage location and subsequent delivery to Place of the Work.
- .2 Review required submittals and notify Consultant of any observed discrepancies or anticipated problems.
- .3 Ensure that course of construction insurance is adequate to cover Owner-supplied Products.
- .4 Receive and unload Owner-supplied Products at Place of the Work.
- .5 Inspect deliveries jointly with Owner. Record and notify Owner and Consultant of shortages and visibly damaged or defective items.

.6 Handle Owner-supplied Products at Place of the Work, including uncrating and storage. Dispose of waste materials and debris.
.7 Take appropriate precautions to protect Owner-supplied Products from loss or damage.
.8 Repair or replace items damaged at Place of the Work.
.9 Assemble, install, connect, adjust and finish Owner-supplied Products.
.10 Arrange for inspections required by authorities having jurisdiction.
.11 Arrange for or perform testing required by authorities having jurisdiction.
.12 Workmanship warranty for installation.
.13 Make Good Owner-supplied Products damaged by Contractor or Subcontractors at Place of the Work.

.3 Schedule of Owner-supplied Products
.1 Paper towel dispensers.
.2 Soap dispensers.

1.4 PRODUCT DELIVERY REQUIREMENTS

.1 Ensure Products are packaged, delivered and stored to prevent damage and to ensure their moisture content is not increased beyond manufactured or specified installation limits.

.2 Label packaged goods to completely describe contents.

.3 Immediately review Product delivery requirements and anticipate foreseeable supply delays for any items.

.4 In the event Contractor fails to notify Consultant of foreseeable supply delays at commencement of the Work, Consultant reserves the right to substitute more readily available Products of similar character, at no increase in Contract Price.

1.5 PRODUCT STORAGE AND HANDLING REQUIREMENTS

.1 Handle and store Products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Provide necessary protection for those materials that require it.

.3 Store Products in a neat and tidy manner.

.4 Store packaged or bundle Product in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in the Work.

.5 Do not allow Product to be placed in contact with ground nor with other materials that could stain them. Store Product subject to damage from weather in weatherproof enclosures.

.6 Store paint and other volatile substances in a separate structure located at least 15 metres from existing facility, and equipped with a suitable size and type of fire extinguisher.

.7 Store materials within existing facility only as approved by Owner. Move materials stored within existing facility should they become a hindrance to Owner's operations, performance of the Work or to delivery of other materials.

.8 Receive, handle, protect and store furniture, fitments and equipment (FF&E) purchased by Owner for use in the Project as they are delivered to Place of the Work.

.9 Remove flammable rubbish and packing materials from Place of the Work.

END OF SECTION

1 General

1.1 CONCEALED CONDITIONS

.1 Refer to GC 6.4 - Concealed or Unknown Conditions.

1.2 EXAMINATION AND ACCEPTANCE OF CONDITIONS

.1 Verify conditions are ready to receive installation.

.2 Ensure substrate surfaces are clean, dimensionally stable, cured and free of contaminants such as oil, sealers and curing compounds.

.3 Notify Consultant in writing of unacceptable conditions.

.4 Commencement of installation means acceptance of conditions.

END OF SECTION

1 General

1.1 EXECUTION REQUIREMENTS

.1 Unless noted otherwise, install, apply or erect Products in strict accordance with manufacturer's written installation instructions and guidelines.

.2 Specifications requiring installation, erection or application of Products to conform to a consensus standard does not replace or supercede the requirement to also conform to manufacturer's written installation instructions and guidelines.

.3 Where manufacturer's installation instructions and requirements of a specified consensus standard are contradictory, manufacturer's written installation instructions and guidelines will govern.

.4 Improper installation, application or erection of Products will result in Consultant requiring their complete removal and replacement with new Products at no increase in Contract Price.

.5 In finished areas, conceal facility service components within construction assemblies, except where indicated otherwise.

.6 Extra payment for incidental furring or other enclosure will not be approved.

.7 Prevent electrolytic and galvanic reactions from occurring between dissimilar metals and materials.

.8 Make holes and voids required for facility service penetrations of correct size to accommodate penetrating items plus any fill material such as backer rods and joint sealants, insulation, firestops and smoke seals.

.9 Remedial Work: Refer to GC 3.12 - Cutting and Remedial Work, and Section 01 73 29.

1.2 COLD WEATHER REQUIREMENTS

.1 Perform the Work continually and avoid weather delays.

.2 Provide temporary heating and cold weather working measures during cold weather periods and winter months. Refer to Section 01 50 00.

.3 Construction delays, whether the responsibility of Contractor or otherwise, which result in unanticipated or extended winter work will not be considered justification for claims for additional payments.

.4 Uniformly distribute heat to avoid hot or cool areas or excessive drying.

1.3 SITE STORAGE AND OVERLOADING

.1 Refer to GC 3.11 - Use of the Work.

.2 Unless specifically indicated, do not cut, drill or sleeve any load bearing structural member without prior written approval of Consultant.

1.4 EXISTING UTILITIES

.1 Refer to GC 9.1 - Protection of Work and Property.

.2 When breaking into or connecting to existing facility or utility services, execute Work at times directed by authorities having jurisdiction, with minimum disturbance to the Work, and to pedestrian and vehicular traffic.

.3 Protect, relocate or maintain existing active services.

.4 When existing services are encountered, cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service.

1.5 INTERFERENCES

.1 Prior to commencement of the Work, coordinate placement of Products to ensure components are properly accommodated within designed spaces. Prepare and submit interference drawings as specified in Section 01 33 00.

.2 Be responsible for additional work and costs necessitated by failure to coordinate the parts of the Work.

.3 Provide adequate access and clearances around Products as required by authorities having jurisdiction, and as required for maintenance purposes by manufacturers.

.4 Notify Consultant if Contract Documents are in conflict with access and clearance requirements.

1.6 LOCATION OF FIXTURES AND FITMENTS

.1 Locations of fixtures and fitments indicated on Drawings are approximate only.

.2 Locate fixtures and fitments precisely in the Work after consultation with affected installer and Consultant.

1.7 INSERTS, ANCHORS AND FASTENERS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Provide fasteners to the full required complement. Products with missing fasteners will be rejected by Consultant.

.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.

.4 Use only factory made, threaded or toggle type inserts for supports and anchors, properly sized for load being carried.

.5 Where inserts cannot be placed, use factory made expansion shields for light weights only.

.6 Provide inserts, holes, anchor bolts and sleeves during placement or fabrication of structural elements.

.7 Fasteners stressed in withdrawal will be rejected.

.8 Metal fasteners are to be of a material that will not set up a galvanic reaction with the materials being fastened.

.9 Powder-actuated fasteners are to be a system suitable for the specific application, corrosion-resistant, and capable of sustaining without failure a load equal to 10 times the design load when tested to ASTM E1190.

.10 Do not use powder-actuated fasteners stressed in withdrawal for finished work.

.11 Do not use powder-actuated fasteners within 100 mm of concrete or masonry edges.

.12 Do not use powder-actuated fasteners in post-tensioned concrete.

1.8 TEMPLATES, BUILT-INS AND DIMENSIONS

.1 Take dimensions necessary for the proper execution of the Work.

.2 Assume responsibility for accuracy and completeness of dimensions.

.3 Provide forms, templates, anchors, inserts and accessories to be fixed to or inserted as part of the Work.

.4 Prepare and submit setting drawings, templates and other information necessary for placement and installation of Products, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels.

.5 Supply items in sufficient time, complete with templates and other necessary information, to accommodate installation without causing delay to the Work. Failure to do so will not result in an increase in Contract Price and Contract Time.

.6 Verify that the Work, as it proceeds, is executed in accordance with dimensions and positions indicated, which maintain levels and clearances to adjacent work, as set out in Contract Documents.

.7 Ensure defective and rejected work is corrected before subsequent construction commences. Refer to Section 01 71 00.

.8 Verify details and measurements at Place of the Work prior to fabricating Products of special design to ensure fit.

END OF SECTION

1 General

1.1 SUBMITTALS

.1 Submit written request in advance of cutting or alteration which affects:
.1 Structural integrity of any element of Project.
.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 contractor.

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

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit requests for substitutions as specified in Section 01 25 00.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of work.

.3 Beginning of cutting and patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill to complete the Work.

.2 Fit the 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 the Work for penetrations by facility services.

.7 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

.8 Employ properly trained labourers to perform cutting and patching for weather-exposed and moisture-resistant elements, and for visually-exposed surfaces.

.9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools are not allowed with masonry materials without prior written approval.

.10 Restore work with new Products in accordance with requirements of Contract Documents.

.11 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.12 At penetration of fire-rated assemblies, completely seal voids with firestopping and smoke seal materials, for full thickness of assembly.

.13 Refinish surfaces to match adjacent finishes, as follows:
- .1 Continuous Surfaces: Refinish to nearest intersection.
- .2 Assemblies: Refinish entire unit.

END OF SECTION

1 General

1.1 PROGRESS CLEANING

.1 Maintain the Work in tidy condition, free from accumulation of waste and debris, other than that caused by Owner or other contractors.

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

.3 Remove waste and debris from Place of the Work in an approved manner at end of each Working Day.

.4 Clean interior areas prior to installing finishing Products.

.5 Maintain areas free of dust and other contaminants during finishing operations.

1.2 FINAL CLEANING

.1 Refer to GC 3.13 - Cleanup.

.2 Provide professional cleaning by a recognized, established cleaning company.

.3 Standards Meeting: Prior to final cleaning, hold a meeting at Place of the Work to determine the acceptable standard of clean. Owner, Consultant, Contractor and cleaning Subcontractor to be in attendance.

.4 Lock each room after completing final cleaning in that area.

.5 Restrict access to areas that have been final cleaned. Re-clean areas that have been accessed by workers prior to Owner occupancy.

.6 Remove stains, dirt and smudges from finished surfaces. Conform to respective manufacturers' recommendations.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, and plastic laminate.

.8 Replace broken, scratched or disfigured glass.

.9 Clean electrical and mechanical fixtures and other fittings of labels, wrappings, paper and other foreign material.

.10 Vacuum clean and dust building interiors, including inside ducts, blowers and coils and behind grilles, louvres and screens.

.11 Wax, seal, shampoo and prepare floor finishes as recommended by manufacturers.

.12 Power wash exterior paved surfaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Conform to CCA 81-2001, A Best Practices Guide to Solid Waste Reduction.

.2 Fire and burning of waste and debris at Place of the Work is not permitted.

.3 Burying of waste and debris at Place of the Work is not permitted.

.4 Disposal of waste or volatile materials, such as kerosene, mineral spirits, oil or paint thinner into storm or sanitary sewers is prohibited. Collect such waste in appropriate containers and dispose of in accordance with applicable regulatory requirements.

.5 Provide on-site disposal service for rubbish accumulated by Subcontractors and Suppliers, in accordance with authorities having jurisdiction.

.6 Prevent extraneous materials from contaminating air beyond application areas by constructing temporary enclosures as specified in Section 01 50 00.

.7 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

.8 Deposit packaging materials in appropriate container at Place of the Work for recycling or reuse.

.9 Avoid using landfill waste disposal procedures when recycling facilities are available.

.10 Keep discarded packaging away from children.

1.4 HAZARDOUS WASTE DISPOSAL

.1 If and when required, remove and dispose of contaminated material in accordance with applicable regulatory requirements.

.2 Transport contaminated material using a licensed waste hauling company.

.3 Submit one copy of waste hauling company's Certificate of Approval to authority having jurisdiction prior to transporting contaminated materials.

.4 Stockpile suspected contaminated material temporarily in neat and secure stockpiles overlying a double layer of 0.20 mm thick high density polyethylene.

.5 Isolate stockpiles from remainder of Place of the Work and cover with a single layer of 0.20 mm thick polyethylene to prevent entry, wind disturbance or collection of surface water.

.6 Do not transport potentially contaminated material until such material has been identified by authority having jurisdiction.

END OF SECTION

1 General

1.1 REFERENCES

.1 AABC National Standards for Field Measurements and Instrumentation, Total Systems Balance, Air Distribution Hydronics Systems.

1.2 QUALITY ASSURANCE

.1 Testing Organization: Current member in good standing of AABC certified to perform specified services.

.2 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

1.3 SUBMITTALS

.1 Prior to commencement of the Work, submit names of specialty personnel proposed to perform services.

.2 Submit 3 copies of final reports on applicable forms.

1.4 SYSTEM START-UP PROCEDURES

.1 Comply with procedural standards of certifying associations under whose standards these services will be performed.

.2 Arrange for affected Subcontractors to send senior and capable personnel for demonstrations, training and start-up instructions prior to system start-up.

.3 Start-up equipment and systems, bringing them to expected operational levels.

.4 Report to Consultant any deficiencies or defects noted during start-up.

.5 Prepare each system for testing and balancing.

1.5 TESTING, ADJUSTING AND BALANCING PROCEDURES

.1 Test equipment, balance distribution systems and adjust devices.

.2 Cooperate with testing organization, ensuring adequate access to equipment and systems.

.3 Notify testing organization 7 days prior to when Project will be ready for testing, adjusting and balancing.

.4 Provide instruments required for testing, adjusting and balancing operations.

.5 Verify systems installation is complete and in continuous operation.

.6 Verify lighting is turned on when lighting is included in cooling load.

.7 Verify equipment is in full operation.

END OF SECTION

1 General

1.1 DEFINITIONS

.1 Make Good means to restore new or existing work after being damaged, cut, patched or rejected by Consultant. Use materials identical to original materials, with visible surfaces matching appearance of original surfaces in all respects and with no apparent junctions between new and original surfaces.

1.2 PROTECTING INSTALLED CONSTRUCTION AND ADJACENT PROPERTY

.1 Refer to GC 9.1 - Protection of Work and Property.

.2 Refer to Specifications for Product-specific protection requirements.

.3 Adequately protect parts of the Work that are either completed or in-progress.

.4 Unless specified otherwise, maintain protection until Substantial Performance of the Work.

.5 Provide protective coverings at walls, projections, corners and jambs, sills and soffits of openings in and adjacent to traffic areas.

.6 Remove protection and protective coverings upon expiry of specified duration.

.7 Protect Products from frost during construction.

.8 Remove snow and ice from the uncompleted roof and from any floors.

.9 As soon as the Work is sufficiently advanced, and in order to prevent delay, enclose the Work using tarpaulins, plastic sheeting or glazing, and temporary lockable doors.

.10 Provide protection for completed and partially completed finishes and equipment during performance of the Work.

.11 Protect prefinished Products from damage caused by subsequent construction operations.

.12 Protect existing trees and vegetation designated to remain as part of Project to OPSS.MUNI 801. Provide snow fencing or other protection where directed by Consultant.

1.3 UNDERGROUND AND CONCEALED SERVICES

.1 Protect facility and utility services from damage during performance of the Work.

.2 Take necessary precautions to locate underground and concealed utility services. Protect concealed utility services from damage.

1.4 WATERPROOFING AND ROOFING

.1 Restrict traffic from using waterproofed and roofed surfaces and restrict material storage on these surfaces.

.2 Keep waterproofed and roofed surfaces free of debris.

1.5 MAKING GOOD

.1 Make Good defective and damaged portions of the Work.

.2 Make Good damage to property adjacent to Place of the Work.

.3 Make Good damage to existing surfaces designated to remain as part of the Work.

.4 Make Good damage to the Work resulting from lack of adequate heating protection.

.5 Make Good damaged utility or facility services in accordance with authorities having jurisdiction.

END OF SECTION

1 General

1.1 CLOSEOUT PROCEDURES

.1 Conform to OGCA 100 - OAA/OGCA Takeover Procedures FOR PROJECTS UNDER THE CONSTRUCTION ACT (after July 1, 2018).

.2 Additional Reviews Required of Consultant: In the event Consultant must undertake additional reviews and assessments beyond those described, and resulting from either Contractor's lack of preparation or their inability to correct deficiencies within the time prescribed, then Contractor shall reimburse Consultant for such additional reviews and assessments, paid for at Consultant's standard hourly rate.

.3 Video Inspections of Underground Utility Services
- .1 Prior to applying for Substantial Performance of the Work, conduct a video inspection of the interior condition of underground utility services, including water mains, storm sewers and sanitary sewers.
- .2 Pay for video inspection as Cost of the Work.
- .3 Submit video record to Consultant.

.4 Above Ceiling Work
- .1 Prior to installation of gypsum board ceilings and placement of acoustical lay-in ceiling tiles, advise Consultant that above-ceiling work is complete and ready for review. Allow minimum 72 hours notice for any cancellation or changes; failure to do so may result in back charges to Contractor for costs of Owner's personnel.
- .2 Owner, Consultant and affected subconsultants will conduct above-ceiling review and prepare list of deficiencies.
- .3 Correct deficiencies and advise Consultant when they have been corrected.
- .4 Do not install gypsum board ceilings or acoustical ceiling panels until Consultant has verified that above-ceiling deficiencies have been corrected.
- .5 Substantial performance inspection may not proceed until above-ceiling deficiencies have been corrected.

.5 Substantial Performance of the Work
- .1 Refer to GC 5.5 - Substantial Performance of the Work.
- .2 Prior to requesting Substantial Performance of the Work, prepare and submit a complete deficiency list.
- .3 Owner, Consultant and affected subconsultants will review the Work and may require additional items be added to deficiency list.
- .4 Prior to requesting Substantial Performance of the Work, submit the following:
  - .1 Written statement that the Work has been substantially performed in accordance with Contract Documents, and is ready for use.
  - .2 Verification that operation of systems has been demonstrated to Owner.
  - .3 Two copies of complete and reviewed operation and maintenance manuals.
  - .4 Inspection and acceptance certificates required from authorities having jurisdiction.
  - .5 Life safety systems verification.

.6 Final Payment
- .1 When deficiencies have been corrected, and not later than 60 days after the date of Substantial Performance of the Work, request a final review of the Work.
- .2 Owner, Consultant and affected subconsultants will review the Work and notify Contractor of outstanding deficiencies.
- .3 After expiry of 60 day period, Owner may elect to correct outstanding deficiencies and deduct resulting costs from final payment. Deficient work shall be valued at 150 percent of normal cost with no item less than $50.00.
- .4 Prior to claiming final payment, submit:
  - .1 As-built drawings.

.2 A complete set of reviewed Shop Drawings, folded to 8-1/2" x 11" size, contained in heavy duty manila envelopes, numbered and labelled. Follow specification format with no more than one Section per envelope.
.3 Operation and maintenance manuals.
.4 A final accounting of approved changes to Contract Price, including adjustments to cash allowances.

END OF SECTION

1 General

1.1 OPERATION AND MAINTENANCE MANUALS

.1 Submit to Consultant two bound hard copies and one digital copy of completed operation and maintenance manuals.

.2 Prepare digital copy in the form of Adobe Acrobat (.pdf) files.

.3 Organize data in the form of an instructional manual, with hard copies bound in commercial-quality binders, 8-1/2" x 11" size, with maximum ring size.

.4 Cover: Identify each binder with typed or printed title "Operation and Maintenance Manuals"; listing volume number, Project name and identifying subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Prepare hard copies with tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.

.7 Prepare digital copy with electronic bookmarks for each separate Product and system, with description of Product and major component parts of equipment.

.8 Extended Warranties: Arranged in systematic order matching specification format. Include a listing of extended warranties. Each warranty must indicate Project name and address, Owner's name, corresponding Section number and title, and issuer's name, address, telephone number, web site address, contact person information, seal and signature.

.9 Prepare Drawings with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.10 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.11 As a minimum requirement, include the following information as applicable:
- .1 Table of Contents. If more than one volume is required, provide a cross-reference contents page at the front of each volume.
- .2 Complete list of Subcontractors and Suppliers, indicating name, address, telephone and fax numbers, contact person information, and description of work performed.
- .3 Complete list of Products used in the Work, indicating Product name, part number or code and manufacturer for each listing.
- .4 Door hardware schedule, as amended.
- .5 Schedule of paints and coatings, including identification of each surface with applicable paint or coating used. Enclose copy of colour schedule.
- .6 Maintenance instructions for finished surfaces.
- .7 Brochures, cuts of equipment and fixtures.
- .8 Operating and maintenance instructions for equipment.
- .9 Valve manual.
- .10 Controls schematics.
- .11 Air and water balancing reports.
- .12 Extended warranties.
- .13 Maintenance contracts.
- .14 Other data required by Contract Documents.

1.2 AS-BUILT DOCUMENTS

.1 Promptly record revisions, omissions and additions on one set of black line opaque Drawings and in Specifications.

.2 Keep as-built documents up-to-date at all times. Failure to do so may result in postponement of payment.

.3 Record information concurrently with construction progress.

.4 Do not conceal work until required information is recorded.

.5 Legibly mark each item to record actual construction, including manufacturer name, trade name and catalog number of each product actually installed, particularly optional items and substitutions.

.6 Maintain manufacturers' certifications, inspection certifications, hardware schedules, colour schedules and field test records as required by Specifications.

.7 Mark revised documents as "AS-BUILT".

.8 Include revisions, with special emphasis on mechanical, electrical, structural steel and reinforced concrete.

.9 Prior to Substantial Performance of the Work, collect marked-up drawings from Subcontractors and have information electronically transferred to a master set of drawing files by Consultant. Pay Consultant for electronic transfer of as-built information from cash allowances specified in Section 01 21 00.

1.3 SPARE PARTS, SPECIAL TOOLS AND EXTRA MAINTENANCE MATERIALS

.1 Two weeks prior to requesting Substantial Performance of the Work, submit to Consultant special tools or equipment required for maintenance purposes.

.2 Spare parts and maintenance materials shall be new, not damaged or defective, and of same quality and manufacture as Products incorporated in the Work. If requested, furnish evidence as to type, source and quality of spare parts and maintenance materials.

.3 Defective Products will be rejected, regardless of previous inspections. Replace defective Products.

.4 Store spare parts and extra maintenance materials in a manner to prevent damage or deterioration.

.5 Submit spare parts, special tools, maintenance and extra materials in specified quantities.

END OF SECTION

1 General

1.1 DEMONSTRATION AND TRAINING

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing and maintenance of each item of equipment at agreed upon times and at designated locations.

.2 Owner will prepare a list of personnel to receive instructions, and will coordinate their attendance at agreed upon times.

.3 Prior to demonstrations proceeding, ensure equipment has been inspected and put into proper operation, including start-up, testing, adjusting and balancing.

.4 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.5 Review contents of operating and maintenance manual in detail to explain aspects of operation and maintenance.

.6 Allow Owner to video record demonstration and training instructions.

.7 Prepare and insert additional data in operation and maintenance manuals when need for additional data becomes apparent during instructions.

END OF SECTION

1 General

1.1 REFERENCES

.1 CSA S350-M1980 (R2003): Code of Practice for Safety in Demolition of Structures.

.2 CSA Z783-12: Deconstruction of Buildings and Their Related Parts.

1.2 SEQUENCING

.1 Schedule deconstruction activities to minimize disruption to existing facility operations.

.2 Verify deconstruction schedule with Consultant prior to commencement of the Work.

.3 Protect existing facility occupants from dust and from any danger arising from deconstruction operations. Refer to Section 01 50 00.

1.3 SPECIAL PROCEDURE SUBMITTALS

.1 Submit 3 copies of each photograph taken of existing conditions to Consultant.

1.4 QUALIFICATIONS

.1 Demolition Supervisor: An individual experienced in building deconstruction, capable of ensuring deconstruction is carried out safely, expeditiously and without unnecessary damage to materials and surfaces designated to remain.

1.5 FIELD CONDITIONS

.1 Inspect and photograph existing adjacent surfaces and assemblies.

.2 Record conditions and stability in a manner suitable for evaluation of possible damage caused by deconstruction operations.

.3 Approximate locations of existing facility services may be indicated on Drawings. Owner and Consultant assume no responsibility for accuracy of such information.

2 Products

2.1 REGULATORY REQUIREMENTS

.1 Permits and Fees: Include tipping charges and other related fees necessary for completion of deconstruction operations.

.2 Utilities: Obtain approval from authorities having jurisdiction prior to commencing deconstruction operations.

.3 Hazardous Waste: Conform to authorities having jurisdiction.

2.2 EQUIPMENT

.1 Deconstruction: Appropriate equipment for type of deconstruction being contemplated.

.2 Do not use heavy equipment for making openings in existing walls or in confined spaces where damage to other parts of the Work or adjacent property may result.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify locations and construction of structures to be demolished.

.3 Verify construction and details of other existing and adjacent property.

.4 Verify location of utility and facility services.

.5 Undertake x-ray investigations of existing building elements designated for selective demolition to determine locations of concealed components, utility services and facility services.

3.2 PREPARATION

.1 Erect shoring, bracing and other temporary structures to prevent collapse, settlement and movement of property. Refer to Section 01 50 00.

.2 Provide and maintain dust protection screen as specified in Section 01 50 00.

.3 Provide and maintain weather enclosures as specified in Section 01 50 00.

.4 Barricade access by unauthorized persons to areas in which deconstruction is in-progress.

.5 Post danger signs in conspicuous locations to warn persons that deconstruction is in-progress.

.6 Erect protection to ensure safe access that must be maintained to existing areas still occupied by the public.

.7 Protect adjacent property from damage caused by deconstruction operations.

.8 Remove flammable and contaminated materials, and refuse from area before deconstruction operations commence.

.9 Arrange for disconnection, capping and plugging of facility services that may be affected by deconstruction operations.

3.3 DECONSTRUCTION

.1 Perform deconstruction work in an expeditious and safe manner.

.2 Conform to CSA S350-M and CSA Z783.

.3 Confine deconstruction operations to only those areas required.

.4 Prevent and contain spread of dust.

.5 Do not drop debris more than one storey unless in an enclosed chute. Lower large components carefully, under control and fully supported at all times.

.6 Withdraw or flatten protruding nails as deconstruction operations proceed.

3.4 SALVAGE

.1 Carefully remove materials scheduled for salvage to CSA Z783.

.2 Clean and prepare salvaged items for use by others.

.3 Store salvaged materials in secure locations, protected from damage.

.4 Items not scheduled for salvage become property of Contractor.

3.5 CLEANING

.1 Leave Place of the Work in a clean and orderly condition, ready for use by others.

.2 Remove waste and debris in accordance with authorities having jurisdiction.

.3 Remove protections, barricades and other temporary constructions on completion of deconstruction operations.

.4 Make Good property and materials damaged during deconstruction operations.

END OF SECTION

1 General

1.1 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating Product composition, physical and chemical properties, Product limitations and installation guidelines, and warranty details.

1.2 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance guidelines, including precautions for avoiding staining; sufficient quantity for inclusion in operation and maintenance manuals.

1.3 QUALIFICATIONS

.1 Applicator: A firm specializing in applying concrete floor sealers, and having minimum 5 years documented experience.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products protected from harmful environmental conditions. Conform to manufacturer's recommended temperature and humidity conditions.

.3 Store and handle Products protected from dirt, corrosion, oil, grease and other contaminants.

1.5 AMBIENT CONDITIONS

.1 Do not apply Products when air, material and surface temperatures are expected to fall below 4 degrees C within four hours of completed application.

.2 Ensure adequate temporary heating is available during cold weather work.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 CPD Construction Products.
.2 Degussa.
.3 W. R. Meadows of Canada Limited.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Concrete Floor Sealer: One-component; urethane / acrylic polymer based, high solids, liquid sealer; clear and transparent, non-yellowing formulation; chemical-resistant; maximum 200 g/L VOC content; eg. Decra-Seal W/B by W. R. Meadows of Canada Limited.

.2 Slip-Resistant Additive: Finely ground polymer, silica-free aggregate; eg. Sure-Step by W. R. Meadows of Canada Limited.

2.3 MIXING

.1 Mix slip-resistant additive into sealer at manufacturer's recommended rate.

.2 Occasionally stir mixture to keep particles well suspended within coating.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify concrete has not been previously treated with chlorinated rubber-based cure and seal compounds.

.3 Verify new concrete has cured for minimum 28 days.

3.2 PREPARATION

.1 Sweep and wash floors to remove debris, grease, oil and wax.

.2 Remove stains and discolourations.

.3 Completely remove incompatible cure and seal compounds. Allow concrete to dry.

3.3 APPLICATION

.1 Spray apply Product, completely wetting concrete surface without producing drips, puddles or rundown.

.2 Apply Product to achieve Medium sheen finish.

.3 Spray apply two coats to prepared concrete slab.

.4 Allow first coat to dry before applying second coat.

.5 Apply Product evenly, without ponding.

.6 Avoid puddling in low areas.

3.4 PROTECTION

.1 Refer to Section 01 76 00.

.2 Restrict foot traffic for 12 hours.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 07 92 00 - Joint Sealants.

.3 Section 08 12 13 - Hollow Metal Frames.

.4 Section 08 31 00 - Access Doors and Panels.

.5 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM A641/A641M-19: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.2 ASTM A951/A951M-16e1: Standard Specification for Steel Wire for Masonry Joint Reinforcement.

.3 ASTM A1011/A1011M-18a: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability and Ultra-High Strength.

.4 ASTM C331/C331M-17: Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

.5 CSA A165 SERIES-14 (R2019): CSA Standards on Concrete Masonry Units.

.6 CAN/CSA-A179-14: Mortar and Grout for Unit Masonry.

.7 CSA A370-14 (R2018): Connectors for Masonry.

.8 CAN/CSA-A371-14 (R2019): Masonry Construction for Buildings.

.9 CSA A3001-18: Cementitious Materials for Use in Concrete.

.10 CSA A3002-18: Masonry and Mortar Cement.

.11 CSA G30.18-09 (R2014): Carbon Steel Bars for Concrete Reinforcement.

.12 CSA S304-14: Design of Masonry Structures.

.13 NCMA TEK 3-2A-2005: Grouting Concrete Masonry Walls.

.14 NCMA TEK 10-2C-2010: Control Joints for Concrete Masonry Walls - Empirical Method.

1.3 QUALIFICATIONS

.1 Manufacturers: A firm specializing in manufacturing concrete masonry units, having minimum 5 years documented experience and a member of CCMPA.

.2 Installers: A firm specializing in installing commercial masonry, having minimum 5 years documented experience and a member of OMCA.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver mortar and grout materials in original unbroken and undamaged packages with manufacturer's name and brand distinctly marked.

.3 Store mortar and grout materials in a shed until ready for use.

.4 Store or pile sand on a plank platform and protect from dirt and rubbish.

.5 Store mortar materials and sand in such a manner as to prevent deterioration or contamination by foreign materials.

.6 Deliver masonry units in an approved protective film.

.7 Store masonry units off ground with care to avoid damage. Damaged units will not be acceptable for face work.

1.5 AMBIENT CONDITIONS

.1 Environmental Requirements: To CAN/CSA-A371.

.2 Do not use anti-freeze, liquid salts, or other substances to lower the freezing point of mortar or grout.

2 Products

2.1 MORTAR AND GROUT MATERIALS

.1 Portland Cement: To CSA A3001, Type GU; Grey colour.

.2 Masonry Cement: To CSA A3002, Type N.

.3 Mortar Aggregate: To CAN/CSA-A179, standard masonry type; clean, dry, protected against dampness, freezing, and foreign matter.

.4 Grout Coarse Aggregate: To CAN/CSA-A179, maximum 10 mm size; 27 percent by volume.

.5 Grout Fine Aggregate: To CAN/CSA-A179, clean well graded sharp sand; 54 percent by volume.

.6 Water: Potable, clean and free of deleterious amounts of acids, alkalies or organic materials.

.7 Plasticizer: Water reducing type, reducing porosity and absorption to increase bond strength.

.8 Water Repellent: Mixture of calcium carbonate and hydrous magnesium aluminum silicate powders; eg. Hydrocide Powder by Degussa Building Systems.

2.2 MASONRY UNITS

.1 Concrete Masonry Unit - Normal Weight (CMU): To CSA A165.1, using N aggregate; 190 mm face height, 390 mm face length, bed depths as indicated on Drawings; types as follows:
.1 Hollow: H/15/A/M.
.2 Solid (75 percent): S/15/A/M.
.3 Solid (100 percent): S_f/15/A/M.

.2 Concrete Masonry Unit - Lightweight (CMU-LWT): To CSA A165.1, using $L_2$20S slag aggregate to ASTM C331; 190 mm face height, 390 mm face length, bed depths as indicated on Drawings; types as follows:
.1 Hollow: H/15/C/M.
.2 Solid (75 percent): S/15/C/M.
.3 Solid (100 percent): S_f/15/C/M.

2.3 ACCESSORIES

.1 Single Wythe Joint Reinforcement: To CSA A370, Ladder-type, Heavy Duty, fabricated from steel wire to ASTM A951/A951M; mill galvanized; BL-10 by Blok-Lok.

.2 Reinforcing Steel: To CSA G30.18, Grade 400R; new billet steel, deformed bars; sizes as indicated on Drawings.

.3 Joint Filler: Closed cell polyurethane or polyethylene oversized by 50 percent; self-expanding.

.4 Building Paper: No. 15 asphalt saturated felt.

2.4 MORTAR MIXES

.1 Mortar for Use with Loadbearing Concrete Unit Masonry: To CAN/CSA-A179, Type S using the Proportion specification method; Portland cement-masonry cement-sand mix, complete with water repellent admixture.

.2 Mortar for Use with Non-Loadbearing Concrete Unit Masonry: To CAN/CSA-A179, Type N using the Proportion specification method; masonry cement-sand mix, complete with water repellent admixture.

2.5 MORTAR MIXING

.1 Thoroughly mix materials in proper measured quantities needed for immediate use, to CAN/CSA-A179.

.2 Provide uniformity of mix and colouration.

.3 Take representative samples for testing consistency of strength and colour to CAN/CSA-A179.

.4 Use mortar within 1-1/2 hours after mixing at temperature of 25 degrees C or higher, or 2-1/2 hours after mixing at temperatures less than 25 degrees C.

.5 Discard mortars exceeding time limits specified above.

2.6 GROUT MIXES

.1 Grout for Use in Spaces 50 mm or Wider: To CAN/CSA-A179, Coarse Grout using the Property Specification method.

.2 Grout for Use in Spaces Narrower than 50 mm: To CAN/CSA-A179, Fine Grout using the Property Specification method.

.3 Match grout's 28 day compressive strength to the compressive strength of the concrete masonry unit being filled.

2.7 GROUT MIXING

.1 Thoroughly mix materials in proper measured quantities needed for immediate use, to CAN/CSA-A179.

.2 Use grout within 1-1/2 hours after mixing.

.3 Discard grout exceeding time limit specified above.

2.8 FINISHES

.1 Mill Galvanized Coating: To ASTM A641/A641M, Regular; 30 g/m^2 zinc coating on all surfaces.

3 Execution

3.1 PREPARATION

.1 Supply metal anchors to the appropriate trades for placement. Direct correct placement.

.2 Verify anchorages embedded in concrete or attached to structural steel members are properly placed. Embed anchorages in every second joint.

.3 Apply bonding agent to existing concrete surfaces.

.4 Plug clean-out holes with masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

3.2 COORDINATION WITH OTHERS

.1 Securely install Products supplied by other Sections.

.2 Anchor frames with backs of jambs solidly packed with mortar. Where mortar additives have been used to prevent freezing, coat metal frames with bitumen paint before installation.

.3 Provide openings wherever required, including those required by facility service Subcontractors. Locating openings is the responsibility of component installer.

.4 Accurately locate chases and openings and neatly finish to required sizes.

.5 No pipe, conduit chase or enclosure shall be covered until after the affected parts of the Work have been inspected and tested.

.6 Coordinate placement of steel and concrete anchors with applicable Subcontractors.

3.3 COURSING

.1 Place masonry to lines and levels indicated.

.2 Maintain masonry courses to uniform width.

.3 Lay concrete masonry units in half-running bond.

.4 Maintain 10 mm thick mortar joints in both directions.

.5 When thumbprint hard, tool mortar joints to a smooth, tightly compressed, concave profile.

3.4 PLACING AND BONDING

.1 Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.

.2 Fully bond intersections, and external corners.

.3 Strike mortar joints flush where resilient base is scheduled.

.4 Isolate masonry partitions from vertical structural framing members with a control joint.

.5 Extend and anchor non-loadbearing partitions to underside of structural deck.

.6 Use bull-nosed concrete masonry units at exposed corners.

3.5 REINFORCEMENT AND ANCHORAGES

.1 Conform to CSA A370.

.2 Place masonry joint reinforcement continuous in every second horizontal joint.

.3 Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 400 mm minimum each side of opening.

.4 Place joint reinforcement continuous in first and second joint below top of walls.

.5 Install reinforcing bars supported and secured against displacement.

.6 Reinforce joint corners and intersections of concrete unit masonry walls and partitions with strap anchors 400 mm OC.

3.6 LINTELS

.1 Install loose steel lintels as scheduled. Set steel lintels dry to permit movement.

.2 Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled. Construct lintels using grout fill and reinforcing. Maintain minimum 200 mm bearing on each side of opening.

3.7 GROUTED COMPONENTS

.1 Install masonry grout to NCMA TEK 3-2A.

.2 Fill masonry cores located within 300 mm of a wall opening solid with masonry grout.

3.8 CONTROL JOINTS

.1 Provide control joints in concrete unit masonry to NCMA TEK 10-2C.

.2 Do not continue horizontal joint reinforcing across control joints.

.3 Size joints as specified in Section 07 92 00 for sealant performance.

3.9 TOLERANCES

.1 Variation from Unit to Adjacent Unit: $\underline{<}$ 1.5 mm.

.2 Variation of Joint Thickness: $\underline{<}$ 3 mm within 1 000 mm.

3.10 CLEANING

.1 Clean masonry as work progresses.

.2 Allow mortar droppings on masonry to partially dry then remove by means of brushing with a stiff fibre brush.

3.11 FIELD QUALITY CONTROL

.1 Perform field inspection and testing as described in Section 01 40 00.

.2 Submit sample cubes of mortar and grout for laboratory testing and test data as specified in Section 01 40 00 and to CSA S304.

.3 Report on the compressive strength and water content of mortar and grout mixes.

.4 Submit product data on design mix, indicate Proportion or Property specification method used, required environmental conditions and admixture limitations.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 07 84 00 - Firestopping.

.3 Section 08 80 00 - Glazing.

.4 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 AAMA 611-14: Voluntary Specification for Anodized Architectural Aluminum.

.2 AAMA 2605-17a: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).

.3 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.4 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.5 ASTM A240/A240M-20a: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.6 ASTM A269/A269M-15a(2019): Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.7 ASTM A276/A276M-17: Standard Specification for Stainless Steel Bars and Shapes.

.8 ASTM A307-21: Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

.9 ASTM A449-14(2020): Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

.10 ASTM A563/A563M-21a: Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).

.11 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.12 ASTM A780/A780M-09(2015): Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.13 ASTM A1008/A1008M-21: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

.14 ASTM B209/B209M-21: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.15 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.16 ASTM F436/F436M-19: Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

.17 ASTM F467M-06a(2012): Standard Specification for Nonferrous Nuts for General Use (Metric).

.18 ASTM F468M-06(2012): Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use (Metric).

.19 ASTM F593-17: Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

.20 ASTM F594-09(2020): Standard Specification for Stainless Steel Nuts.

.21 ASTM F3125/F3125M-19e2: Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

.22 CSA G40.20-13 (R2018): General Requirements for Rolled or Welded Structural Quality Steel.

.23 CSA G40.21-13 (R2018): Structural Quality Steel.

.24 CSA S136-16: North American Specification for the Design of Cold-Formed Steel Structural Members.

.25 CSA W47.1:19: Certification of Companies for Fusion Welding of Steel.

.26 CSA W47.2-11 (R2020): Certification of Companies for Fusion Welding of Aluminum.

.27 CSA W55.3-08 (R2018): Certification of Companies for Resistance Welding of Steel and Aluminum.

.28 CSA W59-18: Welded Steel Construction.

.29 CSA W59.2-M1991 (R2018): Welded Aluminum Construction.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, prepared for each required custom-fabricated metal item, illustrating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.4 QUALIFICATIONS

.1 Fabricator: A firm specializing in fabricating custom metal components, having minimum 3 years documented experience.

.2 Welders: Workers certified by CWB to CSA W47.1, CSA W47.2 and CSA W55.3 as applicable.

2 Products

2.1 DESIGN CRITERIA

.1 Design cold-formed steel fabrications to CSA S136.

2.2 MATERIALS

.1 Galvanized Sheet Steel: To ASTM A653/A653M, Structural Steel (SS) Grade 230, Types 1 and 2; cold-rolled sheet steel, galvanized; thicknesses as indicated.

.2 Sheet Steel: To ASTM A1008/A1008M, Structural Steel (SS) Grade 230, Types 1 and 2; cold-rolled sheet steel, thicknesses as indicated.

.3 Steel Sections and Plates: To CSA G40.20 and CSA G40.21, Grade 300W; profiles and sizes as indicated.

.4 Hollow Structural Steel Sections: To CSA G40.20 and CSA G40.21, Grade 350W, Class H; sizes as indicated.

.5 Stainless Steel Sheet, Sections and Plates: To ASTM A240/A240M, Type 304L for welded applications and Type 304 for other applications; thicknesses and sizes as indicated.

.6 Stainless Steel Tubing: To ASTM A269/A269M, Grade TP316L; thicknesses, diameters and sizes as indicated.

.7 Stainless Steel Bars and Shapes: To ASTM A276/A276M, Type 304L for welded applications and Type 304 for other applications; sizes and profiles as indicated.

.8 Extruded Aluminum: To ASTM B221M, 6063 alloy, T6 temper; profiles and sizes as indicated.

.9 Aluminum Sheet: To ASTM B209/B209M, 3003-H14 alloy for shop-painted material and 5005-H32 alloy for anodized material; thicknesses as indicated.

2.3 ACCESSORIES

.1 Stainless Steel Bolts: To ASTM F593, Group 1.

.2 Stainless Steel Nuts and Washers: To ASTM F594, Group 1.

.3 High-Strength Bolts: To ASTM F3125/F3125M, Type 1 for interior applications, Type 3 for exterior applications; quenched and tempered steel heavy hex structural bolts.

.4 Medium-Strength Bolts: To ASTM A449, Type 1 for interior applications, Type 3 for exterior applications; quenched and tempered steel hex bolts.

.5 Machine Bolts: To ASTM A307, Grade A; carbon and alloy steel, galvanized where noted.

.6 Steel Nuts: To ASTM A563/A563M, Grade A, Heavy Hex Style for use with high strength bolts, and Hex Style for use with medium strength bolts and machine bolts; carbon and alloy steel; galvanized where noted.

.7 Steel Washers: To ASTM F436/F436M, Type 1 for interior applications, Type 3 for exterior applications; hardened steel washers, circular, bevelled and clipped types as required.

.8 Aluminum Bolts: To ASTM F468M, shop finished to match adjacent surfaces.

.9 Aluminum Nuts and Washers: To ASTM F467M, including plain washers; shop finished to match adjacent surfaces.

.10 Welding Materials: To CSA W59 and CSA W59.2.

2.4 PRIMERS

.1 Primer for Ferrous Metal Surfaces: Red oxide type.

.2 Primer for Galvanized Surfaces: Zinc-rich paint type.

2.5 FABRICATION

.1 Prior to fabrication, verify existing conditions and take field measurements to ensure perfect fit of fabricated items.

.2 Fabricate cold-formed steel components to CSA S136.

.3 Shop weld steel components to CSA W59.

.4 Shop weld aluminum components to CSA W59.2.

.5 Fit and shop assemble components in largest practical sections to accommodate delivery to Place of the Work.

.6 Seal joints with continuous welds.

.7 Grind visually-exposed joints flush and smooth with adjacent finish surface.

.8 Make visually-exposed joints butt tight, flush and hairline.

.9 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; except where specifically noted otherwise.

.10 Supply components required for anchorage of fabrications.

2.6 FINISHES

.1 Shop Priming:
.1 Clean surfaces of rust, scale, grease, and foreign matter prior to shop priming.
.2 Do not prime surfaces designated to come into direct contact with concrete, or where field welding is required.
.3 Prime components using minimum two coats primer.

.2 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.3 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

.4 Galvanized Coating on Sheet Steel: To ASTM A653/A653M, Grade Z275; hot dipped zinc alloy coating.

.5 Stainless Steel: To AISI No. 4 - Brushed.

.6 Anodized Coating on Aluminum: To AAMA 611, AA-M10C21A31, Class II Clear Anodic Oxide coating No. 17.

.7 Monochromatic Paint Coating on Aluminum: To AAMA 2605; two-coat thermosetting fluoropolymer PVDF liquid extrusion and coil coating, factory-applied to 0.03 mm dry film thickness; eg. Duranar by PPG Industries, Inc.; colours as selected by Consultant.

.8 Metallic Paint Coating on Aluminum: To AAMA 2605; three-coat thermosetting fluoropolymer PVDF liquid extrusion and coil coating, complete with metal flakes incorporated in colour coat; factory-applied to 0.04 mm dry film thickness; eg. Duranar XL by PPG Industries, Inc.; colour as selected by Consultant.

.9 Powder Coated Finish on Metal Components: To AAMA 2605; electrostatically sprayed polymer powder, factory-applied to 0.05 mm dry film thickness; colours as selected by Consultant.

.10 Monochromatic Paint Coating on Sheet Steel: Two-coat silicone modified polyester coil coating, factory-applied to 0.028 mm dry film thickness; eg. WeatherXL by Valspar, colours as selected by Consultant.

3 Execution

3.1 PREPARATION

.1 Make provision for erection loads with temporary bracing.

.2 Clean and strip primed steel items to bare metal where site welding is required.

.3 Supply items required to be cast into concrete and or embedded in masonry with setting templates, to appropriate Sections.

3.2 INSTALLATION

.1 Install components plumb and level, accurately fitted, free from distortion or defects.

.2 Provide fasteners and anchors necessary to secure components rigidly in place.

.3 Field weld steel components to CSA W59.

.4 Field weld aluminum components to CSA W59.2.

.5 Field bolt and weld to match shop bolting and welding.

.6 Mechanically fasten joints butted tight, flush, and hairline.

.7 Grind welds smooth and flush.

.8 After erection, prime welds, abrasions, and surfaces not yet shop primed or galvanized, except surfaces to be in direct contact with concrete.

.9 Make Good damaged galvanized coatings to ASTM A780/A780M.

3.3 SCHEDULE

.1 The following schedule is a list of principal items only. Refer to Drawings for items not specifically scheduled.

.1 Sleeves and Openings: Including templates and required information, supplied to appropriate Sections.

.2 Attachments: Anchor bolts, washers, nuts, lag screws, expansion shields, toggles, straps, sleeves, brackets, etc. as required and secured with sufficient self-tapping shake-proof screws with flat countersunk heads.

.3 Brackets: Fabricated from mild steel plate, sizes and configurations as required to support countertops, shelving, seating, benches, valances, coat hooks and other similar components; pre-drilled for fastening of other components.

.4 Lateral Support Brackets for Masonry Partitions: 75 x 75 mm steel angles, 6 mm thick, as follows:
.1 Concealed Conditions: 200 mm long and spaced at 3 000 mm OC; minimum two anchors each.
.2 Exposed Conditions: Continuous lengths, anchored at 1 000 mm OC.

.5 Fire-Rated Glasswall Perimeter Frames: 25 x 25 mm size, 1.52 mm thick steel L-shaped angles, shop primed finish; secured to wall substrate using 50 mm long No. 12 Philips flat head screws spaced at 150 mm OC and maximum 50 mm from each end; conforming to ULC Design Assembly as listed on Drawings.

.6 Overhead Door Wall Jamb Covers: 2.66 mm thick galvanized cold-formed steel channels, depth to suit wall thickness; full height for wall opening; locations and quantities as indicated on Drawings.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 06 20 00 - Finish Carpentry.

.2 Section 06 40 00 - Architectural Woodwork.

.3 Section 07 62 00 - Sheet Metal Flashing and Trim.

1.2 REFERENCES

.1 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM F593-17: Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

.3 ASTM F594-09(2020): Standard Specification for Stainless Steel Nuts.

.4 ASTM F1667-21: Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.5 CAN/CSA O80 Series-08 (R2012) Consolidated: Wood Preservation.

.6 CAN/CSA-O86-09 Consolidated: Engineering Design in Wood.

.7 CSA O112.9-10: Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.8 CSA O121-08 (R2013): Douglas Fir Plywood.

.9 CSA O141-05 (R2009): Softwood Lumber.

.10 CSA O151-09: Canadian Softwood Plywood.

.11 NLGA Standard Grading Rules for Canadian Lumber, August 2017 Edition.

.12 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 QUALITY ASSURANCE

.1 Lumber Identification: Grade stamp clearly identifying assigned grade, mill of origin, moisture content at time of manufacture, species or species group, and grading authority having jurisdiction over mill of origin.

.2 Plywood Identification: Face or edge stamp depending on appearance requirement, clearly identifying panel grade, species designation, mill identification, certifying agency, and waterproof glue bond designation.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver and store Products under waterproof cover.

.3 Prevent damage to Products, existing property and to the Work.

.4 Store Products where it does not hinder progress of the Work.

1.5 EXISTING CONDITIONS

.1 The Work involves renovations and alterations to an existing facility.

.2 Include re-blocking or re-framing as required.

.3 Make minor adjustments from Drawings wherever existing conditions dictate.

2 Products

2.1 MATERIALS

.1 Dimension Lumber: To CSA O141, S4S; SPF species, kiln dried to S-DRY moisture content; preservative treated for exterior applications where noted on Drawings, sizes as indicated on Drawings; NLGA Light Framing Grade Category, Standard and Better Common Grade Mix.

.2 Plywood - Exterior Applications: To CSA O121, DFP species, SHG Grade; veneer core, butt edge, unsanded faces; preservative treated, thicknesses as indicated on Drawings.

.3 Plywood - Interior Applications: To CSA O151, CSP species, SHG Grade; veneer core, butt edge, unsanded faces; flame retardant treated where noted, thicknesses as indicated on Drawings.

2.2 ACCESSORIES

.1 Nails: To ASTM F1667, Type I (NL); common wire type for general use and spiral type for structural connections; sizes necessary to ensure adequate securement; and as follows:
.1 For Use with Preservative Treated Wood: Type 304 or 316 stainless steel.
.2 For Use with Untreated Wood: Galvanized steel.

.2 Spikes: To ASTM F1667, Type III (SP); common wire type for general use and spiral type for structural connections; sizes necessary to ensure adequate securement; and as follows:
.1 For Use with Preservative Treated Wood: Type 304 or 316 stainless steel.
.2 For Use with Untreated Wood: Galvanized steel.

.3 Staples: To ASTM F1667, Type IV (ST); common wire; leg length necessary to ensure adequate securement; and as follows:
.1 For Use with Preservative Treated Wood: Type 304 or 316 stainless steel.
.2 For Use with Untreated Wood: Galvanized steel.

.4 Screws: Bugle head, power driven type, sizes necessary to ensure adequate securement; types as follows:
.1 For Use with Preservative Treated Wood: Type 304 or 316 stainless steel.
.2 For Use with Untreated Wood: Galvanized steel.

.5 Stainless Steel Bolts: To ASTM F593, Group 1.

.6 Stainless Steel Nuts: To ASTM F594, Group 1.

.7 Adhesive: To CSA O112.9.

.8 Anchors: Toggle bolt type for anchorage to hollow masonry, expansion shield and lag bolt type for anchorage to solid masonry or concrete, or bolts or ballistic fasteners for anchorages to steel.

.9 Touch-Up Wood Preservative: To CAN/CSA O80; brush-applied copper azole (CBA-A or CA-B) or alkaline copper quaternary (ACQ) preservative.

.10 Touch-up Flame Retardant Coating: To CAN/CSA O80; brush-applied Dricon by Lonza.

2.3 FINISHES

.1 Flame Retardant Treatment
  .1 Flame Retardant Treatment: To CAN/CSA O80; chemically treated and pressure impregnated; as follows:
    .1 Surface Burning Characteristics (CAN/ULC-S102): Flame Spread Index $\leq$ 25.
    .2 Manufacturer and Product Name: eg. Dricon by Lonza.
  .2 Flame retardant treated materials must bear a ULC classification label.

.2 Wood Preservative Treatment:
  .1 Wood Preservative Treatment: To CAN/CSA O80; chemically treated and pressure impregnated using copper azole (CBA-A or CA-B) or alkaline copper quaternary (ACQ) preservative.
  .2 Preservative treated materials must bear CSA classification label.
  .3 Make preservative treated materials available for inspection by Consultant at place of treatment, before shipment to Place of the Work.

.3 Galvanized Coating on Steel Hardware: To ASTM A153/A153M; 610 g/m^2 hot dipped zinc alloy coating.

3 Execution

3.1 SITE APPLIED WOOD TREATMENT

.1 When wood in contact with exterior cementitious materials, roofing and related metal flashings has not been previously preservative treated, brush apply two coats of touch-up wood preservative, to CAN/CSA O80.

.2 Apply two coats of touch-up wood preservative to sawn ends of preservative treated material, to CAN/CSA O80.

.3 Apply two coats of touch-up flame retardant coating to sawn ends of flame retardant treated material, to CAN/CSA O80.

3.2 INSTALLATION

.1 Erect wood framing members level and plumb.

.2 Place horizontal members laid flat, crown side up.

.3 Construct framing members full length without splices.

.4 Secure plywood sheets perpendicular to framing members, with ends staggered and sheet edges secured directly over firm bearing.

.5 Provide wood blocking required for attachment of fitments and equipment by other Sections.

.6 Provide 19 mm thick flame retardant treated plywood backer board on wood blocking for mounting electrical equipment where indicated on Drawings.

.7 Construct curb and cant members of single pieces per location.

.8 Curb roof openings except where prefabricated curbs are provided.

.9 Form corners by lapping side members alternately.

.10 Coordinate work with installation of decking and support of decking at openings.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 06 24 00 - High Pressure Decorative Laminate.

.4 Section 06 40 00 - Architectural Woodwork.

.5 Section 07 92 00 - Joint Sealants.

.6 Section 08 71 00 - Door Hardware.

.7 Section 08 80 00 - Glazing.

.8 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ANSI A135.4-2004: Basic Hardboard.

.2 ANSI A208.1-2009: Particleboard.

.3 ANSI A208.2-2009: Medium Density Fiberboard (MDF) for Interior Applications.

.4 ASTM B456-11e1: Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.5 ASTM F1667-21: Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.6 AWMAC NAAWS 4.0-2021: North American Architectural Woodwork Standards.

.7 CSA O121-08 (R2013): Douglas Fir Plywood.

.8 CSA O141-05 (R2009): Softwood Lumber.

.9 CSA O151-09: Canadian Softwood Plywood.

.10 ANSI/HPVA HP-1-2020: American National Standard for Hardwood and Decorative Plywood.

.11 NHLA Grading Rules.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate samples, as follows:
.1 Melamine Composite Panel: 300 x 300 mm size, illustrating laminate-clad face colour, pattern and texture; core materials; and quality of PVC edgebanding.
.2 Hardwood Plywood: 300 x 300 mm size, illustrating full panel sheet, edge and joint trim.
.3 Hardwood Trim: 300 mm long, illustrating size and shape of profiles, and quality of wood grain.

1.4 QUALIFICATIONS

.1 Trim and Finish Carpenter: A firm employing workers specializing in finish carpentry work, and having minimum 3 years documented experience.

2 Products

2.1 MATERIALS

.1 Dressed Lumber - Softwood (DL-SWD): To CSA O141; SPF species, kiln dried to maximum 7 percent moisture content, with mixed grain capable of receiving a high quality opaque finish; sizes as indicated on Drawings.

.2 Dressed Lumber - Hardwood (DL-HWD): Maple species, to NHLA Select and Better Grade; kiln dried to maximum 7 percent moisture content, with vertical grain capable of receiving a high quality transparent finish; sizes as indicated on Drawings.

.3 Plywood - Softwood (PLY-SWD): CSP to CSA O151; SEL TF Grade; SPF veneer core of minimum 9 plies; thicknesses as indicated on Drawings; capable of receiving a high quality opaque finish.

.4 Plywood - Softwood, Moisture-Resistant Core (PLY-SWD-MR): CSP to CSA O151; SEL TF Grade; composite core of moisture-resistant particle board to ANSI A208.1, Grade M-3 - Exterior Glue; thicknesses as indicated on Drawings; capable of receiving a high quality opaque finish.

.5 Plywood - Hardwood (PLY-HWD): To ANSI/HPVA HP-1, Architectural G1S, thicknesses as indicated on Drawings; as follows:
.1 Core: Hardwood veneer core, minimum 9 plies.
.2 Face Veneers: Maple species; Face Grade A; Plain-Sliced; of clear Pleasing match grain capable of receiving a high quality transparent finish.

.6 Plywood - Hardwood, Moisture-Resistant Core (PLY-HWD-MR): To ANSI/HPVA HP-1, Architectural G1S, thicknesses as indicated on Drawings; as follows:
.1 Core: Composite core, moisture-resistant particle board to ANSI A208.1, Grade M-3 - Exterior Glue.
.2 Face Veneers: Maple species; Face Grade A; Plain-Sliced; of clear Pleasing match grain capable of receiving a high quality transparent finish.

.7 Particleboard (PB): To ANSI A208.1, Grade M-2; made from 100 percent post-industrial wood fibres; minimum 635 kg/m^3 density and maximum 6 percent moisture content; no added urea formaldehyde (nauf); certified EPP by Composite Panel Association; thicknesses as indicated on Drawings.

.8 Melamine Composite Panel (MCP): Particleboard core with factory-applied low pressure laminate thermo-fused to both faces; Premium quality; thicknesses as indicated on Drawings; colours, textures and patterns as selected by Consultant.

.9 Medium Density Fiberboard (MDF): To ANSI A208.2, Grade MD; minimum 740 kg/m^3 density and moisture content between 4.5 - 8.0 percent; thicknesses as indicated on Drawings.

.10 Hardboard (HB): To ANSI A135.4, Class 1 - Tempered; inter-felted ligno-cellulosic fibers consolidated under heat and pressure; minimum 500 kg/m^3 density; S1S surface finish; thicknesses as indicated on Drawings.

2.2 CLOSET ACCESSORIES

.1 Metal Tube Closet Rod System: 27 mm OD, heavy wall steel tube rod, with heavy duty metal flanges and brackets; chrome-plated finish.

.2 Coat Hook: Two-prong heavy duty design, 4.5 mm thick flat steel bar, 108 mm high, 19 mm wide; pre-drilled for screw attachment; zinc plated finish; Model 209Z by Royal Arch Inc.

2.3 ACCESSORIES

.1 Decorative Laminate: High pressure decorative laminate, Type HPDL as specified in Section 06 24 00.

.2 Contact Adhesives: Water base type.

.3 Wall Adhesive: Solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

.4 Nails: To ASTM F1667, Type I (NL), galvanized steel, common wire; sizes necessary to ensure adequate securement.

.5 Staples: To ASTM F1667, Type IV (ST); galvanized steel, common wire; leg length necessary to ensure adequate securement.

.6 Screws: Galvanized steel, tapered head suitable for counter sunk applications; sizes necessary to ensure adequate securement.

.7 Bolts, Nuts, Washers, Lags and Blind Fasteners: Size and type to suit application; plain finish.

.8 Dimension Lumber: As specified in Section 06 10 00.

.9 Primer: Alkyd primer sealer type.

.10 Wood Filler: Solvent base, tinted to match surface finish colour.

.11 Joint Sealant: Interior general purpose sealant, Type SEAL-INT-GP as specified in Section 07 92 00.

2.4 FINISHES

.1 Chrome/Nickel Plating on Metal Components: To ASTM B456, Type SC 2; electrodeposited nickel plus chromium coating; Polished.

3 Execution

3.1 INSTALLATION

.1 Install Products to AWMAC NAAWS 4.0, Custom Grade.

.2 Set and secure Products in place; straight, plumb and level.

.3 Unless noted otherwise, install Products with nails, screws, or bolts with blind fasteners spaced at 400 mm OC, or adhesive as required by specific installation requirements.

.4 Install wood trim to fire-rated glasswall assembly frames as specified in Section 08 80 00.

.5 Finish exposed edges of veneer-clad panels with 3.2 mm thick hardwood edge trim, glued and nailed.

.6 Finish exposed edges of laminate-clad panels with 1.0 mm thick decorative laminate edgebanding, applied using hot melt adhesive.

.7 Apply decorative laminate to core materials as specified in Section 06 24 00.

.8 Install MCP shelf and metal tube closet rod where indicated on Drawings.

.9 Install coat hooks where indicated on Drawings.

.10 Install door hardware as specified in Section 08 71 00.

.11 Seal gaps and joints as specified in Section 07 92 00.

3.2 ADJUSTING AND CLEANING

.1 Set exposed fasteners.

.2 Apply wood filler over exposed nail and staple indentations. Allow to dry and sand smooth.

.3 Conceal countersunk fasteners with matching hardwood dowels, sanded smooth and flush to adjacent surface.

.4 Clean and prepare surfaces for site finishing. Coordinate with Section 09 90 00.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 06 20 00 - Finish Carpentry.

.2 Section 06 40 00 - Architectural Woodwork.

.3 Section 22 42 00 - Plumbing Fixtures.

1.2 REFERENCES

.1 ANSI/NEMA LD 3-2005: High Pressure Decorative Laminates.

.2 AWMAC NAAWS 4.0-2021: North American Architectural Woodwork Standards.

.3 CAN/CGSB-71.20-M88: Adhesive, Contact, Brushable.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate chains of laminate samples, illustrating available colours, patterns and textures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver decorative laminate with heavy kraft paper protection and store in cartons during shipping.

.3 Protect decorative laminate surfaces during fabrication and installation stages; do not remove protective covering until final clean-up prior to final inspection.

.4 Do not store or install Products in areas where relative humidity is less than 25 percent RH or greater than 60 percent RH at 22 degrees C.

1.5 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of two years, covering against warping, splitting, or delamination, subject to normal usage excluding excessive moisture or heat.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
- .1 Arborite.
- .2 Formica.
- .3 Nevamar.
- .4 Pionite.
- .5 Tafisa.
- .6 Wilsonart.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 High Pressure Decorative Laminate (HPDL): To ANSI/NEMA LD 3; decorative surface papers impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins; colours, textures and patterns as selected by Consultant; NEMA Types, Grades and thicknesses as listed below:
- .1 General Purpose Type: Grade HGS; 1.2 mm thick.
- .2 Vertical Surface Type: Grade VGS; 0.7 mm thick.
- .3 Postforming Type: Grade HGP; 1.0 mm thick.
- .4 Vertical Postforming Type: Grade VGP; 0.7 mm thick.
- .5 Cabinet Liner Type: Grade CLS; 0.5 mm thick.
- .6 Backer Type: Grade BKM; 1.0 mm thick.

.2 Core Materials: As indicated on Drawings.

.3 Sealer: Water-resistant type.

.4 Draw Bolts and Splines: Suitable for new core bases, and acceptable to fabricator.

.5 Contact Adhesive: To CAN/CGSB-71.20-M.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify cutouts in core materials are prepared for penetrating components.

3.2 PREPARATION

.1 Make joints in core materials tight, flush and hairline; using draw bolts and splines.

.2 Round internal corners, chamfer edges and seal exposed edges in core materials.

3.3 INSTALLATION

.1 Comply with ANSI/NEMA LD 3, Annex A and AWMAC NAAWS 4.0.

.2 Install Products plumb, true and square, neatly scribed and fitted to adjoining surfaces.

.3 Ensure adjacent laminate sheets match in colour, texture and pattern.

.4 Ensure decorative laminate and core profiles coincide to ensure full continuous support and bond over entire surface.

.5 Use continuous lengths to minimize joints. Maintain joints minimum 600 mm from cutouts.

.6 Offset joints in decorative laminate from joints in core material.

.7 Apply decorative laminate to exposed edges of core material for straight self-edging strips or flat work.

.8 Chamfer exposed edges of decorative laminate uniformly at 20 degrees.

.9 Do not mitre decorative laminate edges.

.10 Apply backing sheets where required to conceal and balance core material.

.11 Apply cabinet liner sheets to interior of cabinets where indicated on Drawings.

3.4 FIELD QUALITY CONTROL

.1 Gaps at corners or between trim and core materials will be rejected by Consultant.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Remove kraft paper protective covering.

.3 Visually inspect each installed item. Wash and thoroughly polish surfaces.

3.6 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation from damage with removable, temporary protective coverings.

.3 Maintain protection until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 06 20 00 - Finish Carpentry.

.2 Section 06 24 00 - High Pressure Decorative Laminate.

.3 Section 07 92 00 - Joint Sealants.

.4 Section 08 80 00 - Glazing.

1.2 REFERENCES

.1 ANSI A135.4-2004: Basic Hardboard.

.2 ANSI A208.1-2009: Particleboard.

.3 ANSI A208.2-2009: Medium Density Fiberboard (MDF) for Interior Applications.

.4 ASTM A240/A240M-20a: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.5 ASTM A276/A276M-17: Standard Specification for Stainless Steel Bars and Shapes.

.6 ASTM B456-11e1: Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.7 ASTM F1667-21: Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.8 AWMAC NAAWS 4.0-2021: North American Architectural Woodwork Standards.

.9 ANSI/BHMA A156.9-2015: Cabinet Hardware.

.10 ANSI/BHMA A156.11-2014: Cabinet Locks.

.11 ANSI/BHMA A156.26-2017: Continuous Hinges.

.12 CSA O112.9-10: Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.13 CSA O112.10-08 (R2013): Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).

.14 CSA O121-08 (R2013): Douglas Fir Plywood.

.15 CSA O141-05 (R2009): Softwood Lumber.

.16 CSA O151-09: Canadian Softwood Plywood.

.17 ANSI/HPVA HP-1-2020: American National Standard for Hardwood and Decorative Plywood.

.18 ANSI/NEMA LD 3-2005: High Pressure Decorative Laminates.

.19 NHLA Grading Rules.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating layouts, dimensions, materials, component profiles and sizes, fastening methods, jointing details, finishes, accessories, locations of outlets, anchorage and hardware.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate samples, as follows:
.1 Melamine Composite Panel: 300 x 300 mm size, illustrating laminate-clad face colour, pattern and texture; core materials and quality of PVC edgebanding.
.2 Hardwood Panel: 300 x 300 mm size, illustrating quality of veneer faces, edge profile, quantity of plies, joint and edge trim and shop-applied finish.
.3 Hardwood Trim: 300 mm long, illustrating profile sizes and shapes, quality of wood grain and shop-applied finish.

1.5 QUALIFICATIONS

.1 Fabricator and Installer: A firm specializing in fabricating and installing custom casework, having minimum 3 years documented experience and a member of AWMAC.

1.6 MOCK-UPS

.1 Construct mock-ups as specified in Section 01 40 00.

.2 Mock-up: Full-size, 450 mm wide sample of each type of custom casework, including materials, finishes, hardware and countertops.

.3 Accepted mock-ups will be used as the standard for acceptance of the Work.

.4 Remove and replace installed Product that does not conform to accepted mock-up.

.5 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products under waterproof cover both in transit and at Place of the Work in a manner to prevent damage to Products, to existing property and to the Work.

.3 Store completed Products in a dry, clean area where it does not hinder progress of the Work.

.4 Do not store or install Products in the Work until building is dry and heated.

1.8 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: A two year AWMAC Guarantee Certificate, or a two year 100 percent maintenance bond, covering replacement, re-working, and re-finishing of deficient Product resulting from faulty workmanship or defective materials.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of melamine composite panels having Product considered acceptable for use:
.1 Arauco North America.
.2 Panolam.
.3 Tafisa.
.4 Uniboard.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Dressed Lumber - Hardwood (DL-HWD): Maple species; NHLA Select and Better Grade; kiln dried to maximum 7 percent moisture content, capable of receiving a high quality transparent finish; sizes as indicated on Drawings.

.2 Dressed Lumber - Softwood (DL-SWD): To CSA O141, S4S; AWMAC Custom grade; Eastern White Pine, Douglas Fir or Spruce species, kiln dried to maximum 7 percent moisture content, with mixed grain capable of receiving a high quality opaque finish; sizes as indicated on Drawings.

.3 Plywood - Hardwood (PLY-HWD): To ANSI/HPVA HP-1, Architectural G2S, thicknesses as indicated on Drawings; as follows:
.1 Core: Hardwood veneer core, minimum 9 plies.
.2 Face Veneers: Maple species; Face Grade A; Plain-Sliced; of clear Book match grain capable of receiving a high quality transparent finish.

.4 Plywood - Hardwood, Moisture-Resistant Core (PLY-HWD-MR): To ANSI/HPVA HP-1, Architectural G2S, thicknesses as indicated on Drawings; as follows:
.1 Core: Composite core, moisture-resistant particle board to ANSI A208.1, Grade M-3 - Exterior Glue.
.2 Face Veneers: Maple species; Face Grade A; Plain-Sliced; of clear Book match grain capable of receiving a high quality transparent finish.

.5 Melamine Composite Panel (MCP): Particleboard core with factory-applied low pressure laminate thermo-fused to both faces; Premium quality; colours, textures and patterns as selected by Consultant; thicknesses as indicated on Drawings.

.6 Medium Density Fiberboard (MDF): To ANSI A208.2, Grade MD; minimum 740 kg/m^3 density and moisture content between 4.5 - 8.0 percent; thicknesses as indicated on Drawings.

.7 Particleboard (PB): To ANSI A208.1, Grade M-2; made from 100 percent post-industrial wood fibres; minimum 635 kg/m^3 density and maximum 6 percent moisture content; no added urea formaldehyde (nauf); certified EPP by Composite Panel Association; thicknesses as indicated on Drawings.

.8 Hardboard (HB): To ANSI A135.4, Class 1 - Tempered; inter-felted ligno-cellulosic fibers consolidated under heat and pressure; minimum 500 kg/m^3 density; S1S surface finish; complete with factory-applied low pressure laminate thermo-fused to one face; colours, textures and patterns as selected by Consultant; thicknesses as indicated on Drawings.

.9 Dimension Lumber: As specified in Section 06 10 00; sizes as indicated on Drawings.

2.3 ACCESSORIES

.1 Adhesive for Wet Area Exposures: To CSA O112.9.

.2 Adhesive for Dry Area Exposures: To CSA O112.10.

.3 Nails: To ASTM F1667, Type I (NL); galvanized steel, common wire; sizes necessary to ensure adequate securement.

.4 Spikes: To ASTM F1667, Type III (SP); galvanized steel, common wire; sizes necessary to ensure adequate securement.

.5 Staples: To ASTM F1667, Type IV (ST); galvanized steel, common wire; leg length necessary to ensure adequate securement.

.6 Screws: Galvanized steel, bugle head, power driven type, sizes necessary to ensure adequate securement.

.7 Stainless Steel Sheet and Plate: To ASTM A240/A240M, Type 304; sizes and thicknesses as indicated on Drawings.

.8 Stainless Steel Bar and Shape: To ASTM A276/A276M, Type 304; sizes and profiles as indicated on Drawings.

.9 Decorative Laminate: High pressure decorative laminate, Type HPDL as specified in Section 06 24 00.

.10 Solid Plastic Edgebanding: 3 mm thick PVC edgebanding with eased edge, colour and pattern to match cabinet panel faces, unless noted otherwise.

.11 Tackable Surface: 6 mm thick linoleum-based cork sheet, Krommenie by Forbo Linoleum Inc., colour as selected by Consultant.

.12 Glass: Type GL-3 as specified in Section 08 80 00.

.13 Glazing Materials: As specified in Section 08 80 00.

.14 Eggcrate Lay-in Panel: 13 mm thick acrylic eggcrate grating, White colour; percentage opening and dimensions as indicated on Drawings.

.15 Metal Grille: Extruded aluminum to ASTM B221M, 6061-T5 alloy; anodized finish; linear design with percentage opening and dimensions as indicated on Drawings.

.16 Joint Sealants: As specified in Section 07 92 00, types as follows:
.1 Dry Areas and Food Preparation Wet Areas: Interior general purpose sealant, SEAL-INT-GP.
.2 Other Wet Areas: Interior mildew-resistant sealant, SEAL-INT-MR.

2.4 CASEWORK HARDWARE

.1 Unless specified otherwise, Provide cabinet hardware to ANSI/BHMA A156.9, Grade 1.

.2 Casework Hinges: Fully-concealed, adjustable, articulated, screw on type metal hinges; accommodating 100 degree, 110 degree, 125 degree, and 170 degree openings, and complete with soft-closing mechanism.

.3 Pull: Stainless steel, 10 mm OD handle, 185 mm overall length with 128 mm centre-to-centre fastening and 35 mm projection; eg. Contemporary Stainless Steel Handle Pull - 2102 by Richelieu.

.4 Drawer Box and Slides: Full extension for 60 kg load at 500 mm; roller runners for bottom mounting, steel construction with baked enamel finish, ball bearing rollers, and complete with soft-closing mechanism.

.5 Continuous Hinges: To ANSI/BHMA A156.26; continuous stainless steel hinges, heavy duty type, length to suit full door height; eg. Roton 790-900 by Hager, with US32D finish.

.6 Cupboard and Drawer Lock: To ANSI/BHMA A156.11, Operational Class, Grade 1; eg. National disc tumbler cylinder cam lock C8080 Series, Chrome finish, keyed to Owner's master keying system.

.7 Slide Bolt For Inactive Leaf: 60 mm long barrel bolt, nickel plated.

.8 Elbow Catch: Heavy duty type, nickel finish; eg. Model 5540180 by Richelieu.

.9 Door Bumper: Nylon bumper; eg. Model MP303-11 by Richelieu.

.10 Pilaster Strip: 16 mm wide, 4 mm deep perforated metal strip, zinc plated; length as required; Model 2332GXX by Richelieu.

.11 Pilaster Clip: Heavy duty bent metal clips, zinc plated; Model CP2562G by Richelieu.

.12 Shelf Support for Drilled Gable: 5 mm OD metal pin, plastic-clad; eg. Model 34004011 by Richelieu.

.13 Support Housing and Bolt: Nickel-plated metal, 9.5 mm mounting centre, suitable for 19 mm thick panels; complete with matching connecting bolt; eg. Rafix-SE Housing Model 263.15.705 by Hafele.

.14 Cable Grommet: Plastic counter top fitting for computer / telephone / power cables; two-part cable set with spring closure top, 50 mm OD; Black colour; Model 60.2700.90 by Richelieu, or Type SG by Doug Mockett.

.15 Wire Management Moulding: 50 x 38 mm size, lengths as indicated; complete with mounting screws; Black colour; eg. Model 512490 by Richelieu.

.16 Magnetic Catch: Magnetic catch, automatic opening.

.17 Automatic Door Bolt: Model 245.58.754 by Hafele.

.18 Double Door Cabinet Lock for Glass: Zinc die cast construction with chrome plated finish; keyed alike; suitable for use with 5 - 6 mm thick glass; complete with two keys, strike plate, rubber protector and screw-type fasteners; eg. Model BP641751140 by Richelieu.

.19 Display Case Hardware:
- .1 Track Set for Display Glass Sliding Doors: Anodized aluminum upper track, bottom track and glass H-rail; Model 1551210 by Richelieu.
- .2 Hardware Set for Two Glass Doors: One glass door lock with two identical keys, upper track silencer, u-spline plastic gaskets, 4 casters and 4 end caps; capable of supporting up to 14.6 kg per door; Model BP15510 by Richelieu.
- .3 Glass Shelf Bracket: Adjustable bracket, White colour; Model 4180 by Richelieu; sizes as noted on Drawings.
- .4 Glass Shelf Pilaster Strip: White colour; Model 4080 by Richelieu; sizes as noted on Drawings.
- .5 Glass Shelf Cushion: Rubber cushion; Model 109100 by Richelieu.

.20 Table Leg: 700 mm high adjustable metal leg, 60 mm OD; adjustable from 0 - 30 mm; chrome plated finish; complete with mounting plate, 4 legs per set; eg. Model 615710140 by Richelieu.

.21 Base Cabinet Leveller: 100 mm size, adjustable to minus 5 mm and plus 10 mm; Model 637.45.326 by Hafele.

2.5 FABRICATION

.1 Prior to fabrication, verify existing conditions and take field measurements necessary to ensure a perfect fit.

.2 Fabricate Products to AWMAC NAAWS 4.0, Custom Grade.

.3 Manufacture casework as individual cabinets in standard width increments, or in custom widths where indicated on Drawings.

.4 Fabricate each module to be self-supporting with both exterior gables finished to allow removal and relocation without alterations to casework.

.5 Pre-drill and cut mounting holes for sinks, faucets and electrical receptacles.

.6 Finish exposed edges of veneer-faced components with 3.2 mm thick hardwood edgebanding, glued and nailed.

.7 Finish exposed edges of laminate-faced components with solid plastic edgebanding, applied with an edge-bander using hot melt adhesive.

.8 Secure wall case and floor case bottoms to casework with three locking mechanical fasteners at each end.

.9 Secure fixed shelves, toe space rails, bottom rails, and top rails to casework with two locking mechanical fasteners at each end.

.10 Limit unsupported span of shelving to AWMAC NAAWS 4.0.

.11 Rabbet gables and insert pilaster strips for flush, recessed appearance. Screw fasten pilaster strips in place.

.12 Construct joints to have a good fit, fully glued and rigid in final construction.

.13 Hardware Preparation: Factory install cabinet hinges, runners and hardware, anchoring components firmly into position for long life under hard use. Provide quantity of hinges as follows:
.1 Doors up to 1 000 mm High: Two.
.2 Doors up to 1 500 mm High: Three.
.3 Doors greater than 1 500 mm High: Four.

.14 Equally space banks of drawers, with minimum height of 120 mm.

.15 Apply decorative laminate to core materials as specified in Section 06 24 00.

.16 Factory seal cutouts and service fitting openings in countertops with moisture-resistant epoxy.

.17 Drill holes in gables to receive adjustable shelving pins. Provide ferow sleeves in drilled holes.

.18 Install neoprene or rubber bumpers at top and bottom of doors and drawers.

.19 Adjust doors and drawers to proper operation prior to installation.

2.6 FINISHES

.1 Transparent Finish on Hardwood and Hardwood Veneer-clad Products: To AWMAC NAAWS 4.0, System 12 - POLYURETHANE, WATER-BASED, Custom Grade for Transparent finish; colour and sheen as selected by Consultant.

.2 Opaque Finish on Unfaced Composite Panel and Softwood Products: To AWMAC NAAWS 4.0, System 4 - LATEX ACRYLIC, WATER-BASED, Custom Grade for Opaque finish; colour and sheen as selected by Consultant.

.3 Chrome/Nickel Plating on Metal Components: To ASTM B456, Type SC 2; electrodeposited nickel plus chromium coating; Polished.

.4 Stainless Steel: To AISI No. 5 - Satin or No. 6 - Matte.

2.7 SOURCE QUALITY CONTROL

.1 Arrange for an AWMAC appointed inspector to inspect the work of this Section at the plant.

.2 Pay costs of AWMAC inspection.

.3 Make Good rejected Products and workmanship.

3 Execution

3.1 INSTALLATION

.1 Install Products to AWMAC NAAWS 4.0, Custom Grade.

.2 Where practical, assemble finished casework at mill and deliver to Place of the Work ready for installation.

.3 Accurately fit joints and miters and set nail heads ready for finishing.

.4 Set and secure materials and components in place, rigid, square and plumb.

.5 Provide wood blocking, framing or furring shown on Drawings as part of casework fabrication or erection.

.6 Accurately scribe and closely fit compounds to irregularities of adjacent surfaces.

.7 Use draw bolts and splines to form tight, flush, hairline joints. Accurately fit joints in true plane, locate joints over bearing or supporting surfaces.

.8 Provide heavy duty fasteners, securely anchoring casework to floor, ceiling and wall surfaces. Use only concealed type fasteners.

.9 Where permitted, secure concealed elements with small headed finishing nails. Countersink nail heads with nail setter.

.10 Provide sinks, service fittings and electrical outlets. Coordinate with other Sections for connection to facility services.

.11 Where access is required to valves and other facility service components located behind casework, Provide removable wood access panels, each secured with minimum 4 brass screws.

.12 Install laminate-clad countertops as specified in Section 06 24 00.

.13 Install glazing as specified in Section 08 80 00.

.14 Provide closers and filler strips in matching finish as required to ensure a neat and complete finished assembly.

.15 Seal gaps and joints in wet areas with mildew-resistant joint sealer, and in non-wet areas with general purpose interior sealant. Conform to Section 07 92 00.

3.2 FIELD QUALITY CONTROL

.1 Arrange for an AWMAC appointed inspector to inspect the work of this Section after installation.

.2 Pay costs of AWMAC inspection.

.3 Make Good rejected Products and workmanship.

3.3 ADJUSTING

.1 Adjust doors and drawers to proper operation after installation.

.2 Fill and touch up damaged finishes to match factory finish.

.3 Replace damaged Product that can not be repaired.

3.4 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation from damage with temporary protective coverings.

.3 Maintain protection until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 26 00 - Vapour Retarders.

.2 Section 07 27 00 - Air Barriers.

.3 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.4 Section 07 84 00 - Firestopping.

.5 Section 09 21 16 - Gypsum Board Assemblies.

.6 Section 09 81 00 - Acoustic Insulation.

1.2 REFERENCES

.1 ASTM C518-21: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.2 ASTM C612-14(2019): Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.3 ASTM C1104/C1104M-19: Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

.4 ASTM D1621-10: Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

.5 ASTM D2842-19: Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.6 ASTM E96/E96M-16: Standard Test Methods for Water Vapor Transmission of Materials.

.7 CGSB 71-GP-24M: Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.

.8 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.9 CAN/ULC-S107-2019: Standard Methods of Fire Tests of Roof Coverings.

.10 CAN/ULC-S114-2018: Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.11 CAN/ULC-S126-14 (R2019): Standard Method of Test for Fire Spread Under Roof-Deck Assemblies.

.12 CAN/ULC-S701.1-2017: Standard for Thermal Insulation, Polystyrene Boards.

.13 CAN/ULC-S702.1-14 (R2019): Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

.14 ULC-S702.2-15: Standard for Mineral Fibre Thermal Insulation for Buildings, Part 2: Installation.

.15 CAN/ULC-S704.1-2017: Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

.16 CAN/ULC-S770-15 (R2020): Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Store, handle and protect Products as specified in Section 01 60 00.

.2 Minimize time plastic-type insulation Products are stored or exposed to sunlight at Place of the Work.

.3 Store Products away from construction activity and sources of ignition.

.4 Protect Products from damage during handling, installation and at point of installation.

1.4 AMBIENT CONDITIONS

.1 Apply Products only when surfaces and ambient temperatures are within manufacturer's prescribed limits.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of extruded polystyrene rigid board insulation having Product considered acceptable for use:
.1 DuPont de Nemours, Inc.
.2 Owens-Corning Canada Inc.

.2 Manufacturers of polyisocyanurate rigid board insulation having Product considered acceptable for use:
.1 Atlas Roofing Corporation.
.2 Elevate.
.3 GAF Materials Corporation.
.4 Hunter Panels.
.5 IKO Industries Ltd.
.6 Soprema.

.3 Manufacturers of mineral fibre batt and blanket insulation having Product considered acceptable for use:
.1 CertainTeed Canada, Inc.
.2 Knauf Insulation.
.3 Owens-Corning Canada Inc.
.4 Rockwool.

.4 Substitution Procedures: Refer to Section 01 25 00.

2.2 REGULATORY REQUIREMENTS

.1 Conform to applicable regulatory requirements for combustibility and surface burning characteristic requirements.

.2 Ensure foamed plastic insulations contain zero HFC and HCFC blowing agents, and conform to Global Warming Potential (GWP) values required by The Montreal Protocol.

2.3 RIGID BOARD INSULATION

.1 Rigid Board Insulation (INS-RB-1): To CAN/ULC-S701.1, Type 4; extruded polystyrene (XPS) rigid board insulation, closed cell type, with integral high density skin; and as follows:
.1 Aged Thermal Resistance (ASTM C518): RSI $\geq$ 0.88 per 25 mm of thickness.
.2 Board Size: 600 x 2 400 mm.
.3 Compressive Strength (ASTM D1621): 210 KPa.
.4 Water Absorption (ASTM D2842): $\leq$ 0.7 percent by volume.
.5 Edges: Shiplap.

.6 Water Vapour Permeance (ASTM E96/E96M): 50 ng/Pa•s•m^2.
.7 Thickness: As indicated on Drawings.
.8 Manufacturer and Product Name: eg. Styrofoam SM by DuPont de Nemours, Inc.

.2 Rigid Board Insulation (INS-RB-2): To CAN/ULC-S704.1; polyisocyanurate rigid board insulation, closed cell type; and as follows:
.1 Long Term Thermal Resistance (CAN/ULC-S770): RSI $\geq$ 0.93 per 25 mm of thickness.
.2 Compressive Strength (ASTM D1621): 140 kPa.
.3 Faces: Glass reinforced mat facers both sides.
.4 Water Absorption (ASTM D2842): < 1 percent.
.5 Edges: Square.
.6 Combustibility: Meets CAN/ULC-S107 and CAN/ULC-S126.
.7 Water Vapour Permeance (ASTM E96/E96M): 85 ng/Pa•s•m^2.
.8 Thickness: Do not use boards less than 38 mm thick; total thickness as indicated on Drawings using a minimum of two layers.
.9 Manufacturer and Product Name: eg. ISO 95+GL by Elevate.

2.4 BATT AND BLANKET INSULATION

.1 Batt Insulation (INS-BB-1): To CAN/ULC-S702.1, Type 1; mineral fibre non-rigid, friction fit thermal batt insulation, manufactured from glass, rock, or slag fibers; and as follows:
.1 Aged Thermal Resistance (ASTM C518): RSI $\geq$ 0.75 per 25 mm of thickness.
.2 Facing: Unfaced.
.3 Batt Size: 413 x 1 219 mm.
.4 Density (ASTM C612): 32 kg/m^3.
.5 Combustibility (CAN/ULC-S114): Noncombustible.
.6 Thickness: As indicated on Drawings.
.7 Manufacturer and Product Name: eg. ComfortBatt by Rockwool.

2.5 ACCESSORIES

.1 Adhesive for Use with Polystyrene: To CGSB 71-GP-24M, Type 1.

.2 Adhesive for Use with Other Materials: Mastic type, synthetic rubber base, fungi resistant, gun or trowel applied.

.3 Tape: 50 mm wide polyester self-adhering tape.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Ensure air seals and vapour retarders are in place.

3.2 RIGID BOARDS

.1 Secure rigid board insulation with adhesive, applied in three continuous beads per board length.

.2 Install insulation boards on wall surface either horizontally or vertically as required. Place membrane surface of insulation solidly against substrate and secure in-place.

.3 Stagger side and end joints.

.4 Butt edges and ends tight to adjacent board and to protrusions.

3.3 BATTS AND BLANKETS

.1 Install mineral fibre batts and blankets to ULC-S702.2.

.2 Install batt insulation in spaces without gaps and voids.

.3 Fit insulation tight in spaces and tight to exterior side of facility service components within plane of insulation.

3.4 FIELD QUALITY CONTROL

.1 Notify Consultant and independent inspection company to inspect thermal insulation before, during and upon completion of installation.

3.5 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect insulation edges at end of each Working Day.

.3 Protect insulation in areas where welding will be carried out.

.4 Replace insulation damaged by other Sections.

.5 Protect insulation requiring a thermal barrier in accordance with applicable regulatory requirements.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 21 00 - Thermal Insulation.

.2 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.3 Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

.1 ASTM E96/E96M-16: Standard Test Methods for Water Vapor Transmission of Materials.

.2 SWI Sealant and Caulking Guide Specification.

1.3 SEQUENCING

.1 Sequence installation of Products in conjunction with other air and vapour barrier materials and seals.

1.4 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating material characteristics, performance criteria and limitations.

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's instructions as specified in Section 01 33 00.

.2 Manufacturer's Instructions: Manufacturer's standard installation guidelines, indicating preparation and installation requirements and techniques.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Carlisle Coatings and Waterproofing.
.2 Elevate.
.3 Henry Company Canada.
.4 IKO Industries, Ltd.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Ensure continuity of building enclosure vapour retarder in conjunction with materials specified in other Sections.

.2 Seal gaps between building enclosure components and wall and roof opening frames.

2.3 MATERIALS

.1 Bituminous Membrane Vapour Retarder: Self-adhering bituminous membrane with laminated top surface; as follows:
.1 Thickness: 0.76 mm.
.2 Core: SBS modified asphalt.
.3 Top Surface: Tri-laminate woven high density polyethylene.

.4 Water Vapour Permeance (ASTM E96/E96M): $\leq$ 1.5 Ng/Pa•s•m^2.
.5 Manufacturer and Product Name: eg. V-Force Vapour Barrier Membrane by Elevate.

.2 Primer for Bituminous Membrane Vapour Retarder: Single-component, water-based primer; eg. V-Force WB Primer by Elevate.

.3 Joint Sealant: Exterior flashing sealant, Type SEAL-EXT-FL as specified in Section 07 92 00.

3 Execution

3.1 PREPARATION

.1 Ensure substrate surfaces are clean, dry and free of oil, grease, dirt, excess mortar or other contaminants.

.2 Cure new concrete for minimum two weeks.

.3 Prime substrate prior to applying self-adhering bituminous membranes.

3.2 INSTALLATION

.1 Install Products to SWI Sealant and Caulking Guide Specification.

.2 Apply self-adhered bituminous membranes over primed surface, from low points to high points, overlapping edges by 65 mm.

.3 Stagger end laps.

.4 Install membrane to avoid fishmouths and wrinkles.

.5 Roll membrane with a weighted roller wrapped in resilient material.

3.3 FIELD QUALITY CONTROL

.1 Inspect vapour retarders prior to concealment and identify gaps, holes and punctures.

.2 Seal gaps, holes and punctures in vapour retarder membranes with joint sealant, as specified in Section 07 92 00.

.3 Request Consultant inspection of vapour retarders prior to concealment. Work that has been concealed prior to Consultant inspection will be exposed while Consultant remains at Place of the Work, inspected, and then only concealed upon Consultant acceptance.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean extra materials from adjacent surfaces.

.3 Leave a suitable substrate for subsequent installations.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 21 00 - Thermal Insulation.

.2 Section 07 26 00 - Vapour Retarders.

.3 Section 07 27 36 - Sprayed Foam Air Barrier.

.4 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.5 Section 07 92 00 - Joint Sealants.

.6 Section 08 12 13 - Hollow Metal Frames.

.7 Section 08 51 13 - Aluminum Windows.

.8 Section 08 90 00 - Louvers and Vents.

1.2 REFERENCES

.1 ASTM D412-16: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.

.2 ASTM D882-12: Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

.3 ASTM E96/E96M-16: Standard Test Methods for Water Vapor Transmission of Materials.

.4 ASTM E154/E154M-08a(2019): Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

.5 ASTM E2178-21: Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

.6 SWI Sealant and Caulking Guide Specification.

.7 CAN/ULC-S741-2008 (R2016): Standard for Air Barrier Materials - Specification.

.8 CAN/ULC-S742-2011 (R2016): Standard for Air Barrier Assemblies - Specification.

1.3 SEQUENCING

.1 Sequence installation in conjunction with other air and vapour barrier materials and seals.

1.4 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating material characteristics, performance criteria and Product limitations.

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's instructions as specified in Section 01 33 00.

.2 Manufacturer's Instructions: Manufacturer's standard installation instructions, indicating substrate preparation, and Product installation requirements and techniques.

1.6 QUALIFICATIONS

.1 Applicators: A firm recognized by manufacturer as suitable for applying specified air barrier Products.

1.7 DELIVERY STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products in undamaged containers and original packaging indicating name of manufacturer and product.

.3 Store roll materials on end in original packaging.

.4 Store adhesives and primers at 5 degrees C to facilitate handling.

.5 Keep solvent away from open flame or excessive heat.

.6 Protect rolls from direct sunlight until ready for use.

1.8 AMBIENT CONDITIONS

.1 Apply sheet membranes when ambient air temperature is above 5 degrees C.

.2 Apply membranes only during dry conditions, and to dry substrates that are free of snow, ice and water.

.3 Apply only dry materials, during weather that will not introduce moisture into assembly.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of air barrier membranes having Product considered acceptable for use:
.1 Dörken Systems, Inc.
.2 Henry Company Canada.
.3 SRP Canada, Inc.
.4 VaproShield.
.5 W. R. Meadows of Canada Limited.

.2 Manufacturers of air/vapour barrier membranes having Product considered acceptable for use:
.1 Carlisle Coatings and Waterproofing, Inc.
.2 Henry Company Canada.
.3 IKO Industries Ltd.
.4 Soprema Inc.
.5 Tremco.
.6 W. R. Meadows of Canada Limited.

.3 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Ensure continuity of building enclosure air barrier in conjunction with adjacent Products.

.2 Seal gaps between building enclosure components and wall and roof opening frames.

2.3 MATERIALS

.1 Air/Vapour Barrier Sheet Membrane: To CAN/ULC-S741 and CAN/ULC-S742, Class A1; SBS rubberized asphalt sheet membrane, self-adhering grade; and as follows:
.1 Thickness: $\geq$ 1.0 mm.
.2 Air Leakage (ASTM E2178): $\leq$ 0.02 L/s•m^2 @ 75 Pa.
.3 Water Vapour Permeance (ASTM E96/E96M, Method A): $\leq$ 1.71 ng/Pa•s•m^2.
.4 Elongation (ASTM D412 - Modified): 200 percent.
.5 Tensile Strength (ASTM D412 - Modified): 3.45 MPa.

.6 Puncture Resistance (ASTM E154/E154M): 178 N.
.7 Product and Manufacturer Name: eg. Bakor Blueskin SA by Henry Company Canada.

.2 Air Barrier Sheet Membrane: To CAN/ULC-S741 and CAN/ULC-S742, Class A1; vapour permeable, water resistive, air barrier sheet membrane, self-adhering grade; and as follows:
.1 Thickness: $\geq$ 0.55 mm.
.2 Air Leakage (ASTM E2178): $\leq$ 0.02 L/s•m^2 @ 75 Pa.
.3 Water Vapour Permeance (ASTM E96/E96M, Method A): $\geq$ 1 655 ng/Pa•s•m^2.
.4 Tensile Strength (ASTM D882): 182 N.
.5 Product and Manufacturer Name: eg. Bakor Blueskin VP 160 by Henry Company Canada.

.3 Air/Vapour Barrier Sealant: To CAN/ULC-S741 and CAN/ULC-S742, Class A1; single-component, trowel- or brush-applied solvent type synthetic rubber; and as follows:
.1 Air Leakage (ASTM E2178): $\leq$ 0.02 L/s•m^2 @ 75 Pa.
.2 Water Vapour Permeance (ASTM E96/E96M, Method A): $\leq$ 1.7 ng/Pa•m^2•s.
.3 Solids Content by Weight: 72 percent.
.4 Product and Manufacturer Name: eg. Bakor Air-Bloc 21 by Henry Company Canada.

.4 Attachments: Galvanized steel bars and anchors.

.5 Adhesive: Compatible with sheet barrier and substrate, permanently non-curing.

.6 Tape: 66 mm wide, self-adhesive polypropylene tape.

.7 Primer: As recommended by self-adhering membrane manufacturer.

.8 Joint Sealant: Exterior flashing sealant, Type SEAL-EXT-FL as specified in Section 07 92 00.

3 Execution

3.1 PREPARATION

.1 Ensure surfaces are clean, dry and free of oil, grease, dirt, excess mortar and other contaminants.

.2 Cure new concrete for minimum two weeks.

.3 Fill spalled concrete or open mortar joints to an even plane.

.4 Apply primer to substrates.

3.2 INSTALLATION

.1 Install Products to SWI Sealant and Caulking Guide Specification.

.2 Provide air tight joints.

.3 Seal Products completely around projections and penetrations.

.4 Fully adhere sheet membranes to primed substrate, using consecutive weatherboard method.

.5 Eliminate wrinkles, gaps, bubbles, air pockets and fishmouths.

.6 Apply transition sheet membranes at openings and transitional connections.

.7 Leave sufficient amount of excess membrane over top of parapet walls and around wall openings for tie-in by other Sections.

.8 Cut membrane neatly around penetrations. Use heated trowel to soften and form membrane. Seal with air/vapour barrier sealant.

.9 Do not leave installed membranes exposed to UV or weather for more than 42 days.

3.3 FIELD QUALITY CONTROL

.1 Inspect completed installation prior to concealment and identify gaps, holes and punctures.

.2 Seal gaps, holes and punctures with air/vapour barrier sealant.

.3 Request Consultant inspection prior to concealment. Work that has been concealed prior to Consultant inspection will be exposed while Consultant remains at Place of the Work, inspected, and then only concealed upon Consultant acceptance.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean extra material from adjacent surfaces.

.3 Leave a suitable substrate for subsequent construction.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 21 00 - Thermal Insulation.

.2 Section 07 27 00 - Air Barriers.

.3 Section 08 12 13 - Hollow Metal Frames.

.4 Section 08 51 13 - Aluminum Windows.

.5 Section 08 90 00 - Louvers and Vents.

1.2 REFERENCES

.1 SWI Sealant and Caulking Guide Specification.

.2 CAN/ULC-S710.1-2019: Standard for Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification.

.3 CAN/ULC S710.2-11: Standard for Thermal Insulation - Bead Applied One-Component Polyurethane Air Sealant Foam, Part 2: Application.

.4 CAN/ULC-S711.1-2019: Standard for Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification.

.5 CAN/ULC S711.2-11: Standard for Thermal Insulation - Bead Applied Two-Component Polyurethane Air Sealant Foam, Part 2: Application.

1.3 SEQUENCING

.1 Sequence installation of Products in conjunction with air barriers and vapour retarders.

1.4 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating material characteristics, performance criteria and Product limitations.

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's instructions as specified in Section 01 33 00.

.2 Manufacturer's Instructions: Manufacturer's standard installation instructions, indicating preparation and installation requirements and techniques.

1.6 DELIVERY STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products in undamaged containers and original packaging indicating name of manufacturer and Product.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 DuPont de Nemours, Inc.
.2 Henkel Canada Corporation.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Ensure continuity of building enclosure air barrier in conjunction with Products specified in other Sections.

.2 Seal gaps between building enclosure components and opening frames.

2.3 MATERIALS

.1 Air Sealant Foam (ASF-1): To CAN/ULC-S710.1; one-component polyurethane sealant.

.2 Air Sealant Foam (ASF-2): To CAN/ULC-S711.1; two-component polyurethane sealant.

3 Execution

3.1 PREPARATION

.1 Ensure surfaces are clean, dry and free of oil, grease, dirt, excess mortar and other contaminants.

3.2 INSTALLATION

.1 Install air sealant foam in accordance with authorities having jurisdiction.

.2 Avoid overfilling restricted spaces.

.3 Seal gaps between air barrier membranes and frames installed in openings.

.4 Apply air sealant foam Type ASF-1 to cracks or openings 6 mm to 50 mm wide. Conform to CAN/ULC S710.2.

.5 Apply air sealant foam Type ASF-2 to gaps over 50 mm wide, and to voids in hidden cavities. Conform to CAN/ULC S711.2.

3.3 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean extra material from adjacent surfaces.

.3 Leave a suitable substrate for subsequent construction.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 30 00 - Steel Deck.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 07 21 00 - Thermal Insulation.

.4 Section 07 26 00 - Vapour Retarders.

.5 Section 07 62 00 - Sheet Metal Flashing and Trim.

.6 Section 07 92 00 - Joint Sealants.

.7 Section 08 62 26 - Flat Glass Unit Skylights.

1.2 REFERENCES

.1 ASTM C1278/C1278M-17: Standard Specification for Fiber-Reinforced Gypsum Panel.

.2 ASTM E84-22: Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 ASTM F1667-21: Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.4 CRCA Roofing Specifications.

.5 CSA A123.4-M1979: Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.

.6 CSA A123.21:20: Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.

.7 CSA A123.23-15: Product Specification for Polymer-Modified Bitumen Sheet, Prefabricated and Reinforced.

.8 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.9 CAN/ULC-S107-2019: Standard Methods of Fire Tests of Roof Coverings.

.10 CAN/ULC-S114-2018: Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.11 CAN/ULC-S126-14 (R2019): Standard Method of Test for Fire Spread Under Roof-Deck Assemblies.

.12 CAN/ULC-S706.1-2020: Standard for Wood Fibre Insulating Boards for Buildings.

1.3 PREINSTALLATION MEETINGS

.1 Conduct preinstallation meetings as specified in Section 01 31 00.

.2 Prior to commencement of deck installation, review and document methods and procedures related to roof deck and roofing system construction, including:
  .1 Participants: Authorized representatives of Owner, Contractor, Consultant, roofing Subcontractor, roofing manufacturer, and installers of roof accessories and roof-mounted equipment.
  .2 Review methods and procedures related to roofing installation, including manufacturer's written installation instructions.

.3 Review construction schedule and confirm availability of Products, Subcontractor personnel, equipment and facilities.
.4 Review deck installation criteria and finishes for conformance with roofing system criteria, including issues of flatness and fastening.
.5 Review structural loading conditions and limitations of roof deck both during and after roofing application.
.6 Review flashing details, special roofing details, roof drainage, roof penetrations, equipment curbs and other conditions affecting roofing installation.
.7 Review governing regulatory requirements, and requirements for insurance and certificates as applicable.
.8 Review safety requirements, including temporary fall-arrest measures.
.9 Review field quality control procedures.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating degree of slope and layout of tapered insulation, flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations and drains.

1.5 CERTIFICATES

.1 Manufacturer Certificates: Signed by roofing manufacturer verifying installer is approved, authorized or licensed by manufacturer to install specified Products.

.2 Installer Certificates: Signed by installer verifying they have specified qualifications.

1.6 TEST AND EVALUATION REPORTS

.1 Submit test reports as specified in Section 01 33 00.

.2 Test Reports: Manufacturer's standard test results indicating Products meet specified performance criteria, prepared by independent testing agency and current within past 5 years.

1.7 FIELD QUALITY CONTROL SUBMITTALS

.1 Submit manufacturer's field inspection reports as specified in Section 01 40 00.

.2 Manufacturer Field Inspection Reports: Manufacturer's written acceptance of roofing installation based on regular inspections.

1.8 QUALIFICATIONS

.1 Applicator: A firm specializing in applying modified bituminous membrane roofing, having minimum 10 years documented experience and a member of OIRCA.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Do not store insulation, roofing felts or cants on roof. Keep materials elevated and under cover.

.3 Package roofing materials and identify on attached labels, the manufacturer, brand, contents, weight as applicable and product and specification numbers.

.4 Protect edges of roll goods from damage. Take extra precaution with base sheet.

.5 Protect porous materials from moisture.

.6 Protect insulation from sunlight.

1.10 AMBIENT CONDITIONS

.1 Do not apply any roofing materials during inclement weather.

.2 Comply with manufacturer's recommendations for minimum and maximum temperatures and humidity during application.

.3 Do not install Products when temperatures are below -10 degrees C.

.4 Consider effects of wind chill on adhesives, and ensure they will not prematurely set before proper adhesion takes place.

.5 Keep water-based Products from freezing. Do not apply water-based Products if temperatures are below 5 degrees C.

1.11 WARRANTY

.1 Submit extended warranties in accordance with General Conditions of the Contract.

.2 Installer's Extended Warranty: Standard OIRCA two year extended warranty, covering labour and materials necessary to repair defective roofing system, and cover damage to building and contents resulting from failure to resist penetration of water.

.3 Manufacturer's Extended Warranty: A written warranty stating manufacturer will replace, at no cost to Owner, any portion of roofing membrane experiencing actual leaks resulting from manufacturing defects for a period of 15 years after Substantial Performance of the Work.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
- .1 Elevate.
- .2 Henry Company Canada.
- .3 IKO Industries Ltd.
- .4 Johns Manville.
- .5 Soprema.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESIGN AND PERFORMANCE CRITERIA

.1 Design roof assembly to arrest water migration from entering building through roof membrane.

.2 Dynamic Wind Uplift Resistance (CSA A123.21): As follows:
- .1 Field of Roof: 1.2 kPa.
- .2 Edge of Roof: 1.7 kPa.
- .3 Corners of Roof: 2.74 kPa.

.3 Conform to CAN/ULC-S126 and CAN/ULC-S107.

2.3 MATERIALS

.1 Underlay and Cover Boards: To ASTM C1278/C1278M; 12.7 mm thick fiber-reinforced gypsum board with water-resistant core; and meeting the following criteria:
- .1 Combustibility (CAN/ULC-S114): Noncombustible.
- .2 Surface Burning Characteristics (CAN/ULC-S102):
  - .1 Flame Spread Index $\leq$ 5.
  - .2 Smoke Developed Index = 0.

.2 Vapour Retarder: Bituminous membrane vapour retarder, as specified in Section 07 26 00.

.3 Flat Roof Insulation: Polyisocyanurate rigid board insulation, Type INS-RB-2, minimum two layers, as specified in Section 07 21 00.

.4 Tapered Roof Insulation: Polyisocyanurate rigid board insulation, Type INS-RB-2 as specified in Section 07 21 00; slopes and thicknesses as indicated on the tapered insulation Shop Drawings.

.5 Base Sheet: To CSA A123.23, Type C, Grade 3; 2.5 mm thick SBS modified bituminous membrane, self-adhering grade, non-woven reinforced composite mat strengthened with glass fiber strands; removable silicone-treated release film on underside, and removable split release film on upper surface.

.6 Cap Sheet: To CSA A123.23, Type C, Grade 1; 4.0 mm thick SBS modified bituminous membrane, self-adhering grade, non-woven reinforced composite mat strengthened with glass fiber strands; removable film strip on underside, ceramic mineral granules factory-embedded on upper surface, colour as selected by Consultant.

2.4 ACCESSORIES

.1 Primer: Quick drying, solvent based adhesive; eg. S.A.M. Adhesive by IKO Industries Ltd.

.2 Bitumen: To CSA A123.4-M, Type 3.

.3 Nails: To ASTM F1667, Type I (NL); common wire, galvanized steel, large head roofing style; sufficient length to penetrate a minimum of 25 mm into substrate.

.4 Base and Cap Flashing Membranes: Similar to base and cap sheet roofing membranes.

.5 Insulation Adhesive: One-component elastomeric foamable adhesive; eg. Millennium Adhesive by IKO Industries, Ltd.

.6 Miscellaneous Adhesives: As recommended by roofing manufacturer.

.7 Fibreboard Cant: To CAN/ULC-S706.1, Type I, Grade 2; asphalt-impregnated fibreboard, suitable size to create a 75 x 75 mm size cant set at a 45 degree angle.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Ensure surfaces to receive roofing membrane are dry.

.3 Examine deck to ensure structural soundness, with no significant instances of corrosion or deterioration.

.4 Notify Consultant immediately if deck surface is corroded.

3.2 PREPARATION

.1 Clean deck surface to remove irregularities, old adhesive, dirt, rust, oil and other deleterious materials that would impair application.

3.3 UNDERLAY BOARD

.1 Securely adhere underlay boards over metal roof deck, using beads of adhesive, applied at manufacturer's recommended rate of application.

.2 Stagger underlay boards 150 mm.

.3 Install underlay boards with long axis perpendicular to deck ribs, with end joints fully supported.

.4 Firmly butt each board to surrounding boards. Do not jam or deform boards.

.5 Provide filler boards at 450 mm each direction.

3.4 VAPOUR RETARDER

.1 Adhere roof vapour retarder membrane as specified in Section 07 26 00.

.2 Overlap vapour retarder minimum 100 mm for side laps and 150 mm for end laps. Seal seams.

.3 Extend vapour retarder under cant strips and blocking. Extend to perimeter and deck protrusions.

.4 Seal roof vapour retarder to wall air/vapour barrier system with flexible flashing membranes to ensure continuity of building air/vapour barrier envelope.

3.5 INSULATION

.1 Immediately after installing vapour retarder membrane, install insulation boards as specified in Section 07 21 00 and as described below. Ensure vapour retarder membrane is clean and dry.

.2 Embed minimum two layers of rigid board insulation into continuous beads of insulation adhesive.

.3 Lay subsequent layers of insulation with joints staggered 150 mm.

.4 Lay insulation boards with edges in moderate contact without forcing.

.5 Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

.6 Install tapered insulation boards where indicated and in accordance with accepted Shop Drawings.

.7 When recommended by insulation manufacturer, tape joints of insulation boards.

.8 Apply no more insulation than can be sealed with cover board and roof membrane in same day.

3.6 COVER BOARD

.1 Adhere single layer of cover board over insulation using beads of insulation adhesive, applied at manufacturer's recommended rate of application.

.2 Stagger cover board seams with insulation board seams.

.3 Install drain sumps as indicated on Drawings.

.4 Prime cover boards.

.5 Apply no more cover board than can be sealed with roof membrane in same day.

3.7 BASE SHEET

.1 Starting at low point of roof and at right angles to slope, unroll and align base sheet.

.2 Adhere membrane to primed substrate, eliminating wrinkles, gaps, bubbles, air pockets and fishmouths. Heat fuse side laps.

.3 Install base sheet with minimum 75 mm side laps and minimum 150 mm end laps.

.4 Ensure adjacent end laps are staggered minimum 2 000 mm.

.5 Nail each mopped sheet at insulation stops at 200 mm OC where roof slope exceeds 1:12.

.6 Terminate base ply sheets at top of cant.

.7 Cut base sheet flashing from base sheet roll giving pieces 1 000 mm wide by a length that will run minimum 100 mm onto roof surface at base of cant, and will extend up and over parapet. Ensure proper size prior to installation.

.8 Apply base flashing using similar fastening method as base sheet application. Ensure minimum 75 mm wide end laps, staggered from base ply side laps.

3.8 CAP SHEET

.1 In same direction as base sheet, and staggering 500 mm from base sheet side lap and 2 000 mm from base sheet end lap, unroll and align cap sheet membrane.

.2 Adhere cap sheet membrane to base sheet, eliminating wrinkles, gaps, bubbles, air pockets and fishmouths. Heat fuse side laps.

.3 Terminate cap ply sheets at top of cant.

.4 Cut cap sheet flashing from cap sheet roll giving pieces 1 000 mm wide by a length that will run minimum 150 mm onto roof surface at base of cant, and will extend over cant minimum 200 mm above roof surface. Ensure proper size prior to installation.

.5 Apply cap sheet flashing using similar fastening method as cap sheet application. Ensure minimum 75 mm wide end laps, staggered from cap sheet side laps.

3.9 CANTS

.1 Unless shown otherwise on Drawings, install fibreboard cants at junctions between roof and vertical surfaces. Protect cants from moisture with continuous coating of bitumen on all surfaces.

.2 Install cants in continuous bed of bitumen, applied to both horizontal and vertical surfaces.

.3 Provide tight flush joints between lengths of cants and mitre corners.

3.10 ROOF PENETRATIONS

.1 Make roof penetrations watertight.

.2 Prime roof flanges with roofing mastic prior to roofing membrane installation. Install membrane continuously over penetration, then cut out and trim neatly to interior facing. Coat membrane with bitumen, and set and secure any clamping rings in bed of mastic as required.

.3 Insulate sleeves and soil pipes with mineral fibre insulation.

.4 Set caps or collars, and seal with approved sealant to provide a watertight installation.

.5 Apply flashings to ensure a complete and watertight fit of roofing accessories.

.6 Install roof drains only after roofing has been completed, and low points in roof structure have been determined. Ensure roof screens are secured in place over roof drains with mechanical device approved by Consultant.

3.11 FIELD QUALITY CONTROL

.1 Perform field inspection and testing as specified in Section 01 40 00.

.2 Advise Consultant and roofing inspector 48 hours prior to start of roofing operations.

.3 Manufacturer's Field Service: Arrange for manufacturer's technical representative to regularly inspect application (minimum twice per week) and confirm roofing installation is in strict accordance with manufacturer's recommendations.

.4 Contractor Inspection: Inspect completed membrane and flashing for punctures, tears and discontinuously sealed seams. Apply additional layer of membrane over punctures and tears, extending minimum 50 mm beyond damaged area in all directions and seal to roofing membrane. Re-seal seams where necessary.

3.12 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean drains of debris, ensuring free drainage.

.3 Clean adjacent roof surfaces, levels and ground level areas of debris and excess Products.

3.13 PROTECTION

.1 Refer to Section 01 76 00.

.2 Adequately protect Products and the Work from damage by weather, traffic and other causes.

.3 At end of each Working Day, seal exposed edges of roofing membrane watertight.

.4 Protect adjacent parts of the Work from damage.

.5 Make Good damage.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.3 Section 07 92 00 - Joint Sealants.

.4 Section 08 62 26 - Flat Glass Unit Skylights.

1.2 REFERENCES

.1 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A755/A755M-18: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

.3 ASTM B32-20: Standard Specification for Solder Metal.

.4 ASTM D1970/D1970M-21: Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.5 ASTM F1667-21: Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.6 SMACNA Architectural Sheet Metal Manual, Seventh Edition, 2012.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets for manufactured items, indicating:
.1 Catalogue numbers,
.2 Product and manufacturer names,
.3 Available finishes, and
.4 Other pertinent data.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating:
.1 Fascia, trim and closure pieces;
.2 Anchorage devices;
.3 Connection and jointing details;
.4 Dimensions and thicknesses;
.5 Finishes, and
.6 Other pertinent data.

1.5 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: 450 mm long samples, indicating sheet metal flashing design, method of locking and method of anchoring. Include one interior corner and one exterior corner condition.

1.6 QUALIFICATIONS

.1 Installer: A firm specializing in fabricating and installing sheet metal flashing and trim in accordance with SMACNA standard practices and details.

1.7 MOCK-UPS

.1 Construct mock-ups as specified in Section 01 40 00.

.2 Mock-Ups: Full-width, 1 220 mm long, mock-up panels for each type of sheet metal flashing, demonstrating interfaces with adjacent construction; profiles, textures, and colours; edge seaming and sealing techniques; and methods of attachment.

.3 Accepted mock-ups will be used as the standard for acceptance of the Work.

.4 Remove and replace installed Product that does not conform to accepted mock-up.

.5 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.8 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of 5 years, protecting against leakage, joint spalling and similar defects.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of membrane underlayment having Product considered acceptable for use:
.1 Grace.
.2 Henry Company Canada.
.3 Soprema Inc.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Prefinished Sheet Steel: To ASTM A755/A755M, Structural Steel (SS) Grade 230, Types 1 and 2; galvanized sheet steel, 0.76 mm thick before galvanizing; with monochromatic paint coating.

.2 Unfinished Steel Sheet: To ASTM A653/A653MASTM A792/A792M, Structural Steel (SS) Grade 230, Types 1 and 2; galvanized sheet steel, 0.61 mm thick before galvanizing.

.3 Nails: To ASTM F1667, Type I (NL); common wire, corrosion-resistant type, material compatible with adjacent surfaces; sufficient length to penetrate a minimum of 25 mm into substrate.

.4 Cleats: 0.76 mm thick sheet steel; minimum 38 mm wide and interlocked with metal flashing.

.5 Starter Strips: 0.76 mm thick sheet steel; continuous lengths.

.6 Back-up Plates: 0.91 mm thick prefinished sheet steel; minimum 300 mm wide where adjacent lengths of cap flashing meet.

.7 Screws, Bolts and Expansion Shields: Non-ferrous metal compatible with adjacent surfaces. Exposed fastenings; same materials as metal surfaces through which they penetrate. Use cadmium plated screws with round heads suitable for soldering for galvanized work.

.8 Solder: To ASTM B32; 50 percent block tin, 50 percent pig lead.

.9 Flux: Commercial hydrochloric acid cut with zinc, or 10 - 20 percent solution of orthophosphoric acid in water, for use with galvanized work.

.10 Membrane Underlayment: To ASTM D1970/D1970M; 1.0 mm thick, self-sealing, self-adhering, heat-resistant rubberized asphalt membrane, eg. Ice & Water Shield HT by Grace.

.11 Primer: Water-based primer, eg. Perm-A-Barrier WB Primer by Grace.

.12 Joint Sealant: Exterior flashing sealant, Type SEAL-EXT-FL as specified in Section 07 92 00.

.13 Flashing Paint: Quick drying asphaltic base paint; eg. Primer 910-02 by Henry Company Canada.

2.3 MANUFACTURED UNITS

.1 Pre-Insulated Stack Jack Flashings: 1.6 mm thick seamless, spun aluminum; 457 mm overall height with 356 mm high insulated sleeve; diameters to suit applications; complete with premoulded urethane insulation on inner side of sleeve and 102 mm wide bituminous painted deck flange; with removable 1.29 mm thick aluminum hood and perforated collar; eg. Model SJ-31 Vandal Proof Stack Jack Flashing by Thaler Roofing Specialties Products Inc.

.2 Flashing for Flexible Conduit: Goose neck shaped aluminum flashing pipe sleeve; 305 mm high, diameters to suit application; complete with 102 mm wide bituminous painted deck flange; Model MEF-2A/2A1/2A2 Liquid Tight Flexible Conduit Flashing by Thaler Roofing Specialties Products Inc.

.3 Flashing for "B" Vent Pipes with Split Collars: 1.6 mm thick seamless spun aluminum sleeve flashing with sloping sides to allow for air movement, 305 mm high, diameters to suit; complete with 50 mm wide perforated aluminum vent holes at top of sleeve for air circulation, 102 mm wide bituminous painted deck flange, and a 1.6 mm thick split aluminum collar, eg. Model MEF-4A "B" Vent Flashings by Thaler Roofing Specialties Products Inc.

2.4 FABRICATION

.1 Shop fabricate flashing components as much as possible to minimize site operations.

.2 Fabricate Products to SMACNA Architectural Sheet Metal Manual.

.3 Form sheet metal on bending brake.

.4 Perform shaping, trimming and hand seaming on bench, where practicable, using proper sheet metal working tools.

.5 Fabricate material in clean shops, located away from areas where carbon steel is torch cut, ground, or cut with abrasive wheels to ensure carbon steel dust will not be embedded in prefinished surfaces.

.6 Clean tools and dies which have been used on carbon steel prior to fabrication to prevent contamination of surface with carbon steel dust.

.7 Form sections square, true and accurate to size. Flashings shall be free from distortion, waves, twists, buckles or other defects detrimental to appearance and performance.

.8 Allow for thermal movement when forming, installing, interlocking and soldering sheet metal components to avoid buckling, fullness of metal straining of joints or seams.

.9 Limit maximum length of flashing pieces to 2 400 mm.

.10 Double back exposed edges at least 12 mm for appearance and stiffness.

.11 Fabricate flashings, copings, closures, plastic boxes, pipe sleeves and flashings for roof mounted equipment to details shown, unless otherwise indicated.

.12 Wipe and wash clean soldered joints immediately after joint is soldered to remove acid.

.13 Where soldered joints are absolutely necessary and where approved for use in prefinished metal, clean paint off both surfaces before soldering for minimum area necessary.

2.5 FINISHES

.1 Shop Priming:
- .1 Clean surfaces of rust, scale, grease and foreign matter prior to shop priming.
- .2 Do not prime surfaces designated to come into direct contact with concrete or where field welding is required.
- .3 Prime components with minimum two coats primer.

.2 Galvanized Coating on Sheet Steel: To ASTM A653/A653M, Grade Z275; hot dipped zinc alloy coating.

.3 Monochromatic Paint Coating on Sheet Steel: To ASTM A755/A755M; two-coat silicone modified polyester coil coating, factory-applied to 0.028 mm dry film thickness; eg. WeatherXL by Valspar, colour as selected by Consultant.

3 Execution

3.1 PREPARATION

.1 Prime substrates designated to receive self-adhered membrane underlayment.

.2 Secure membrane underlayment in place and lap joints 100 mm.

3.2 INSTALLATION

.1 Install Products to SMACNA Architectural Sheet Metal Manual.

.2 Provide flashings required for proper execution and completion of the Work in an acceptable manner, including metal flashing around mechanical and other equipment occurring on roof.

.3 Install sheet metal flashings with joints lapped, locked, cleated with S-cleats and sealed, or soldered, as required.

.4 Hem exposed edges 12 mm.

.5 Type of joints used shall be adequate for various conditions, subject to approval.

.6 Fabricate exposed fastening in such a manner to prevent water penetration at point of fastening.

.7 Provide starter strips where indicated or required to present true, non-waving, leading edge. Anchor to back-up to provide rigid, secure installation.

.8 Make end joints where adjacent lengths of metal flashing meet using 300 mm long back-up flashing secured in place before installing flashing.

.9 Apply beads of sealant on face of back-up plate to seal ends of metal flashing.

.10 Leave 12 mm wide space between end of adjacent lengths of metal flashings.

.11 Fabricate back-up of same material and finish as metal flashing with which it is being used. Make back-up plate exact profile of flashing allowing for thickness of flashing joints.

.12 Form metal fascia with inner edge extended over fascia top and down cant to meet roofing aggregate. Nail with roofing nails and neoprene washers at 300 mm OC. Avoid placing nails in face of fascia, through membrane or flashing.

.13 Interlock counter flashing pieces with prefinished metal base flashing and fold locking seam into position ensuring complete sealing. Continue counter flashing down to hemmed and sprung position at base of cant and junction of aggregate.

3.3 ADJUSTING

.1 Imperfections in sheet metal work (such as holes, dents, creases or oil-canning) will be rejected.

.2 Make Good damaged sheet metal work.

.3 Wash entire installation down, and leave in neat condition.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 04 00 00 - Masonry.

.3 Section 05 50 00 - Metal Fabrications.

.4 Section 07 92 00 - Joint Sealants.

.5 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

.1 ASTM C303-21: Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.

.2 ASTM C1104/C1104M-19: Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

.3 ASTM E84-22: Standard Test Method for Surface Burning Characteristics of Building Materials.

.4 ASTM E119-22: Standard Test Methods for Fire Tests of Building Construction and Materials.

.5 ASTM E814-13a(2017): Standard Test Method for Fire Tests of Penetration Fire Stop Systems.

.6 ASTM E2174-20a: Standard Practice for On-Site Inspection of Installed Firestop Systems.

.7 ASTM E2393-20a: Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

.8 CAN/ULC-S101-14 (REV1): Standard Method of Fire Endurance Tests of Building Construction and Materials.

.9 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.10 CAN/ULC-S114-2018: Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.11 CAN/ULC-S115-2018: Standard Method of Fire Tests of Firestop Systems.

.12 CAN/ULC-S129-15 (REV1): Standard Method of Test for Smoulder Resistance of Insulation (Basket Method).

.13 CAN/ULC-S702.1-14 (R2019): Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

.14 ULC List of Equipment and Materials.

1.3 PREINSTALLATION MEETINGS

.1 Prior to commencing installation of firestopping and smoke seals, arrange and conduct preinstallation meeting as specified in Section 01 31 00.

.2 Preinstallation Meeting: Discuss proposed methods and materials to be used in each instance.

.3 Representatives of Owner, Contractor, Consultant, Subcontractor, manufacturer and authority having jurisdiction are to be in attendance.

.4 Do not conduct meeting unless identified parties are present.

1.4 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Sealant manufacturer's standard installation instructions and standard drawings, indicating ULC or WHI test designations.

1.5 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating sizes of openings, nature of penetrations and tested method of firestop and smoke seal protection being proposed.
.1 Shop Drawings are to be stamped, signed and dated by manufacturer's design engineer.
.2 Submit Shop Drawings to Consultant and to authority having jurisdiction for review and acceptance.

1.6 CERTIFICATES

.1 Submit certification as specified in Section 01 33 00.

.2 Certificate: Sealant manufacturer's letter of certification verifying Products meet or exceed specified requirements.

1.7 TEST AND EVALUATION REPORTS

.1 Submit test reports as specified in Section 01 33 00.

.2 Test Reports: Manufacturer's standard test results indicating Products meet specified performance criteria, prepared by independent testing agency and current within past two years.

1.8 FIELD QUALITY CONTROL SUBMITTALS

.1 Submit field quality control submittals as specified in Section 01 40 00.

.2 Manufacturer's Field Inspection Reports: Manufacturer's written acceptance of installation based on regular inspections.

.3 Engineered Judgements: Where completed installations deviate from tested design assembly, submit engineered judgements prepared by manufacturer's design engineer verifying compliance with applicable regulatory requirements.

1.9 QUALIFICATIONS

.1 Manufacturer's Design Engineer: A professional engineer having minimum 10 years documented experience designing firestop and smoke seal systems, licensed to practice at Place of the Work.

.2 Installer: A firm specializing in installing firestop and smoke seal systems, approved or certified as an installer by manufacturer.

1.10 MOCK-UPS

.1 Construct mock-ups as specified in Section 01 40 00.

.2 Mock-ups: One example of each fire-resistant joint, penetration fire stop and smoke seal required on Project, including representative substrates and penetrating components, for each fire rating required at each type of wall, floor and roof construction.

.3 Comply with Project requirements as to thickness and density of application to achieve required fire rating.

.4 Accepted mock-ups will be used as the standard for acceptance of the Work.

.5 Remove and replace installed Product that does not conform to accepted mock-up.

.6 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products to Place of the Work in original unopened packages.

.3 Store Products in an enclosed shelter, preventing damage to containers.

1.12 AMBIENT CONDITIONS

.1 Do not apply sealants when temperature of substrate material and surrounding air is below 5 degrees C.

.2 Maintain sealant at minimum 18 degrees C for best workability.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 3M Company Canada.
.2 AD Fire Protection.
.3 Hilti Canada.
.4 Nuco Inc.
.5 Specified Technologies Inc.
.6 Tremco.
.7 The Rectorseal Corporation.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESIGN AND PERFORMANCE CRITERIA

.1 Seal empty holes and penetrations at floors, fire rated walls and smoke barrier walls.

.2 Seal holes accommodating penetrating items such as cables, cable trays, pipes, ducts and conduits.

.3 Design firestopping system to maintain integrity of time rated construction by providing a seal against spread of heat, flame and smoke.

.4 Systems shall be ULC or ULI classified or listed by WHI for appropriate required time rating.

.5 Provide firestop and smoke seal systems to CAN/ULC-S115 and as described below:
.1 Asbestos free materials and systems fully capable of maintaining an effective barrier against gases, flame and smoke in compliance with CAN/ULC-S115, not exceeding opening sizes stated.

.2 Service Penetration Assemblies: Certified by CAN/ULC-S115 and used by ULC Guide 40 U19. Service components listed as certified in this guide are noted under Label Service of ULC.

.6 Fire resistance rating of firestopping assembly must meet or exceed fire resistance rating of floor or wall being penetrated.

.7 Provide elastomeric seal at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control. Do not use cementitious or rigid seals at such locations.

.8 Damming and back up materials, supports and anchoring devices shall be to manufacturer's recommendations, and in strict accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.9 Firestopping compounds shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

2.3 MATERIALS

.1 Primer: As recommended by sealant manufacturer for specific material, substrate and end use.

.2 Firestop Accessories: Firestop foams, boards, blocks, collars, wraps, puttys and plugs; to CAN/ULC-S115; ULC labelled; types as listed in tested assemblies.

.3 Firestop Insulation: To CAN/ULC-S702.1, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application; and having the following physical properties when tested to the identified standard:
.1 Density (ASTM C303): $\geq$ 72 kg/m^3.
.2 Combustibility (CAN/ULC-S114): Noncombustible.
.3 Melt Temperature: > 1 175 degrees C.
.4 Surface Burning Characteristics: To CAN/ULC-S102, as follows:
.1 Flame Spread Index $\leq$ 0.
.2 Smoke Developed Index $\leq$ 0.
.5 Moisture Sorption (ASTM C1104/C1104M): 0.04 percent.
.6 Smoulder Resistance (CAN/ULC-S129): 0.01 percent.

.4 Firestop Sealants: To CAN/ULC-S115; ULC labelled; non-sagging type for vertical applications; types as listed in tested assemblies.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Confirm compatibility of surfaces to receive sealant materials.

.3 Verify surfaces of openings are sound, clean, dry and ready to receive application of sealant.

.4 Verify penetrating elements are securely fixed and properly located.

3.2 PREPARATION

.1 Protect adjacent surfaces and equipment from damage.

.2 Clean contact surfaces of dirt, dust, grease, oil, loose material or other matter which may impair sealant bond.

.3 Remove incompatible materials which affect bond by scraping, brushing, water cleaning, solvent cleaning or sandblasting.

3.3 APPLICATION

.1 Install firestop insulation in compacted thicknesses required by ULC design. Compress insulation approximately 33 percent.

.2 Apply sealant in strict accordance with ULC certification.

.3 Coordinate and cooperate with adjacent, contiguous and related Subcontractors to ensure a proper and timely installation.

.4 Seal holes and voids made by penetrating items to ensure an effective fire and smoke barrier.

.5 Seal intersections and penetrations of floors, ceilings, walls and columns.

.6 Seal around cutouts for facility services.

.7 Wrap non-insulated heated pipes that may be subject to movement with non-combustible smooth material to permit pipe to move without damaging firestopping and smoke seal.

.8 Maintain integrity of insulation and vapour retarders on insulated pipes and ducts at fire separation.

.9 Where floor openings exceed 100 mm in width and may be subjected to traffic or loading, install cover plate systems capable of supporting same loading as floor.

3.4 FIELD QUALITY CONTROL

.1 Perform field testing and inspection as specified in Section 01 40 00.

.2 Inspect penetration firestop systems to ASTM E2174.

.3 Inspect fire-resistant joint systems to ASTM E2393.

.4 Examine finished penetrations to ensure proper installation before concealing or enclosing any areas of work.

.5 Keep areas of work accessible until inspection has been completed.

.6 Manufacturer's Field Service: Inspect and confirm completed installation is in strict accordance with ULC requirements.

.7 Correct defective work and re-inspect to verify compliance with requirements.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Immediately remove spots, smears, stains, residues, adhesives and other disfigurements from installation, including from adjacent surfaces.

.3 Do not use Products containing volatile solvents.

.4 Leave the Work in a clean and satisfactory condition.

3.6 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect firestop and smoke seal assemblies from damage until Owner occupancy.

.3 Make Good damaged firestop and smoke seal assemblies.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-In-Place Concrete.

.2 Section 04 00 00 - Masonry.

.3 Section 06 20 00 - Finish Carpentry.

.4 Section 06 40 00 - Architectural Woodwork.

.5 Section 07 26 00 - Vapour Retarders.

.6 Section 07 27 00 - Air Barriers.

.7 Section 07 27 36 - Sprayed Foam Air Barrier.

.8 Section 07 62 00 - Sheet Metal Flashing and Trim.

.9 Section 07 84 00 - Firestopping.

.10 Section 08 12 13 - Hollow Metal Frames.

.11 Section 08 51 13 - Aluminum Windows.

.12 Section 08 62 26 - Flat Glass Unit Skylights.

.13 Section 08 80 00 - Glazing.

.14 Section 08 90 00 - Louvers and Vents.

.15 Section 09 21 16 - Gypsum Board Assemblies.

.16 Section 09 30 00 - Tiling.

.17 Section 09 51 23 - Acoustical Tile Ceilings.

1.2 REFERENCES

.1 ASTM C919-19: Standard Practice for Use of Sealants in Acoustical Applications.

.2 ASTM C920-18: Standard Specification for Elastomeric Joint Sealants.

.3 ASTM C1193-16: Standard Guide for Use of Joint Sealants.

.4 ASTM C1521-19(2020): Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

.5 CAN/CGSB-19.13-M87: Sealing Compound, One Component, Elastomeric, Chemical Curing.

.6 CAN/CGSB-19.17-M90: One Component Acrylic Emulsion Base Sealing Compound.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate samples of each specified joint sealant, illustrating available colour selections.

1.4 MANUFACTURER REPORTS

.1 Submit manufacturers' reports as specified in Section 01 40 00.

.2 Manufacturers' Reports: Manufacturer field review reports, as specified below.

1.5 QUALIFICATIONS

.1 Applicators: Workers experienced with applying joint sealants, having minimum 3 years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products in manufacturer's sealed packages.

.3 Store Products in warm, dry conditions.

1.7 AMBIENT CONDITIONS

.1 Do not install solvent curing sealants in enclosed building spaces.

.2 Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.8 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of two years, including coverage of installed sealants and accessories which fail to achieve air tight and watertight seal, exhibit loss of either adhesion or cohesion, or do not cure.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of exterior weatherseal sealants, glazing sealants and interior general purpose and mildew-resistant sealants having Product considered acceptable for use:
.1 Dow Chemical Company.
.2 General Electric.
.3 Master Builders Solutions Canada, Inc.
.4 Tremco.

.2 Manufacturers of exterior flashing sealants having Product considered acceptable for use:
.1 Henry Company Canada.
.2 Tremco.
.3 W. R. Meadows of Canada Limited.

.3 Manufacturers of interior tiling sealants having Product considered acceptable for use:
.1 Mapei.

.4 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Seal gaps between dissimilar Products, visible or otherwise.

.2 Protect building components from air infiltration and moisture penetration.

2.3 MATERIALS

.1 Exterior Weatherseal Sealant (SEAL-EXT): To ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A and O; one-part, moisture curing, low modulus polyurethane sealant; accommodating joint movement of plus or minus 35 percent, with a 30- to 90-minute skin time; eg. Dymonic FC by Tremco, colours as selected by Consultant.

.2 Exterior Flashing Sealant (SEAL-EXT-FL): To ASTM C920, Type S, Grade NS, Class 25, Use NT, M, A and O; one-part, moisture curing, low modulus polyurethane sealant; accommodating joint movement of plus or minus 25 percent; eg. Dymonic by Tremco, colour as selected by Consultant.

.3 Glazing Sealant (SEAL-GLZ): To CAN/CGSB-19.13-M, Type MG-2-25-A-L; one-part, moisture curing, acetoxy silicone sealant; eg. Proglaze by Tremco, Clear colour.

.4 Interior General Purpose Sealant (SEAL-INT-GP): To CAN/CGSB-19.17-M; one-part, siliconized acrylic latex, mildew-resistant, accommodating joint movement of plus or minus 12-1/2 percent; eg. Tremflex 834 by Tremco, colours as selected by Consultant.

.5 Interior Mildew-Resistant Sealant (SEAL-INT-MR): To ASTM C920, Type S, Grade NS, Class 25, Use NT, G, A, and O; one-part, acetoxy silicone sealant, complete with integral fungicide; eg. Tremsil 200 by Tremco, colours as selected by Consultant.

.6 Interior Floor Tiling Sealant (SEAL-INT-FT): Premium grade, sanded siliconized acrylic; Keracaulk S by Mapei, colours to match adjacent tile grout colours.

.7 Interior Wall Tiling Sealant (SEAL-INT-WT): Premium grade, unsanded siliconized acrylic; Keracaulk U by Mapei, colours to match adjacent tile grout colours.

2.4 ACCESSORIES

.1 Primer: Non-staining type, recommended by sealant manufacturer to suit application.

.2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

.3 Backer Rod: Open cell polyethylene foam core wrapped in a closed cell polyethylene skin.

.4 Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

3 Execution

3.1 PREPARATION

.1 Clean and prime joints to requirements of manufacturer's instructions.

.2 Remove loose materials and foreign matter which might impair adhesion of sealant.

3.2 APPLICATION

.1 Install joint sealants to ASTM C1193.

.2 Install acoustical sealants to ASTM C919.

.3 Apply sealant with pressure gun having proper size nozzle and extrusion nozzle where required.

.4 Use sufficient pressure to fill joints solid to joint filler.

.5 Shape nozzle to finish sealant in a neat concave bead.

.6 Apply sealant sufficiently in from normal face of joints to form a positive shadow line.

.7 Tool sealant smooth and slightly concave, free from ridges, wrinkles, air pockets and embedded impurities.

.8 Ensure proper configuration and depth achieved. Depth of sealant at point of adhesion shall be not more than one-half the width.

3.3 FIELD QUALITY CONTROL

.1 Inspect completed sealant joints for adhesion and cohesion to ASTM C1521.

.2 Inspect completed sealant joints for holes, gaps, and areas where leaks could become present.

.3 Reject failed joints, joints filled with only a skin bead, and joints having an insufficient volume of sealant.

.4 Remove material from rejected joints, clean, and re-seal to attain proper width-to-depth joint coverage.

3.4 MANUFACTURER SERVICES

.1 Arrange for sealant manufacturer's representative to be present prior to commencement of sealant installation.

.2 Consult with manufacturer's representative as to joint conditions.

.3 Arrange for manufacturer's representative to regularly inspect joint sealant application (minimum twice per week).

.4 Submit written field review reports, confirming sealant installation is in strict accordance with manufacturer's recommendations.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Remove excess sealant and droppings using cleaner which will not damage adjacent surfaces.

.3 Make Good surfaces defaced or disfigured as a result of sealant application.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 07 92 00 - Joint Sealants.

.3 Section 08 13 13 - Hollow Metal Doors.

.4 Section 08 71 00 - Door Hardware.

.5 Section 08 80 00 - Glazing.

.6 Section 09 21 16 - Gypsum Board Assemblies.

.7 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 CSA W59-18: Welded Steel Construction (Metal Arc Welding).

.3 CSDMA Canadian Fire Labeling Guide for Commercial Steel Door and Frame Products.

.4 CSDMA Canadian Metric Conversion Guide for Steel Doors and Frames (Modular Construction).

.5 CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.6 CSDMA Recommended Dimensional Standard for Steel Doors and Frames.

.7 CSDMA Recommended Specifications for Commercial Steel Door and Frame Products.

.8 NFPA 80-2007: Fire Doors and Other Opening Protectives.

.9 CAN/ULC-S104-15 (R2020): Standard Method for Fire Tests of Door Assemblies.

.10 CAN/ULC-S105:2016 (R2020): Standard Specification for Fire Door Frames Meeting Performance Required by CAN/ULC-S104.

.11 CAN/ULC-S106-15 (R2020): Standard Method for Fire Tests of Window and Glass Block Assemblies.

.12 ULC List of Equipment and Materials.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets indicating frame components, available ratings, sizes and thicknesses.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating opening sizes, frame configurations, fire ratings, anchor types and spacings, locations of cut outs, reinforcing and shop finishes.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products to CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

1.6 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of two years, covering against twisting, buckling, weld failure and corrosion.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 All Steel Doors 2000 Limited.
.2 Artek Door (1985) Limited.
.3 Baron Metal Industries Inc.
.4 Daybar Industries Limited.
.5 Fleming Door Products Ltd.
.6 Gensteel Doors.
.7 Metal Door Limited.
.8 Trillium Steel Doors Limited.
.9 Vision Hollow Metal Limited.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 REGULATORY REQUIREMENTS

.1 Fire Rated Frame Assemblies: Permanently labelled to NFPA standards for fire rated class indicated, as tested to CAN/ULC-S104 and CAN/ULC-S106.

2.3 MATERIALS

.1 Sheet Steel: To ASTM A653/A653M, Commercial Steel (CS) Type B; cold-rolled sheet steel, with regular and paintable galvanneal coatings as noted; thicknesses as indicated.

.2 Bituminous Coating: Fibrous asphalt emulsion.

.3 Touch-up Primer: Zinc-rich alkyd primer.

.4 Welding Materials: To CSA W59.

.5 Joint Sealant: Interior general purpose sealant, Type SEAL-INT-GP as specified in Section 07 92 00.

2.4 MANUFACTURED UNITS

.1 Interior Hollow Metal Door Frame: Sheet steel, 1.60 mm nominal coated thickness, with paintable galvanneal finish; fire rating as scheduled; sizes as indicated on Drawings; eg. F-Series Frame by Fleming Door Products Ltd.

.2 Interior Hollow Metal Double Egress Door Frame: Sheet steel, 1.60 mm nominal coated thickness, with paintable galvanneal finish; fire rating as scheduled; sizes as indicated on Drawings; eg. DE-Series Frame by Fleming Door Products Ltd.

.3 Interior Hollow Metal Multi-Opening Frame: Sheet steel, 1.60 mm nominal coated thickness, with paintable galvanneal finish; fire rating as scheduled; sizes and configurations as indicated on Drawings; eg. MN- or ST-Series Frame by Fleming Door Products Ltd.

2.5 ACCESSORIES

.1 Reinforcements: Cold-rolled commercial quality steel, regular galvanneal finish, nominal coated thicknesses as follows:
.1 Flush Bolt, Lock and Strike Reinforcement: 1.60 mm
.2 Hinge Reinforcements: 3.51 mm.
.3 Door Closer and Holder Reinforcements: 2.74 mm.

.2 Anchors: Cold-rolled commercial quality steel, regular galvanneal finish, nominal coated thicknesses as follows:
.1 T-Strap Type: 1.30 mm.
.2 Stirrup-strap Type: 50 x 250 mm size, 1.60 mm thick.
.3 Jamb Floor Type: 1.60 mm thick.
.4 Stud Type: 1.00 mm thick.

.3 Jamb Spreaders: 1.00 mm nominal coated thickness, cold-rolled commercial quality steel, regular galvanneal finish.

.4 Mortar Guard Boxes: 0.84 mm nominal coated thickness, cold-rolled commercial quality steel, regular galvanneal finish.

.5 Glazing Stops: Rolled steel channel shape, butted corners; prepared for countersink style tamper-proof screws.

.6 Bumpers: Resilient rubber.

2.6 FABRICATION

.1 Fabricate frames as welded units.

.2 Conform to CSDMA Recommended Specifications for Commercial Steel Door and Frame Products.

.3 Fabricate fire-rated frames to CAN/ULC-S105.

.4 Provide fire labels to CSDMA Canadian Fire Labeling Guide for Commercial Steel Door and Frame Products.

.5 Fabricate frames with fixed mullions, to profiles shown, with hardware reinforcement plates welded in place.

.6 Welding
.1 Perform welding to CSA W59.
.2 Fill open joints, seams, and depressions with filler or by continuous brazing or welding.
.3 Grind exposed welds smooth and flush, to true sharp arrises and profiles.
.4 Sand welds to a smooth, true, uniform finish.

.7 Mitre corners of frames. Cut frame mitres accurately and weld continuously on inside of frame.

.8 Protect strike and hinge reinforcements and other openings with mortar guard boxes welded to frame.

.9 Reinforce frames wider than 1 220 mm with roll formed steel channels fitted tightly into frame head, flush with top.

.10 Fit frames with channel or angle spreaders, minimum two per frame, to ensure proper frame alignment. Install stiffener plates to spreaders between frame trim where required to prevent bending of trim and to maintain alignment when setting and during construction.

.11 Provide adjustable T-strap anchors in frames to be installed in masonry openings, spaced at 600 mm OC.

.12 Where frames are required to terminate at finished floor, Provide plates for anchorage to floor slab.

.13 Prepare frames for single stud door silencers, as follows:
.1 Single Door Frames: Three on strike jamb.
.2 Double Egress Door Frames: Two on head for each door leaf.

.14 Fabricate frames and screens to accommodate scheduled glazing. Secure glazing stops to frames with counter sunk oval head sheet metal screws.

.15 Prepare frames for scheduled door hardware and building security system devices. Blank, mortise, reinforce, drill and tap components.

2.7 FINISHES

.1 Paintable Galvanneal Coating: To ASTM A653/A653M, Grade ZF120; wiped zinc-iron coating, with streak-free matte grey appearance.

.2 Regular Galvanneal Coating: To ASTM A653/A653M, Grade ZF75; wiped zinc-iron coating, with streak-free matte grey appearance.

3 Execution

3.1 INSTALLATION

.1 Install Products to CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.2 Install Products plumb, square, aligned, without twist and at correct elevation.

.3 Coordinate with masonry and wallboard construction for anchor placement.

.4 Fill designated frames set in masonry walls and partitions solid with mortar, as specified in Section 04 00 00.

.5 Seal gaps between frames and walls with joint sealant, as specified in Section 07 92 00.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 08 12 13 - Hollow Metal Frames.

.2 Section 08 71 00 - Door Hardware.

.3 Section 08 80 00 - Glazing.

.4 Section 08 90 00 - Louvers and Vents.

.5 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 CSA W59-18: Welded Steel Construction (Metal Arc Welding).

.3 CSDMA Canadian Fire Labeling Guide for Commercial Steel Door and Frame Products.

.4 CSDMA Canadian Metric Conversion Guide for Steel Doors and Frames (Modular Construction).

.5 CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.6 CSDMA Recommended Dimensional Standard for Steel Doors and Frames.

.7 CSDMA Recommended Specifications for Commercial Steel Door and Frame Products.

.8 NFPA 80-2007: Fire Doors and Other Opening Protectives.

.9 CAN/ULC-S104-15 (R2020): Standard Method for Fire Tests of Door Assemblies.

.10 CAN/ULC-S702.1-14 (R2019): Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

.11 ULC List of Equipment and Materials.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating materials, component sizes and thicknesses, and available finishes.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating door elevations and sizes, internal reinforcement, fire ratings, closure method, size and location of cut outs and shop finishes.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store hollow metal doors to CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

1.6 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of two years, covering against twisting, buckling, delamination of steel stiffeners, weld failure and corrosion.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
- .1 All Steel Doors 2000 Limited.
- .2 Artek Door (1985) Limited.
- .3 Baron Metal Industries Inc.
- .4 Daybar Industries Limited.
- .5 Fleming Door Products Ltd.
- .6 Gensteel Doors.
- .7 Metal Door Limited.
- .8 Trillium Steel Doors Limited.
- .9 Vision Hollow Metal Limited.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 REGULATORY REQUIREMENTS

.1 Fire Rated Doors: Permanently labelled to NFPA standards for fire rated class indicated, as tested to CAN/ULC-S104.

2.3 MATERIALS

.1 Sheet Steel: To ASTM A653/A653M, Commercial Steel (CS) Type B; cold-rolled sheet steel, with regular and paintable galvanneal coatings as noted; thicknesses as indicated.

.2 Semi-Rigid Board Insulation: To CAN/ULC-S702.1, Type 1; mineral fibre semi-rigid board having an aged thermal resistance of RSI $\geq$ 0.68 per 25 mm of thickness.

.3 Touch-up Primer: Zinc-rich alkyd primer.

.4 Welding Materials: To CSA W59.

2.4 MANUFACTURED UNITS

.1 Interior Hollow Metal Flush Doors - Fire Rated: 45 mm thick, fire rating as scheduled; constructed as follows:
- .1 Door Faces: Sheet steel panels, 1.60 mm nominal coated thickness, flush design, paintable galvanneal finish.
- .2 Vertical Steel Stiffeners: Sheet steel profiles, 1.00 mm nominal coated thickness, 44 mm deep, interlocking design, regular galvanneal finish.
- .3 Door Edges: Continuously welded.
- .4 Glazing Stops: Rolled steel channel shape, butted corners; prepared for countersunk tamper-proof screws.
- .5 Core: Semi-rigid board insulation.

.2 Interior Hollow Metal Flush Doors - Non-Rated: 45 mm thick; constructed as follows:
- .1 Door Faces: Sheet steel panels, 1.60 mm nominal coated thickness, flush design, paintable galvanneal finish.
- .2 Vertical Steel Stiffeners: Sheet steel profiles, 1.00 mm nominal coated thickness, 44 mm deep, interlocking design, regular galvanneal finish.
- .3 Door Edges: Continuously welded.

.4 Glazing Stops: Rolled steel channel shape, butted corners; prepared for countersunk tamper-proof screws.
.5 Core: Semi-rigid board insulation.

2.5 ACCESSORIES

.1 Reinforcements: Commercial quality steel, regular galvanneal finish, nominal coated thicknesses as follows:
.1 Flush Bolt, Lock and Strike Reinforcement: 1.60 mm
.2 Hinge Reinforcements: 3.51 mm.
.3 Door Closer and Holder Reinforcements: 2.74 mm.

.2 Door Grilles: Rated and non-rated door grilles, as specified in Section 08 90 00.

2.6 FABRICATION

.1 Conform to CSDMA Recommended Specifications for Commercial Steel Door and Frame Products.

.2 Fabricate fire-rated doors to CSDMA Canadian Fire Labeling Guide for Commercial Steel Door and Frame Products.

.3 Provide continuous faces free from joints, tool markings and abrasions; with hardware reinforcement plates welded in place.

.4 Welding
.1 Perform welding to CSA W59.
.2 Fill open joints, seams, and depressions with filler, or by continuous brazing, or welding.
.3 Grind exposed welds smooth and flush, to true sharp arrises and profiles.
.4 Sand welds to a smooth, true, uniform finish.

.5 Fabricate doors to accommodate scheduled glazing. Secure glazing stops to doors with counter sunk oval head sheet metal screws.

.6 Prepare doors for scheduled door hardware and building security system devices. Blank, mortise, reinforce, drill and tap components.

.7 Reinforce and stiffen designated doors with vertical steel stiffeners spaced at 152 mm OC, continuous for full height of door, laminated to both door faces.

.8 Completely fill door cores with specified core materials.

.9 Reinforce door edges with channel reinforcing.

.10 Bevel stiles minimum 3 mm.

.11 Continuously weld door edge seams to a smooth, seamless appearance.

2.7 FINISHES

.1 Paintable Galvanneal Coating: To ASTM A653/A653M, Grade ZF120; wiped zinc-iron coating, with streak-free matte grey appearance.

.2 Regular Galvanneal Coating: To ASTM A653/A653M, Grade ZF75; wiped zinc-iron coating, with streak-free matte grey appearance.

3 Execution

3.1 INSTALLATION

.1 Install doors to CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.2 Install door grilles.

3.2 TOLERANCES

.1 Diagonal Distortion: $\leq$ 1.5 mm measured with straight edge, corner to corner.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 09 21 16 - Gypsum Board Assemblies.

.3 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM A1008/A1008M-21a: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

.2 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.3 ASTM E119-22: Standard Test Methods for Fire Tests of Building Construction and Materials.

.4 NFPA 80-2007: Fire Doors and Other Opening Protectives.

.5 CAN/ULC-S702.1-14 (R2019): Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

.6 ULC List of Equipment and Materials.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating materials, profiles, accessories, locations and dimensions.

1.4 CERTIFICATIONS

.1 Submit certification reports as specified in Section 01 33 00.

.2 Fire Test Certification Report: Certifying performance within specified fire rating.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products in a dry, protected, well-vented area.

.3 Remove protective wrapping immediately after installation.

1.6 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Manufacturer's Extended Warranty: For a period of 5 years, covering parts against defects.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Acudor Access Doors.
.2 Bilco Canada.

.3 Cendrex.
.4 The Williams Brothers Corporation.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 REGULATORY REQUIREMENTS

.1 Fire Rated Assemblies: To NFPA requirements for fire rated class indicated in schedule.

2.3 MATERIALS

.1 Sheet Steel: To ASTM A1008/A1008M, Commercial Steel (CS) Types A, B, and C; cold-rolled sheet steel; thicknesses as specified below.

.2 Extruded Aluminum: To ASTM B221M, 6061-T5 alloy, mill finish; thicknesses as specified below.

.3 Insulation: To CAN/ULC-S702.1, Type 1; non-rigid mineral fibre insulation, made from rock or slag fibers.

.4 Gypsum Board: As specified in Section 09 21 16.

2.4 MANUFACTURED UNITS

.1 Gypsum Board Wall Access Panel - Fire-Rated: 1-1/2 hour B-label with maximum temperature rise of 110 degrees C; suitable for both horizontal or vertical installation; sizes as indicated on Drawings; and meeting the following characteristics:
.1 Door: 48 mm deep, 1.2 mm thick sheet steel, insulated with non-rigid mineral fibre insulation, completely filling door cavity.
.2 Box Frame: 1.5 mm thick sheet steel, complete with 25 mm wide, 0.61 mm thick galvanized steel perforated flange.
.3 Closer: Automatic, spring-type.
.4 Hinge: Fully concealed, 170 degree opening pivot-type.
.5 Latch: Self-latching direct action lock opposite hinge; lock designed to accept both key and knurled knob included with each door.
.6 Manufacturer and Product Name: eg. Model WB-FR Standard Fire Rated Access Door With Drywall Bead by The Williams Brothers Corporation.

.2 Gypsum Board Ceiling Access Panel - Fire-Resistive: Suitable for horizontal installation in fire rated gypsum ceilings; sizes as indicated on Drawings; and meeting the following characteristics:
.1 Door: 1.6 mm thick sheet steel, recessed 38 mm to receive double layer of gypsum board infill.
.2 Frame: 1.6 mm thick sheet steel, hat-channel shape.
.3 Hinge: Full length piano hinge, 180 degree opening.
.4 Latch: Flush, stainless steel cam designed to be operated with a screwdriver.
.5 Manufacturer and Product Name: eg. Model WB-ATR Fire-Resistive Ceiling Access Door by The Williams Brothers Corporation.

.3 Gypsum Board Wall Access Panel - Non-Rated: Suitable for vertical installation in gypsum board partitions; sizes as indicated on Drawings; and meeting the following characteristics:
.1 Door: 1.9 mm thick sheet steel, recessed design to receive gypsum board infill.
.2 Box Return Frame: 1.6 mm thick sheet steel, complete with 25 mm wide, 0.61 mm thick galvanized steel perforated flange.
.3 Hinge: Full length piano hinge, 110 degree opening.
.4 Latch: Flush, stainless steel cam designed to be operated with a screwdriver.
.5 Manufacturer and Product Name: eg. Model WB-RDW Access Door for Drywall Surfaces by The Williams Brothers Corporation.

.4 Gypsum Board Ceiling Access Panel - Non-Rated: Suitable for horizontal installation in gypsum board ceilings; sizes as indicated on Drawings; and meeting the following characteristics:
.1 Door: 2.0 mm thick extruded aluminum, complete with 16 mm thick moisture resistant gypsum board infill, brush gasket, and safety chain.
.2 Box Return Frame: 2.0 mm thick extruded aluminum, concealed flange of depth to match adjacent ceiling board thickness.
.3 Hinge: Concealed pivot hinge, allowing for door removal.
.4 Latch: Push to open latch.
.5 Manufacturer and Product Name: eg. Model WB-NTG Recessed Drywall Access Door by The Williams Brothers Corporation.

.5 Masonry Wall Access Panel - Fire-Rated: 1-1/2 hour B-label with maximum temperature rise of 110 degrees C; suitable for both horizontal or vertical installation; and meeting the following characteristics:
.1 Door and Trim: 48 mm deep, 1.9 mm thick sheet steel, with rolled safety edge on inside of door; insulated with non-rigid mineral fibre insulation, completely filling door cavity.
.2 Return Frame: 1.5 mm thick sheet steel, complete with 4 masonry strap anchors.
.3 Closer: Automatic, spring-type.
.4 Hinge: Continuous piano hinge, 180 degree opening.
.5 Latch: Self-latching keyed cylinder paddle latch, opposite hinge.
.6 Manufacturer and Product Name: eg. Model WB-FR Premium Ultra Fire-Rated Access Door by The Williams Brothers Corporation.

.6 Masonry Wall Access Panel - Non-Rated: Suitable for both horizontal or vertical installation in masonry or concrete partitions or bulkheads; and meeting the following characteristics:
.1 Door: 1.9 mm thick sheet steel.
.2 Return Frame: 1.2 mm thick sheet steel, complete with 4 masonry strap anchors.
.3 Hinge: Fully concealed, piano type.
.4 Latch: Flush, stainless steel cam designed to be operated with a screwdriver.
.5 Manufacturer and Product Name: eg. Model WB-GP Premium General Purpose Access Door by The Williams Brothers Corporation.

2.5 FINISHES

.1 Aluminum: Standard factory mill finish.

.2 Baked Enamel Primer on Steel: Electrostatically-applied baked enamel primer over rust-inhibiting phosphate treatment; paintable; Gray colour.

3 Execution

3.1 PREPARATION

.1 Coordinate installation of access panels in masonry walls with Section 04 00 00.

.2 Coordinate installation of access panels in gypsum board partitions and ceilings with Section 09 21 16.

.3 Coordinate exact locations of access panels with facility services Subcontractors.

3.2 INSTALLATION

.1 Install Products straight, plumb and level.

.2 Install Products flush with adjacent surfaces.

.3 Install Products for long life under hard use.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 05 12 00 - Structural Steel.

.3 Section 05 50 00 - Metal Fabrications.

.4 Section 26 05 00 - Electrical Basic Materials and Methods.

1.2 REFERENCES

.1 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A229/A229M-18: Standard Specification for Steel Wire, Quenched and Tempered for Mechanical Springs.

.4 ASTM A307-21: Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

.5 ASTM A449-14(2020): Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

.6 ASTM A563/A563M-21a: Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).

.7 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.8 ASTM A780/A780M-09(2015): Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.9 ASTM E413-22: Classification for Rating Sound Insulation.

.10 ASTM F436/F436M-19: Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

.11 ASTM F3125/F3125M-19e2: Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

.12 CSA G40.20-13 (R2018): General Requirements for Rolled or Welded Structural Quality Steel.

.13 CSA G40.21-13 (R2018): Structural Quality Steel.

.14 CSA W47.1:19: Certification of Companies for Fusion Welding of Steel.

.15 CSA W55.3-08 (R2018): Certification of Companies for Resistance Welding of Steel and Aluminum.

.16 CSA W59-18: Welded Steel Construction (Metal Arc Welding).

.17 ANSI/DASMA 203-2004: Standard for Non-Fire Rated Rolling Door Assemblies.

.18 ANSI/CAN/UL 325-2017: Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

.19 CAN/ULC-S705.1-18: Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Specification.

.20 CAN/ULC-S770-15 (R2020): Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating layout, dimensions, component sizes, closure type, arrangement of hardware, required clearances, fabrication methods and anchorage details.

1.4 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Operation and Maintenance Data: Manufacturer's standard operating instructions, and maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.5 QUALIFICATIONS

.1 Fabricator: A firm specializing in fabricating coiling overhead doors, having minimum 3 years documented experience and a member of DASMA.

.2 Installer: A firm specializing in installing coiling overhead doors, having minimum 5 years documented experience and a member of DASMA.

.3 Welders: Workers certified by CWB to CSA W47.1 and CSA W55.3.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
- .1 Atlas Door.
- .2 Cookson Company.
- .3 Overhead Door Corporation.
- .4 Wayne-Dalton Corporation.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Coiling Overhead Door: Face-of-wall mounted design; insulated steel construction; electric motor operation with push button control station; monochromatic paint finish; eg. Thermotite 800C Series by Wayne-Dalton Corporation.

2.3 PERFORMANCE CRITERIA

.1 Sound Transmission Class (ASTM E413): STC $\geq$ 22.

2.4 MATERIALS

.1 Sheet Steel: To ASTM A653/A653M, Structural Steel (SS) Grade 230, Types 1 and 2; cold-rolled sheet steel, galvanized.

.2 Steel Sections and Plates: To CSA G40.21, Grade 300W unless noted otherwise.

.3 Insulation: To CAN/ULC-S705.1, Type 2; closed cell foamed-in-place urethane insulation providing RSI $\geq$ 1.8 at 50 mm thickness when tested to CAN/ULC-S770.

.4 High-Strength Bolts: To ASTM F3125/F3125M, Type 1; quenched and tempered steel heavy hex structural bolts.

.5 Medium-Strength Bolts: To ASTM A449, Type 1; quenched and tempered steel hex bolts.

.6 Machine Bolts: To ASTM A307, Grade A; carbon and alloy steel.

.7 Nuts: To ASTM A563/A563M, Grade A; Heavy Hex Style for use with high-strength bolts, and Hex Style for use with medium-strength bolts and machine bolts; carbon and alloy steel.

.8 Washers: To ASTM F436/F436M, Type 1; hardened steel; circular, bevelled and clipped types as required.

.9 Welding Materials: To CSA W59.

.10 Primer for Galvanized Steel Surfaces: Zinc-rich paint type.

2.5 EQUIPMENT

.1 Door Operator: To ANSI/CAN/UL 325; heavy duty, high torque, ball-bearing type, worm geared; 1/3 HP, 120V AC, single phase, 60 Hz operation, complete with obstacle detection feature designed to stop door's downward movement in the event an obstacle is detected, electric interlock mechanism and overload protection device.

.2 Push Button Control Station: OPEN / CLOSE / STOP push button stations located at door openings, same side as operators and adjacent to track.

2.6 COMPONENTS

.1 Curtain Slat: 0.76 mm thick galvanized steel front and back slats; 19 mm deep, 62 mm wide flat profile; cores filled with insulation.

.2 Bottom Slat: Galvanized steel; double angle bar with loop-type vinyl weatherstrip.

.3 Counterbalance Assembly: Oil tempered torsion type helical springs to ASTM A229/A229M, complete with spring barrel.

.4 Curtain Hood: 0.61 mm thick galvanized sheet steel; size as indicated on accepted Shop Drawings; complete with flexible hood baffle.

.5 Brackets: Galvanized steel construction; sizes and profiles recommended by coiling door manufacturer.

.6 Guides: Galvanized steel, sealed box-type guides.

.7 Manual Release Mechanism: Manufacturer's standard release handle.

.8 Governor: Engagement only after cable release, restricting automatic door closing speed to between 0.15 m/s and 0.61 m/s.

.9 Seals: Flexible vinyl type.

.10 Latches: Heavy duty type.

2.7 FABRICATION

.1 Prior to fabrication, verify existing conditions and take field measurements necessary to ensure perfect fit.

.2 Fabricate coiling doors to ANSI/DASMA 203.

.3 Provide windlocks fitted to ends of alternate slats.

.4 Provide integral windlock bars and removable bottom bar stops in guides.

.5 Provide counter balance assembly with torsion spring for easy manual operation.

.6 Store coiling door in metal hood.

.7 Provide heavy duty latches to secure coiling doors in both open and closed positions.

2.8 FINISHES

.1 Shop Priming:
.1 Clean surfaces of rust, scale, grease and foreign matter prior to finishing.
.2 Do not prime surfaces designated to come into direct contact with concrete or where field welding is required.
.3 Prime components using minimum two coats primer.

.2 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.3 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

.4 Galvanized Coating on Sheet Steel: To ASTM A653/A653M, Grade Z275; hot dipped zinc alloy coating.

.5 Monochromatic Paint Finish on Sheet Steel: Factory-applied, baked-on polyester primer coat and polyester finish coat, colour as selected by Consultant.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify site measurements of existing openings to ensure suitability.

3.2 PREPARATION

.1 Coordinate with electrical Subcontractor for primary power with local fused disconnect installed near overhead door jamb and 20 amp service required for each overhead door.

.2 Provide electrical control wiring and electrical connections from local disconnect to control panel and operator.

3.3 INSTALLATION

.1 Securely install Products to ANSI/DASMA 203, complete with necessary fitments and trim.

.2 Install Products straight, plumb and square. Conform to accepted Shop Drawings.

.3 Install electrical motors, controller units, push-button stations, relays and other electrical equipment to ANSI/CAN/UL 325. Include electric wiring from power supply located near each door.

3.4 ADJUSTING

.1 Ensure coiling doors operate with manual ease and form a proper seal when closed.

.2 Make Good damaged or defective galvanized coatings to ASTM A780/A780M.

3.5 DEMONSTRATION

.1 Refer to Section 01 79 00.

.2 Instruct Owner's personnel in proper operating and maintenance procedures.

3.6 MAINTENANCE

.1 Adjust and maintain completed installation during Project warranty period.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 07 27 00 - Air Barriers.

.3 Section 07 27 36 - Sprayed Foam Air Barrier.

.4 Section 07 92 00 - Joint Sealants.

.5 Section 08 80 00 - Glazing.

.6 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

.1 AAMA CW-10-12: Care and Handling of Architectural Aluminum from Shop to Site.

.2 AAMA/WDMA/CSA 101/I.S. 2/A440-17: North American Fenestration Standard / Specification for Windows, Doors and Skylights.

.3 AAMA 2605-17a: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).

.4 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.5 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.6 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.7 ASTM B209/B209M-21: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.8 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.9 CAN/CGSB-79.1-M91: Insect Screens.

.10 CSA A440S1:19: Canadian Supplement to AAMA/WDMA/CSA 101/I.S. 2/A440-17, North American Fenestration Standard / Specification for Windows, Doors and Skylights.

.11 CAN/CSA-A440.4-07 (R2012): Window, Door and Skylight Installation.

.12 ANSI/NFRC 100-2017: Procedure for Determining Fenestration Product U-factors.

.13 ANSI/NFRC 200-2017: Procedure for Determining Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating:
  .1 Large scale details of members and materials, of brackets and anchorage devices and of connection and jointing details;
  .2 Fully dimensioned layouts for positioning of brackets and anchorage devices to structures;

.3 Dimensions and thicknesses;
.4 Glazing details, description of materials including catalogue numbers, products and manufacturer's names;
.5 Aluminum alloy and temper designations;
.6 Finish specifications; and
.7 Other pertinent data.

.3 Submit documentation of:
.1 Compliance with AAMA/WDMA/CSA 101/I.S. 2/A440 and CSA A440S1.
.2 Thicknesses, profiles and descriptions of components used in assembly.
.3 Engineering calculations verifying assembly has been designed, constructed and attached to withstand forces anticipated for Project and meet performance criteria required by applicable regulatory requirements.
.4 Ensure calculations are stamped, signed and dated by fabricator's design engineer.

1.4 CERTIFICATES

.1 Submit certifications as specified in Section 01 40 00.

.2 Frame Certification: A certificate from aluminum extruder certifying aluminum alloys and tempers meet or exceed specified types.

1.5 TEST AND EVALUATION REPORTS

.1 Submit test reports as specified in Section 01 33 00.

.2 Test Reports: Manufacturer's standard test results indicating Products meet specified performance criteria, prepared by independent testing agency and current within past 5 years.

1.6 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning instructions; sufficient quantity for inclusion in operation and maintenance manuals.

1.7 QUALIFICATIONS

.1 Fabricator's Design Engineer: A professional structural engineer experienced in designing aluminum windows, licensed to practice at Place of the Work.

.2 Fabricator and Installer: A firm specializing in fabricating and installing aluminum windows, having minimum 5 years documented experience.

1.8 MOCK-UPS

.1 Construct mock-ups as specified in Section 01 40 00.

.2 Mock-Up: One 1 220 x 1 220 mm size mock-up panel, including one corner cross section for each type of window assembly, demonstrating sill and jamb sections, and complete with thermal break, hardware, weatherstripping, glazing, screen, and shop-applied finishes.

.3 Accepted mock-ups will be used as the standard for acceptance of the Work.

.4 Remove and replace installed Product that does not conform to accepted mock-up.

.5 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Conform to AAMA CW-10.

.3 Take precautionary measures and adequately protect frames and frame finishes to prevent damage during fabrication, storage, shipping, handling and installation.

.4 Deliver, handle and store units by methods approved by manufacturer. Protect from damage and staining.

.5 Deliver and store units carefully to avoid damage to window frame.

1.10 WARRANTY

.1 Submit extended warranties in accordance with General Conditions of the Contract.

.2 Manufacturer's Extended Warranty: For a period of 10 years, covering the following:
.1 Finish: Replace any window unit whose finish shows defects, such as but not limited to delamination, blistering or excessive fading.
.2 Performance: Replace or repair any window unit with air leakage, water leakage, defects or malfunctions under normal usage.

.3 Installer's Extended Warranty: For a period of two years, protecting against leakage, operational defects and malfunction under normal usage.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Aerloc Industries Ltd.
.2 Alumicor.
.3 Alwind Industries, Ltd.
.4 Commdoor Aluminum.
.5 CRL US Aluminum.
.6 Kawneer.
.7 Oldcastle BuildingEnvelope.
.8 Windspec Inc.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Aluminum Windows: Extruded aluminum frame and operable vent sash sections, shop fabricated, with monochromatic paint finish; site-glazed with sealed insulating glass units; complete with insect screens, metal sills, flashings, connection flanges, anchorages and attachment devices.

.2 Configuration: As indicated on Window Schedule.

2.3 PERFORMANCE CRITERIA

.1 Aluminum Windows: To AAMA/WDMA/CSA 101/I.S. 2/A440 and CSA A440S1, and meeting the following performance criteria:
.1 Air Tightness:
.1 Fixed Units: Class Fixed.
.2 Operable Vents: Class A3.

.2 Water Tightness:
.1 Fixed Units: Class B7.
.2 Operable Vents: Class B5.
.3 Wind Load Resistance: Class C5.
.4 Screen Strength: Class S1.
.5 Forced Entry: Class F2.
.6 Condensation Resistance Temperature Index: Class $I_G \geq 58$.
.7 Assembly Thermal Transmittance (ANSI/NFRC 100):
.1 Fixed Units: $U \leq 2.15$ W/m^2 degrees C.
.2 Operable Vents: $U \leq 2.56$ W/m^2 degrees C.
.8 Assembly Solar Heat Gain Coefficient (ANSI/NFRC 200): SHGC ≤ 0.40.

2.4 DESIGN CRITERIA

.1 Design assembly to drain water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system to the exterior.

.2 Design intermediate members within units to be either solid or tubular design to suit wind loading, weight carrying requirements and wind deflection limitations.

.3 Design coupling mullions to permit unit module construction and provide for thermal expansion. When required, reinforce wind load carrying members with steel reinforcement suitably treated to prevent electrolytic action.

.4 Design operable vents to have a restricted opening not to exceed 100 mm in accordance with applicable regulatory requirements.

2.5 MATERIALS

.1 Extruded Aluminum: To ASTM B221M, 6063-T5 alloy.

.2 Sheet Aluminum: To ASTM B209/B209M, 3003-H14 alloy.

.3 Sheet Steel: To ASTM A653/A653M, Commercial Steel (CS) Types A, B, and C; cold-rolled sheet steel, galvanized.

.4 Steel Sections: Shaped to suit mullion sections.

.5 Fastener: Stainless steel.

.6 Screen Mesh: 18/16 aluminum mesh, Black colour.

.7 Bituminous Coating: Fibred asphalt emulsion.

.8 Thermal Break: Rigid polyamide.

.9 Air Barriers: As specified in Section 07 27 00.

.10 Air Sealant Foam: As specified in Section 07 27 36.

.11 Glazing Sealant: Type SEAL-GLZ as specified in Section 07 92 00.

.12 Glazing Materials: As specified in Section 08 80 00.

.13 Joint Sealants: As specified in Section 07 92 00, Types as follows:
.1 Exterior Applications: Exterior weatherseal sealant, Type SEAL-EXT.
.2 Transition Sheet Connections: Exterior flashing sealant, Type SEAL-EXT-FL.
.3 Interior Applications: Interior general purpose sealant, Type SEAL-INT-GP.

.14 Touch-Up Primer for Galvanized Metal Surfaces: Zinc-rich paint type.

2.6 COMPONENTS

.1 Frames and Mullions: 2.5 mm thick extruded aluminum; 127 mm deep profile; thermally broken with interior tubular section insulated from exterior; applied glazing stops; drainage holes; internal weep drainage system.

.2 Operable Vent Sash: 2.5 mm thick extruded aluminum sections; top-hinged projecting out (TPO) design; thermally broken with interior tubular section insulated from exterior; applied glazing stops.

.3 Metal Sills: 2.5 mm thick extruded aluminum sections, complete with pre-formed clip anchor; sufficient depth to extend beyond wall face, full length pieces to minimize joints; and with integral drip edge profile and end dams.

.4 Metal Flashing: 2.0 mm thick extruded aluminum, finish to match mullion sections where exposed.

.5 Operable Vent Hardware:
- .1 Hinges: Stainless steel 4 bar hinges, complete with limit stop device.
- .2 Operator: Pivot shoe roto operator complete with removable crank handle.
- .3 Lockable Handles: Hook bolt lock handle, complete with sash mounted strike plate.
- .4 Weatherstripping: Manufacturers standard type to suit application, finish to match frame.

.6 Connection Flange: 3.0 mm thick extruded aluminum angle, size as indicated on Drawings.

.7 Glass: Sealed insulating glass units, Type SIG-CLR-1 as specified in Section 08 80 00.

2.7 FABRICATION

.1 Fabricate Products to AAMA/WDMA/CSA 101/I.S. 2/A440 and CSA A440S1.

.2 Fabricate Products with minimum clearances and shim spacing around perimeter of assembly.

.3 Make joints flush, hairline, and weatherproof.

.4 Arrange fasteners and attachments to conceal from view.

.5 Prepare components with internal reinforcement for operating hardware.

.6 Provide minimum two lockable handles per operable vent sash.

.7 Overlap and seal glazing flanges of abutting members for entire depth and width of flanges to ensure a solid, unbroken air and water barrier. Glass stops shall be screwless, lock-in type.

.8 Provide fully resilient settings for glass and panels by use of EPDM elastomeric glazing gaskets on both sides of glass installed in window frames.

.9 Provide connection flange to full perimeter of frame, attached from interior side of frame with concealed fasteners cut flush with face of flange. Pre-drill fastener holes into flange to accommodate immediate on-site installation.

.10 Fabricate screen frames of tubular extruded aluminum, to CAN/CGSB-79.1-M; prefinished to match window frames.

.11 Secure screen mesh to screen frame with a removable polyethylene spline.

.12 Secure screen assemblies to window frames using mechanical fasteners as required by authorities having jurisdiction.

2.8 FINISHES

.1 Monochromatic Paint Coating on Aluminum: To AAMA 2605; two-coat thermosetting fluoropolymer PVDF liquid extrusion and coil coating, factory-applied to 0.03 mm dry film thickness; eg. Duranar by PPG Industries, Inc.; colour as selected by Consultant.

.2 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.3 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

.4 Galvanized Coating on Sheet Steel: To ASTM A653/A653M, Grade Z275; hot dipped zinc alloy coating.

2.9 SOURCE QUALITY CONTROL

.1 Perform shop inspection and testing as specified in Section 01 40 00.

.2 Shop Inspection and Testing: Random tests conducted by independent testing agency on fabricated window framing at point of manufacture, verifying compliance with specified performance criteria.

3 Execution

3.1 PREPARATION

.1 Apply heavy coat of bituminous paint on surfaces of aluminum placed in contact with concrete, mortar, plaster or dissimilar metals.

.2 Provide fastenings and anchors required to be built in to adjacent work to other Sections.

3.2 INSTALLATION

.1 Install Products to CAN/CSA-A440.4.

.2 Install Products in correct locations, level, square and plumb.

.3 Install Products free from distortion, properly aligned and at proper elevations.

.4 Make joints neat, fine and weathertight.

.5 Allow for expansion and contraction of components.

.6 Provide additional mouldings and closures necessary.

.7 Use appropriate fasteners compatible with materials being fastened. Conceal fasteners.

.8 Fasten connection flange to wall assembly and connect transition sheet membrane to flange.

.9 Seal connection flange to transition sheet membranes with continuous bead of joint sealant prior to application of air sealant foam.

.10 Provide trim panning and flashings of sufficient size to neatly finish the window frame to the interior and exterior window opening.

.11 Fill gaps between exterior frames and adjacent wall assemblies with air sealant foam, as specified in Section 07 27 36.

.12 Install glass as specified in Section 08 80 00.

.13 Provide sills in place with anchoring devices located at ends and evenly spaced at 600 mm OC. Fasten expansion joint cover plates and drip deflectors with self-tapping stainless steel screws.

.14 Maintain a 6 - 9 mm space between butted ends of continuous sills. For sills over 1 220 mm in length, maintain a 3 - 6 mm space at each end.

.15 Install end dams at each sill.

.16 Grind smooth exposed edges of aluminum sills, ensuring no sharp edges.

.17 Provide joint sealants as specified in Section 07 92 00.

3.3 FIELD QUALITY CONTROL

.1 Perform field inspection and testing as specified in Section 01 40 00.

.2 Field Inspection and Testing: Random tests conducted by independent testing agency on installed windows, verifying compliance with specified performance criteria.

.3 Make Good Products not meeting specified performance criteria.

.4 Re-test replacement Products at no additional cost to Owner.

3.4 TOLERANCES

.1 Deviation From Plumb and Level: $\leq$ 3 mm in 3 000 mm.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean glass and aluminum surfaces.

.3 Do not scratch or damage surfaces.

.4 Do not remove protective cover from framing until final cleaning operations.

3.6 PROTECTION

.1 Refer to Section 01 76 00.

.2 Provide protective coatings on surfaces subject to damage.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 31 00 - Steel Deck.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 07 21 00 - Thermal Insulation.

.4 Section 07 26 00 - Vapour Retarders.

.5 Section 07 27 00 - Air Barriers.

.6 Section 07 27 36 - Sprayed Foam Air Barrier.

.7 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.8 Section 07 62 00 - Sheet Metal Flashing and Trim.

.9 Section 07 92 00 - Joint Sealants.

.10 Section 08 80 00 - Glazing.

1.2 REFERENCES

.1 AAMA 2605-17a: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).

.2 AAMA/WDMA/CSA 101/I.S. 2/A440-17: North American Fenestration Standard / Specification for Windows, Doors and Skylights.

.3 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.4 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.5 ASTM B209/B209M-21: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.6 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.7 CSA A440S1:19: Canadian Supplement to AAMA/WDMA/CSA 101/I.S. 2/A440-17, North American Fenestration Standard / Specification for Windows, Doors and Skylights.

.8 CAN/CSA-A440.4-07 (R2012): Window, Door and Skylight Installation.

.9 ANSI/NFRC 100-2017: Procedure for Determining Fenestration Product U-factors.

.10 ANSI/NFRC 200-2017: Procedure for Determining Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating characteristics of light admitted, transparency, and insulation value of unit.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating configurations, dimensions, locations, fastening methods, and installation details.

1.5 FIELD QUALITY CONTROL SUBMITTALS

.1 Submit field quality control submittals as specified in Section 01 40 00.

.2 Testing and Inspection Reports: Project-specific reports, indicating installed Products are leak free, and comply with specified performance criteria.

1.6 QUALIFICATIONS

.1 Manufacturer: A firm experienced in designing and fabricating curb mount glazed skylights, and having minimum 10 years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products in manufacturer's original containers dry and undamaged, with seals and labels intact.

.3 Store Products under cover at Place of the Work.

1.8 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of two years, including coverage of weather-tightness and water-tightness of skylight assembly and its seal with roofing system.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Velux Canada Inc.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Flat Glass Unit Skylights: To AAMA/WDMA/CSA 101/I.S. 2/A440 and CSA A440S1, and meeting the following performance criteria:
.1 Downward Design Pressure: 830 kg/m^2.
.2 Uplift Design Pressure: 341.8 kg/m^2.
.3 Air Leakage: $\leq$ 0.2 L/s/m^2 @ 75 Pa.
.4 Water Infiltration @ 720 Pa: None.
.5 Assembly Thermal Transmittance (ANSI/NFRC 100): U $\leq$ 2.56 W/m^2 degrees C.
.6 Assembly Solar Heat Gain Coefficient (ANSI/NFRC 200): SHGC $\leq$ 0.40.

2.3 DESIGN CRITERIA

.1 Design unit skylights to accommodate expansion and contraction within system components caused by a cycling temperature range of 95 degrees C without causing detrimental effects to system or components.

.2 Design and size members to withstand dead loads and live loads caused by snow, hail, and pressure and suction of wind acting vertically, calculated to applicable regulatory requirements.

.3 Limit member deflection to flexure limit of glass with full recovery of glazing materials.

2.4 MATERIALS

.1 Extruded Aluminum: To ASTM B221M, 6063 alloy, T5 temper.

.2 Sheet Aluminum: To ASTM B209/B209M, 3003-H14 alloy.

.3 Sealed Insulating Glass Units (SIG-CLR-2): Factory-assembled sealed insulating glass unit, with low emissivity exterior pane and clear interior pane separated by stainless steel spacer sealing the space between panes with 95 percent argon gas; as follows:
.1 Outer Pane: 4 mm thick tempered safety glass, with #2 surface coated with 3 layers of low emissivity silver LoE^3 coating.
.2 Inner Pane: Laminated safety glass, comprised of two 2.3 mm thick clear heat-strengthened glass panes, with a 0.76 mm thick clear polyvinyl butyral interlayer sandwiched together.

.4 Structural Sealant: Factory-applied silicone sealant, Black colour; bonding glass pane to aluminum frame, and suitable for external exposure.

.5 Condensation Drainage Gasket: Factory-applied black thermoplastic rubber gasket.

.6 Accessory Tray: Rigid white fiberglass frame, site assembled, mounting directly to curb.

.7 Fasteners: Stainless steel, size and type best suited for application.

.8 Gaskets and Weatherstripping: Co-extruded vinyl, neoprene, or EPDM; as recommended by manufacturer.

.9 Thermal Insulation: As specified in Section 07 21 00.

.10 Vapour Retarder: As specified in Section 07 26 00.

.11 Air Barriers: As specified in Section 07 27 00.

.12 Air Sealant Foam: As specified in Section 07 27 36.

.13 Glazing Sealant: Type SEAL-GLZ as specified in Section 07 92 00.

.14 Perimeter Joint Sealants: As specified in Section 07 92 00, Types as follows:
.1 Exterior Applications: Exterior flashing sealant, Type SEAL-EXT-FL.
.2 Interior Applications: Interior general purpose sealant, Type SEAL-INT-GP.

2.5 MANUFACTURED UNITS

.1 Flat Glass Unit Skylights: Fixed curb-mounted skylight, complete with internal condensation collection system and drainage slots; shop-glazed with sealed insulating glass unit; including exterior structural sealant, roll-formed aluminum frame counter-flashing with corner keys; Model FCM-4646-2004 Curb-Mounted Skylight by Velux-Canada Inc.

2.6 FABRICATION

.1 Fabricate Products to AAMA/WDMA/CSA 101/I.S. 2/A440 and CSA A440S1.

.2 Fabricate one-piece aluminum counter flashing system with corner keys.

.3 Provide internal drainage of glazing spaces with exterior through gasketing to remove condensation.

.4 Mount condensation drainage gasket around entire interior frame assembly, providing a thermal break weather seal and drainage for interior condensation.

.5 Factory glaze units with glazing sealant.

.6 Ensure weather tight assembly.

.7 Minimize need for field assembly as much as possible.

2.7 FINISHES

.1 Monochromatic Paint Coating on Aluminum: To AAMA 2605; two-coat thermosetting fluoropolymer PVDF liquid extrusion and coil coating, factory-applied to 0.03 mm dry film thickness; eg. Duranar by PPG Industries, Inc., colour as selected by Consultant.

.2 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.3 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify curb and rough opening dimensions, squareness, roof pitch and proper orientation of skylight.

3.2 INSTALLATION

.1 Install Products to CAN/CSA-A440.4.

.2 Align skylight with curb, free of warp or twist, maintaining dimensional tolerances.

.3 Screw fasten skylight to curb.

.4 Insulate curb as indicated on Drawings. Refer to Section 07 21 00.

.5 Fill gaps between frames and adjacent roof assemblies with air sealant foam, as specified in Section 07 27 36.

.6 Flash assembly for watertight and weathertight installation.

.7 Provide perimeter joint sealant as specified in Section 07 92 00.

3.3 FIELD QUALITY CONTROL

.1 Refer to Section 01 40 00.

.2 Test for water leaks to AAMA 501.2 after installation and curing of sealants, but before installation of interior finishes.

.3 Perform test for total area of each unit skylight.

.4 Remove and replace defective Products that have failed to pass tests and inspections.

.5 Re-test replaced units at no additional cost to Owner.

.6 Prepare and submit testing and inspection reports.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean surfaces and touch-up damaged coatings and finishes.

.3 Remove excess sealants, glazing materials, dirt and other substances.

3.5 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation from contact with contaminating substances.

.3 Replace damaged glazing.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 08 12 13 - Hollow Metal Frames.

.2 Section 08 13 13 - Hollow Metal Doors.

.3 Section 26 05 00 - Electrical Basic Materials and Methods.

1.2 REFERENCES

.1 ANSI/BHMA A156.1-2016: Butts and Hinges.

.2 ANSI/BHMA A156.2-2017: Bored & Preassembled Locks and Latches.

.3 ANSI/BHMA A156.3-2014: Exit Devices.

.4 ANSI/BHMA A156.4-2019: Door Controls - Closers.

.5 ANSI/BHMA A156.5-2014: Cylinders and Input Devices for Locks.

.6 ANSI/BHMA A156.6-2010: Architectural Door Trim.

.7 ANSI/BHMA A156.8-2010: Door Controls - Overhead Stops & Holders.

.8 ANSI/BHMA A156.12-2018: Interconnected Locks & Latches.

.9 ANSI/BHMA A156.13-2017: Mortise Locks.

.10 ANSI/BHMA A156.14-2013: Sliding and Folding Hardware.

.11 ANSI/BHMA A156.15-2015: Release Devices - Closer Holder, Electromagnetic and Electromechanical.

.12 ANSI/BHMA A156.16-2018: Auxiliary Hardware.

.13 ANSI/BHMA A156.17-2014: Self Closing Hinges & Pivots.

.14 ANSI/BHMA A156.18-2016: Materials and Finishes.

.15 ANSI/BHMA A156.19-2013: Power Assist & Low Energy Power Operated Doors.

.16 ANSI/BHMA A156.21-2014: Thresholds.

.17 ANSI/BHMA A156.22-2017: Door Gasketing and Edge Seal Systems.

.18 ANSI/BHMA A156.23-2017: Electromagnetic Locks.

.19 ANSI/BHMA A156.24-2012: Delayed Egress Locks.

.20 ANSI/BHMA A156.25-2018: Electrified Locking Devices.

.21 ANSI/BHMA A156.26-2017: Continuous Hinges.

.22 ANSI/BHMA A156.28-2018: Recommended Practices for Mechanical Keying Systems.

.23 ANSI/BHMA A156.29-2017: Exit Locks, Exit Alarms, Alarms for Exit Devices.

.24 ANSI/BHMA A156.31-2019: Electric Strikes and Frame Mounted Actuators.

.25 ANSI/BHMA A156.36-2016: Auxiliary Locks.

.26 ANSI/BHMA A156.37-2014: Multipoint Locks.

.27 CSDMA Recommended Dimensional Standard for Steel Doors and Frames.

.28 CSDMA Canadian Fire Labeling Guide for Commercial Steel Door and Frame Products.

.29 CSDMA Canadian Metric Conversion Guide for Steel Doors and Frames (Modular Construction).

.30 ANSI/DHI A115.IG-1994: Installation Guide for Doors and Hardware.

.31 DHI Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

.32 DHI Recommended Locations for Architectural Hardware for Flush Wood Doors.

.33 DHI Sequence and Format for the Hardware Schedule.

.34 DHI Keying Systems and Nomenclature.

.35 DHI Abbreviations and Symbols.

.36 NFPA 80-2007: Fire Doors and Other Opening Protectives.

1.3 PREINSTALLATION MEETINGS

.1 Refer to Section 01 31 00.

.2 Prior to installation of hardware, arrange a meeting between Owner, Contractor, Consultant, manufacturer, hardware Supplier, architectural hardware consultant, and installation Subcontractor to review materials, procedures and coordinate related work.

1.4 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, illustrating materials, sizes, and operating features for each specified piece of door hardware.

.3 Submit templates to installer prior to installation.

1.5 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific documents, including door hardware schedule, keying schedule, and wiring diagrams, as follows:
- .1 Door Hardware Schedule, prepared by architectural hardware consultant (AHC), in vertical format, to DHI Sequence and Format for the Hardware Schedule.
- .2 Keying Schedule: Prepared by architectural hardware consultant (AHC), to DHI Keying Systems and Nomenclature, including special keying notes and stamping instructions. Do not order locks and cylinders until key schedule has been accepted by Consultant.
- .3 Wiring Diagrams: A written description of the functional use of power-operated door hardware. Include door and frame elevations showing location of each scheduled power-operated hardware item, including a wiring diagram showing number and size of conductors.

1.6 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Samples: One sample of each hardware item complete with fasteners, clearly labeled with hardware schedule designation and manufacturer's name and model number.

1.7 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Operating and Maintenance Data: Including maintenance instructions for each hardware item, catalogue cut sheets and Product data sheets for each Product, parts list for each Product, an updated copy of door hardware schedule illustrating actual Products installed, and a copy of final keying schedule.

1.8 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Clearly labeled to identify type of hardware, manufacturer name, model number, and finish; for each of the following:
.1 Ten key lock cylinders for each master keyed group.
.2 Three installation tools for passage sets, locksets and privacy sets.

1.9 QUALIFICATIONS

.1 Hardware Supplier: A firm specializing in supplying institutional door hardware, having minimum 10 years documented experience.

.2 Hardware Supplier Personnel: Employ a qualified architectural hardware consultant (AHC) to supervise scheduling and supplying door hardware.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Package hardware separately for each opening in a package which contains all hardware for that opening and is designated with applicable heading number, door number and key-set symbol.

.3 Store Products in a clean, dry and secure area, on adequate shelving to permit organization so item numbers are readily visible.

.4 Supply Products complete with keys, templates and installation instructions, together with all required screws, expansion shields, anchors, jigs and other related accessories for satisfactory attachment and installation of hardware.

1.11 WARRANTY

.1 Submit manufacturers' standard extended warranties for each item of hardware.

2 Products

2.1 REGULATORY REQUIREMENTS

.1 Fire Rated Assemblies: To NFPA requirements for fire rated doors, frames and hardware.

.2 Ensure fire exit requirements are met with regard to automatic closers, fusible links, positive latching, and direction of travel.

2.2 KEYING

.1 Conform to ANSI/BHMA A156.28.

.2 Key doors to Owner’s existing GMK or MK system.

.3 Provide visual key control (VKC) on face of each cylinder and on change keys.

2.3 DOOR HARDWARE

.1 Butt Hinges: To ANSI/BHMA A156.1, Grade 1.

.2 Continuous Hinges: To ANSI/BHMA A156.26.

.3 Self-Closing Hinges and Pivots: To ANSI/BHMA A156.17.

.4 Locksets and Latchsets: To ANSI/BHMA A156.2, Grade 1.

.5 Exit Devices: To ANSI/BHMA A156.3.

.6 Closers: To ANSI/BHMA A156.4; surface-mounted type.

.7 Cylinders and Input Devices: To ANSI/BHMA A156.5, Operational Class, Grade 1.

.8 Overhead Door Stops: To ANSI/BHMA A156.8.

.9 Interconnected Locks and Latches: To ANSI/BHMA A156.12, Grade 1.

.10 Mortise Locks: To ANSI/BHMA A156.13, Operational Class, Grade 1.

.11 Auxiliary Locks: To ANSI/BHMA A156.36, Grade 1.

.12 Multipoint Locks: To ANSI/BHMA A156.13, Operational Class, Grade 1.

.13 Sliding and Folding Door Hardware: To ANSI/BHMA A156.14.

.14 Powered Release Devices: To ANSI/BHMA A156.15.

.15 Powered Door Operators: To ANSI/BHMA A156.19.

.16 Powered Door Locks: To ANSI/BHMA A156.23; electromagnetic type.

.17 Powered Locking Devices: To ANSI/BHMA A156.25.

.18 Powered Strikes and Actuators: To ANSI/BHMA A156.31.

.19 Delayed Egress Locks: To ANSI/BHMA A156.24.

.20 Alarms for Exit Devices: To ANSI/BHMA A156.29.

.21 Door Trim: Protection plates, push plates, door pulls, push bars, and pull bars; to ANSI/BHMA A156.6.

.22 Thresholds: To ANSI/BHMA A156.21.

.23 Auxiliary Hardware: To ANSI/BHMA A156.16.

.24 Door Gaskets and Weatherstripping: To ANSI/BHMA A156.21.

2.4 FINISHES

.1 Conform to ANSI/BHMA A156.18.

.2 Provide hardware with finishes stipulated in preliminary hardware schedule.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify doors and frames are ready to receive hardware, and that dimensions are as indicated on accepted Shop Drawings and door hardware schedule.

.3 Verify power supply of 120V AC, 20 amps, 3 phase, 60 Hz is available to power-operated devices.

3.2 INSTALLATION

.1 Install hardware to ANSI/DHI A115.IG.

.2 Use templates provided by hardware manufacturer.

.3 Provide routing or mortising for hinges and other items required to be mortised or rebated or otherwise housed within material.

.4 Install hardware at mounting heights specified in manufacturers' templates or as indicated in hardware schedule.

.5 Install hardware using only manufacturer-supplied and -approved fasteners, in strict accordance with manufacturers' published installation instructions. Provide suitable security-type fasteners as specified in hardware sets.

.6 Ensure locksets, latchsets and deadbolts are of correct hand before installation to ensure cylinder is in correct position. Handing is part of installation procedure.

.7 Ensure exit devices are of correct hand and adjust device cam for proper outside trim function prior to installation. Handing is part of installation procedure.

.8 Install head seal prior to installation of “PA”-parallel arm mounted door closers and push side mounted door stops and holders.

.9 Counter sink through-bolt of door pull under push plate during installation.

.10 Mount closers, automatic operators and hold-open devices as noted in hardware schedule.

.11 Secure thresholds with machine screws and anchors.

3.3 FIELD QUALITY CONTROL

.1 Examine installed hardware and notify Consultant of improper installations, defective Products or where installation does not conform to Contract Documents.

3.4 ADJUSTING

.1 Replace Products exhibiting scratched or damaged surfaces.

.2 Properly tighten fasteners and ensure that fasteners are installed to the full required complement.

.3 Adjustment is inclusive of spring power, closing speed, latching speed and back-check at the time of installation.

.4 Adjust delayed-action door operators and closers to forty-second delay to accommodate barrier-free access. Time period to be approved by Owner.

3.5 DEMONSTRATION

.1 Refer to Section 01 79 00.

.2 Demonstrate operation and maintenance of hardware items, including proper use, servicing, adjusting and lubrication procedures.

3.6 PROTECTION

.1 Refer to Section 01 76 00.

.2 Cover surfaces with temporary, removable protective film.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 06 20 00 - Finish Carpentry.

.3 Section 06 40 00 - Architectural Woodwork.

.4 Section 07 92 00 - Joint Sealants.

.5 Section 08 12 13 - Hollow Metal Frames.

.6 Section 08 13 13 - Hollow Metal Doors.

.7 Section 08 51 13 - Aluminum Windows.

.8 Section 08 62 26 - Flat Glass Unit Skylights.

.9 Section 10 28 13 - Toilet Accessories.

1.2 REFERENCES

.1 AAMA 800-16: Voluntary Specifications and Test Methods for Sealants.

.2 ANSI Z97.1-2009: Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

.3 ASTM C509-06(2021): Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

.4 ASTM C864-05(2019): Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

.5 ASTM C1115-17: Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.

.6 ASTM C1281-16: Standard Specification for Preformed Tape Sealants for Glazing Applications.

.7 ASTM C1376-21a: Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.

.8 ASTM C1503-18: Standard Specification for Silvered Flat Glass Mirror.

.9 CAN/CGSB-12.1-2017: Safety Glazing.

.10 CAN/CGSB-12.2-M91 (R2017): Flat, Clear Sheet Glass.

.11 CAN/CGSB-12.3-M91 (R2017): Flat, Clear Float Glass.

.12 CAN/CGSB-12.8-2017: Insulating Glass Units.

.13 CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

.14 GANA Glazing Manual.

.15 GANA Laminated Glazing Reference Manual.

.16 GANA GIB 01-0300: Proper Procedures for Cleaning Architectural Glass.

.17 IGMAC Quality Standard Specification.

.18 IGMAC Glazing Recommendations for Sealed Insulated Glass Units.

.19 ANSI/NFRC 100-2017: Procedure for Determining Fenestration Product U-factors.

.20 ANSI/NFRC 200-2017: Procedure for Determining Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

.21 CAN/ULC-S104-15 (R2020): Standard Method for Fire Tests of Door Assemblies.

.22 CAN/ULC-S106-15 (R2020): Standard Method for Fire Tests of Window and Glass Block Assemblies.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating structural, physical and environmental characteristics, thickness and size limitations, special handling and installation requirements.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate 300 x 300 mm size samples of each specified sealed insulating glass unit; illustrating colouration and design.

1.5 CERTIFICATES

.1 Submit certificates as specified in Section 01 33 00.

.2 Certificate of Compliance: Manufacturer's standard certificate of compliance, attesting fire-rated glazing materials comply with CPSC requirements.

1.6 TEST AND EVALUATION REPORTS

.1 Submit test reports as specified in Section 01 33 00.

.2 Test Reports: Manufacturer's standard test results indicating Products meet specified performance criteria, prepared by independent testing agency and current within past 5 years.

1.7 QUALITY ASSURANCE

.1 Conform to glazing installation methods and quality standards specified in:
- .1 GANA Glazing Manual,
- .2 GANA Laminated Glazing Reference Manual,
- .3 IGMAC Quality Standard Specification, and
- .4 IGMAC Glazing Recommendations for Sealed Insulated Glass Units.

.2 Select glazing compounds and sealants in accordance with glass manufacturers' instructions.

1.8 WARRANTY

.1 Submit extended warranties in accordance with General Conditions of the Contract.

.2 Manufacturer's Extended Warranties: For a period of 5 years, covering complete replacement of units experiencing:
- .1 Sealed Insulating Glass Units: Seal failure or interpane dusting and misting.
- .2 Mirrored Glass Units: Deterioration or delamination of reflective coating that affects reflectivity of mirrored unit.
- .3 Laminated Glass Units: Edge separation or delamination within the field area of glass that obstructs or affects visibility through laminated unit.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of single pane glass and sealed insulating glass units having Product considered acceptable for use:
.1 AFG Glass Inc.
.2 AGC Glass Company North America.
.3 Cardinal Glass Industries.
.4 Guardian Glass.
.5 Libbey-Owens Ford.
.6 Pilkington Glass North America, Inc.
.7 Prelco.
.8 Vitro Architectural Glass.

.2 Manufacturers of fire-rated ceramic glass having Product considered acceptable for use:
.1 Schott North America, Inc.
.2 Technical Glass Products Inc.

.3 Manufacturers of fire-rated glasswall assembly having Product considered acceptable for use:
.1 Technical Glass Products.

.4 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Fire-Rated Glasswall Assembly: Fire-rated intumescent glass with butt-glazed joints, strictly conforming to ULC Design Assembly noted on Drawings; secured in L-shaped steel angle perimeter frames as specified in Section 05 50 00, and including perimeter wood trim as specified in Section 06 20 00; Fireframes Clearview System by Technical Glass Products.

2.3 REGULATORY REQUIREMENTS

.1 Fire-rated Glass: Each lite to bear a permanent, non-removable label designating type of glass, fire rating and UL mark.

2.4 DESIGN CRITERIA

.1 Design Products installed in an exterior application to contribute to continuity of building enclosure air and vapour seals.

.2 Determine necessary glass thickness to withstand dead loads and positive and negative live loads acting normal to plane of glass.

.3 Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

2.5 PERFORMANCE CRITERIA

.1 Fire-Rated Intumescent Glass: Having the following tested physical properties:
.1 Daylight Transmittance: 86 percent.
.2 Sound Transmission Class: STC = 44.
.3 Weight: 61 kg/m^2.
.4 Coefficient of Heat Transmission (U-Value): 0.83.

.2 Sealed Insulating Glass Units (SIG-CLR-1): Having the following tested physical properties:
.1 Visible Light Transmittance (VLT): 70 percent.
.2 Visible Light Reflectance:
.1 Exterior: 11 percent.
.2 Interior: 12 percent.
.3 Coefficient of Heat Transmission, Winter, Argon-Filled (ANSI/NFRC 100): U = 1.36 W/m^2 degrees C.

.4 Solar Heat Gain Coefficient (ANSI/NFRC 200): SHGC = 0.39.
.5 Light to Solar Gain Ratio: LSG = 1.79.

2.6 SINGLE PANE GLASS

.1 Float Glass (GL-1): To CAN/CGSB-12.3-M; glazing quality, 6 mm thick unless noted otherwise.

.2 Mirrored Glass (GL-2): To ASTM C1503; clear float glass, with silvered coating evenly applied over rear face; sizes as scheduled or noted on Drawings; 4 mm thick unless noted otherwise.

.3 Tempered Safety Glass (GL-3): To CAN/CGSB-12.1; clear float glass fully tempered horizontally to achieve a net strength of not less than 4 to 5 times greater than regular annealed glass; impact safety rating meeting ANSI Z97.1, Class A and CPSC 16 CFR 1201, Categories I and II; 6 mm thick unless noted otherwise.

.4 Sheet Glass (GL-4): To CAN/CGSB-12.2-M; glazing quality, 3 mm thick unless noted otherwise.

.5 Laminated Safety Glass (GL-5): To CAN/CGSB-12.1; two layers of 3 mm thick tempered safety glass laminated to a 0.76 mm thick vinyl interlayer to form a single, unified construction; impact safety-rated to ANSI Z97.1, Class A and CPSC 16 CFR 1201, Categories I and II.

.6 Fire-Rated Ceramic Glass (GL-6): 5 mm thick fire-rated and impact safety-rated glass ceramic with surface-applied safety film; impact safety rating meeting ANSI Z97.1, Class A and CPSC 16 CFR 1201, Categories I and II; Clear style, polished one side; Standard Grade; 88 percent visible light transmittance, 9 percent visible light reflectance; 90-minute fire rating when tested to CAN/ULC S104 and CAN/ULC-S106; eg. FireLite NT Standard by Technical Glass Products Inc.

.7 Fire-Rated Intumescent Glass (GL-7): 27 mm thick laminated low-iron float glass with clear intumescent interlayers, fire-rated and impact safety-rated to ANSI Z97.1, Class A and CPSC 16 CFR 1201, Categories I and II; Clear style, Premium grade finish; eg. Pyrostop 60-201 by Pilkington Glass North America, Inc.

2.7 SEALED INSULATING GLASS UNITS

.1 Sealed Insulating Glass Units (SIG-CLR-1): To CAN/CGSB-12.8; double pane with warm edge seal; comprised as follows:
.1 Outer Pane: 6 mm thick Clear tempered safety glass, sputtered Low-E coating on #2 surface.
.2 Interpane Space: Filled with minimum 90 percent Argon gas.
.3 Inner Pane: 6 mm thick Clear tempered safety glass.
.4 Overall Thickness: 25 mm.
.5 Manufacturer's Name and Product: eg. Solarban 60 (2) Clear + Clear by Vitro Architectural Glass.

.2 Sealed Insulating Glass Units (SIG-CLR-2): As specified in Section 08 62 26.

2.8 COATINGS AND FILMS

.1 Low-E Coating: To ASTM C1376, Kind CV; magnetron sputtered vacuum deposition (MSVD) coating; eg. Solarban 60 Solar Control Low-E by Vitro Architectural Glass.

2.9 ACCESSORIES

.1 Warm Edge Seal: Polyisobutylene primary seal with a secondary seal comprised of either silicone, butyl, polysulphide or urethane, as recommended by sealed insulating glass unit manufacturer for each particular glazing application.

.2 Dense Compression Gasket: Moulded or extruded gaskets, made from neoprene or EPDM to ASTM C864, or thermoplastic polyolefin rubber to ASTM C1115; of profile and hardness required to maintain watertight seal.

.3 Soft Compression Gasket: To ASTM C509, Type II; moulded or extruded, closed-cell, integral-skinned gaskets made from neoprene, EPDM or thermoplastic polyolefin rubber; Black colour; profile and hardness required to maintain watertight seal.

.4 Back-Bedding Mastic Glazing Tapes: To ASTM C1281 and AAMA 800, preformed, butyl-based elastomeric tape with 100 percent solids content; non-staining and non-migrating in contact with non-porous surfaces; with or without spacer rod; packaged on rolls with release paper backing.

.5 Expanded Cellular Glazing Tapes: Closed cell, PVC foam tape, factory-coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; to AAMA 800 for the following types:
.1 Tape Acts as Primary Seal: Type 1.
.2 Tape Used in Combination with Full-Bead of Sealant: Type 2.

.6 Glazing Tape for Fire-rated Glass Applications: Fiberfrax Alumino-Silicate Fiber glazing tape by Unifrax Corporation.

.7 Setting Blocks: Elastomeric material, having a Shore A durometer hardness of 85, plus or minus 5.

.8 Setting Blocks for Fire-rated Glass Applications: Calcium silicate.

.9 Spacers: Elastomeric blocks or continuous extrusions, having a Shore A durometer hardness sufficient to maintain glass lites in place both during and after installation.

.10 Edge Blocks: Elastomeric material of sufficient hardness to limit glass lateral movement.

.11 Glazing Sealant: SEAL-GLZ as specified in Section 07 92 00.

.12 Cleaners, Primers and Sealers: Types recommended by sealant and gasket manufacturers.

2.10 FIRE-RATED GLASSWALL ASSEMBLY ACCESSORIES

.1 Perimeter Frames: As specified in Section 05 50 00.

.2 Permanent Edge Tape: Factory-applied silver-coloured tape, as recommended by glasswall assembly manufacturer.

.3 Temporary Glass Edge Tape: Factory-applied temporary black TESA fabric tape.

.4 Ceramic Tape: 15 x 5 mm size ceramic tape, White colour; as recommended by glasswall assembly manufacturer.

.5 Alignment Clamp Strip: 100 mm long gasketed clamping strip, with M4 threaded rods, wing nuts, and washers; as recommended by glasswall assembly manufacturer.

.6 Butt-Joint Sealant: Ceresit 3B Translucent Silicone.

.7 Wood Trim: As specified in Section 06 20 00.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify openings for glazing are correctly sized, within tolerance and clean.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

.1 Conform to GANA Glazing Manual.

.2 Install exterior glazing forming part of building envelope to IGMAC Glazing Recommendations for Sealed Insulated Glass Units; to achieve airtight and watertight seal.

.3 Protect glass edges from damage during handling and installation. Remove damaged glass Products from Place of the Work and dispose of in accordance with authorities having jurisdiction. Damaged glass is defined as glass with edge damage or other imperfections that, when installed, could weaken the glass and impair performance and appearance.

.4 Install setting blocks in sill rabbets, sized and located in accordance with GANA Glazing Manual. Set blocks in heel bead of glazing sealant.

.5 Do not exceed edge pressures stipulated by glass manufacturer for installing glass lites.

.6 Provide spacers for glass lites where length plus width is larger than 1 270 mm.

.7 Provide edge blocking necessary to prevent glass lites from moving sideways in glazing channel, in accordance with GANA Glazing Manual.

.8 Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sight line of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
.1 Cover vertical framing joints by applying tapes first to heads and sills, and then to jambs.
.2 Cover horizontal framing joints by applying tapes first to jambs, and then to heads and sills.
.3 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant.
.4 Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets, formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towards center of openings.

.9 Gasket Glazing: Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
.1 Insert soft compression gasket between glass and frame or fixed stop such that it is securely in place, with joints miter cut and bonded together at corners.
.2 Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets, formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towards center of openings.
.3 Install gaskets so they protrude evenly past face of glazing stops.
.4 Compress gaskets to produce weather tight seal without developing bending stress in glass.
.5 Seal gasket joints with compatible sealant.

.10 Fire-rated Glasswall Assembly:
.1 Install perimeter angle frames to substrate as specified in Section 05 50 00. Conform to applicable ULC Design Assembly as noted on Drawings.
.2 Remove temporary glass edge tape from fire-rated glass. Do not remove permanent edge tape.

.3 Apply PVC glazing tape to interior leg of perimeter frames.
.4 Install fire-rated glass with minimum 10 mm glass bite. Place glass into opening onto setting blocks without tilting or sliding, ensuring equal clearance around glass edges. Adjust setting blocks as required.
.5 Install fire-rated glass with identifying brand mark located in bottom right corner, clearly visible and legible after installation from interior side.
.6 Leave 5 mm wide gap between lites at butt joints.
.7 Install temporary clamping strips along butt joints, spaced maximum 610 mm OC.
.8 Install ceramic tape and butt-joint sealant to first side of butt joint. Remove temporary clamps and seal second-side only after first-side has properly cured.
.9 Coordinate with Section 06 20 00 for installation of perimeter wood trim as indicated on Drawings.

.11 Sliding Glass Panels
.1 Site measure casework openings, and fabricate sliding glass panels to sufficient sizes, including adequate overlaps to accommodate locking devices.
.2 Coordinate necessary clearances and sizes with manufacturer of sliding glass track assembly specified in Section 06 40 00.
.3 Drill holes in glass panes as required.
.4 Grind edges smooth and slightly rounded.
.5 Temper glass after fabrication is complete.
.6 Install sliding glass panels in casework on hardware specified in Section 06 40 00. Ensure smooth operation.

.12 Glass Shelves
.1 Polish glass edges prior to installation.
.2 Install shelves in fitments or casework on hardware specified in Section 06 40 00.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Remove glazing materials from finish surfaces.

.3 Remove non-permanent labels upon Substantial Performance of the Work.

.4 Clean glass surfaces to GANA GIB 01-0300.

3.5 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface.

.3 Protect glass from contact with contaminating substances resulting from subsequent construction operations.

.4 Remove and replace Products that have been damaged, including but not limited to having been broken, chipped, cracked or abraded; regardless of cause, before Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 12 00 - Structural Steel.

.2 Section 07 26 00 - Vapour Retarders.

.3 Section 07 27 00 - Air Barriers.

.4 Section 07 27 36 - Sprayed Foam Air Barrier.

.5 Section 07 62 00 - Sheet Metal Flashing and Trim.

.6 Section 07 92 00 - Joint Sealants.

.7 Section 08 13 13 - Hollow Metal Doors.

1.2 REFERENCES

.1 AAMA CW-10-12: Care and Handling of Architectural Aluminum from Shop to Site.

.2 AAMA 611-14: Voluntary Specification for Anodized Architectural Aluminum.

.3 AAMA 2605-17a: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).

.4 AMCA 500-L-07: Laboratory Methods of Testing Louvers for Rating.

.5 AMCA 501-03: Application Manual for Air Louvers.

.6 AMCA 511-07: Certified Ratings Program - Product Rating Manual for Air Control Devices.

.7 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.8 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.9 ASTM A1008/A1008M-21a: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

.10 ASTM B209/B209M-21: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.11 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.12 ASTM D3363-2020: Standard Test Method for Film Hardness by Pencil Test.

.13 NFPA 80-2007: Fire Doors and Other Opening Protectives.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating materials and thicknesses, and air flow and water entrainment performance test results.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating materials, sizes, configurations, anchorage details, connection details for component parts and finishes.

.3 Shop Drawings to include engineering calculations stamped, signed and dated by fabricator's design engineer.

1.5 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate set of 50 x 50 mm size samples, illustrating full range of colour and finish selections.

1.6 TEST AND EVALUATION REPORTS

.1 Submit test reports as specified in Section 01 33 00.

.2 Test Reports: Manufacturer's standard test results indicating Products meet specified performance criteria, prepared by independent testing agency, and current within past 5 years.

1.7 QUALIFICATIONS

.1 Fabricator's Design Engineer: A professional mechanical engineer experienced in air movement and control design and licensed to practice at Place of the Work.

.2 Fabricator and Installer: A firm specializing in fabricating and installing wall intake and exhaust louvers, having minimum 5 years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Conform to AAMA CW-10.

.3 Deliver Products to Place of the Work in clearly labelled protective cartons or wrappings.

.4 Store Products sufficiently off ground and covered with weatherproof, flame-resistant sheeting.

.5 Handle Products in a manner to prevent racking.

.6 Hoist Products from jambs only.

.7 Do not use heads, sills or blades to lift or transport Products.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of fire-rated door grilles having Product considered acceptable for use:
.1 Nailor Industries Inc.

.2 Manufacturers of non-rated door grilles having Product considered acceptable for use:
.1 Metal-Aire.

.3 Manufacturers of louvered wall vents having Product considered acceptable for use:
.1 C/S Group.
.2 McGill Architectural Products.
.3 Ten-Plus Architectural Products Ltd.
.4 Ventex, Inc.

.4 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESIGN AND PERFORMANCE CRITERIA

.1 Design Products to withstand wind and snow loads in accordance with applicable regulatory requirements.

.2 Allowable Deflection for Structural Members: Maximum L/180 or 19 mm, whichever is less.

.3 Allowable Deflection for Blades: Maximum L/120 or 13 mm across the weak axis, whichever is less.

.4 Design louvered wall vents to have an average free area of 50 percent or greater when tested to AMCA 500-L.

.5 Design louvered wall vents to have the following properties when tested to AMCA 501:
.1 Free Area Velocity at Point of Beginning Water Penetration: 5.52 m/s.
.2 Maximum Recommended Air Intake Velocity: 4.51 m/s.
.3 Intake Pressure Drop: 44.7 Pa.
.4 Exhaust Pressure Drop: 32.3 Pa.

2.3 MATERIALS

.1 Extruded Aluminum: To ASTM B221M, 6063 alloy, T5 or T6 temper.

.2 Sheet Aluminum: To ASTM B209/B209M, 3003-H14 alloy for painted applications and 5005-H32 alloy for anodized applications.

.3 Sheet Steel: To ASTM A1008/A1008M, Commercial Steel (CS) Types A, B, and C; cold-rolled steel sheet; 1.2 mm thick.

.4 Fasteners: Stainless steel, 300 Series; prefinished to match louvre frame.

.5 Bituminous Coating: Fibred asphalt emulsion.

.6 Joint Sealant: As specified in Section 07 92 00, types as follows:
.1 Exterior Perimeters: Exterior weatherseal sealant, SEAL-EXT.
.2 Interior Perimeters: Interior general purpose sealant, SEAL-INT-GP.

.7 Air Sealant Foam: As specified in Section 07 27 36.

2.4 MANUFACTURED UNITS

.1 Door Grille - Non-Rated: Extruded aluminum frame and blades; overall grille size as indicated on Drawings; surface mounted design, and telescoping rear frame to accommodate door width; inverted V-louver blades; factory anodized finish; eg. Model DGDF-04 by Metal-Aire.

.2 Door Grille - Fire-Rated: 44 mm deep, sheet steel frame and blades, having a 45 percent free area, complete with UL listed fusible link with stainless steel operating spring and deadlock bar; 90 minute UL rating; sizes as indicated on Drawings; shop primed finish; Model 61DGD-FR by Nailor Industries Inc.

.3 Louvered Wall Vent: Drainable type, fabricated as follows:
.1 Frame: Extruded aluminum, 50 x 100 mm size, flanged L- or A-frame as required by framing conditions; powder coated finish; to the following thicknesses:
.1 Heads: 1.78 mm.
.2 Jambs and Mullions: 3.18 mm.
.3 Sills: 2.03 mm.
.2 Blades: 1.78 mm thick extruded aluminum, 30 degree configuration, powder coated finish.

.3 Bird Screen: 1.27 mm OD aluminum wire, interwoven to 16 x 16 mm open weave, square pattern, set in 1.4 mm thick extruded aluminum frame, mill finish.
.4 Sill Flashing: 1.27 mm thick sheet aluminum, roll formed to required shape, single length in one piece per location; powder coated finish.
.5 Insulated Infill Panel: 1.2 mm thick aluminum sheet outer face, semi-rigid mineral fibre insulation to thicknesses indicated on Drawings, and 1.2 mm thick galvanized steel rear panel sealed at all edges; powder coated finish on sheet aluminum outer face.
.6 Sizes: As indicated on Drawings.
.7 Manufacturer Name and Product: eg. Model A4177 by C/S Group.

2.5 FABRICATION

.1 Fabricate Products free from distortion and effects detrimental to appearance and performance.

.2 Fasten louver frames and blades with stainless steel screws or heliarc welding.

.3 Neatly mitre louver frames at corners and reinforce with corner brackets.

2.6 FINISHES

.1 Anodized Coating on Aluminum: To AAMA 611, AA-M10C21A31, Class II Clear Anodic Oxide coating, No. 17.

.2 Powder Coated Finish on Aluminum: To AAMA 2605; 100 percent resin fluoropolymer coating, factory-applied to 0.075 mm dry film thickness, with 4H Hardness rating to ASTM D3363; colour as selected by Consultant.

.3 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.4 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify dimensions of supporting structure at Place of the Work.

3.2 PREPARATION

.1 Apply heavy coat of bituminous coating on aluminum surfaces placed in direct contact with concrete, mortar, plaster, or dissimilar metals.

3.3 INSTALLATION

.1 Securely install Products straight, plumb and level, with uniform joints.

.2 Install fire rated door grilles to ANSI/NFPA 80.

.3 Install door grilles in doors using full complement of fasteners. Adjust telescoping mechanism to accommodate door width.

.4 Install louvered wall vents to AMCA 501.

.5 Cut and trim components during erection only with manufacturer's prior written approval. Make Good damaged finishes.

.6 Remove and replace members where site-cutting or trimming has impaired strength or appearance of assembly.

.7 Flash exterior louvers, vents and grilles to prevent water infiltration into building enclosure.

.8 Fill gaps between exterior frames and adjacent wall assemblies with air sealant foam, as specified in Section 07 27 36.

.9 Provide perimeter joint sealant as specified in Section 07 92 00.

3.4 TOLERANCES

.1 Maximum Variation From Plane: Plus or minus 3 mm per 3 660 mm of length, but not exceeding 13 mm in any total building length.

.2 Maximum Offset From True Alignment Between Two Members: Plus or minus 1.5 mm, under both loaded and non-loaded conditions.

3.5 ADJUSTING

.1 Field touch-up scratches or damaged enamel finishes.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealants.

.2 Section 08 12 13 - Hollow Metal Frames.

.3 Section 08 31 00 - Access Door and Panels.

.4 Section 09 51 23 - Acoustical Tile Ceilings.

.5 Section 09 72 35 - Dry Erase Wall Coverings.

.6 Section 09 81 00 - Acoustic Insulation.

.7 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM A641/A641M-19: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.2 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A792/A792M-22: Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.4 ASTM C475/C475M-17: Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.5 ASTM C514-04(2020): Standard Specification for Nails for the Application of Gypsum Board.

.6 ASTM C645-18: Standard Specification for Nonstructural Steel Framing Members.

.7 ASTM C754-20: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.8 ASTM C840-20: Standard Specification for Application and Finishing of Gypsum Board.

.9 ASTM C954-18: Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

.10 ASTM C1002-20: Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.11 ASTM C1047-19: Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.12 ASTM C1264-19: Standard Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Panel Products.

.13 ASTM C1396/C1396M-17: Standard Specification for Gypsum Board.

.14 ASTM C1629/C1629M-19: Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

.15 ASTM C1658/C1658M-19e1: Standard Specification for Glass Mat Gypsum Panels.

.16 ASTM E90-09(2016): Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.17 CGC Gypsum Construction Handbook.

.18 CAN/CGSB-71.25-M88: Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.19 CISCA Ceiling Systems Handbook, 2012 Edition.

.20 GA-214-2015: Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels.

.21 GA-226-2019: Application of Gypsum Board to Form Curved Surfaces.

.22 CAN/ULC-S101-14 (REV1): Standard Method of Fire Endurance Tests of Building Construction and Materials.

.23 ULC List of Equipment and Materials.

1.3 QUALIFICATIONS

.1 Installers: A firm specializing in erecting metal framing and installing gypsum board, having minimum 5 years documented experience.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Conform to ASTM C1264.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of metal framing having Product considered acceptable for use:
.1 Bailey Metal Products Limited.
.2 CGC Inc.
.3 Dietrich Metal Framing.

.2 Manufacturers of gypsum board having Product considered acceptable for use:
.1 CertainTeed Canada, Inc.
.2 CGC Inc.
.3 G-P Gypsum Corporation.

.3 Manufacturers of cyclorama trim having Product considered acceptable for use:
.1 Pro Cyc, Inc.

.4 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Interior Partitions: Vertical non-load bearing metal stud framing clad with wall boards mechanically-fastened or adhered on one or both sides, and including acoustical insulation and accessories where indicated.

.2 Suspended Ceilings: Horizontal non-load bearing channels and framing carrying mechanically-fastened ceiling boards, and including acoustical ceiling hangers, insulation and accessories where indicated.

.3 A non-load bearing (non-structural) member is defined as a member in a steel-framed system which is limited to transverse (out-of-plane) load of not more than 480 Pa, a superimposed axial load, exclusive of sheathing materials, of not more than 1 460 N/m, or a superimposed axial load of not more than 890 N.

.4 A load bearing (structural) stud may be used in a non-load bearing application; however, non-load bearing members (studs or track) may never be used in a load bearing (axial or lateral loading) application.

2.3 PERFORMANCE CRITERIA

.1 Provide metal wall framing systems with maximum design limit of 240 Pa and maximum allowable deflection of L/360.

.2 Provide metal ceiling framing systems with maximum allowable deflection of L/240.

.3 Fire-Resistance Rated Assemblies: Provide Products and construction identical to those tested in listed assemblies; to CAN/ULC-S101.

.4 Sound Rated Assemblies: Provide Products and construction identical to those tested in listed assemblies; to ASTM E90.

2.4 METAL FRAMING

.1 Metal Studs and Tracks - Standard Duty: To ASTM C645; 0.455 mm thick sheet steel; galvanized or galvalumed finish; C-Shape with 32 mm wide flange, complete with serrated faces and knock-outs for electrical fitments; depths as indicated on Drawings.

.2 Metal Studs and Tracks - Heavy Duty: To ASTM C645; 0.836 mm thick sheet steel; galvanized or galvalumed finish; C-Shape with 32 mm wide flange, complete with serrated faces and knock-outs for electrical fitments; depths as indicated on Drawings.

.3 Metal Deflection Track: To ASTM C645; 0.455 mm thick sheet steel; galvanized or galvalumed finish; U-Shape with long legs, designed to accommodate structural deflections; depths as indicated on Drawings.

.4 Furring Members: To ASTM C645; 0.455 mm thick sheet steel; galvanized or galvalumed finish; and as described below:
.1 C-Shaped Furring Channels: 13 mm wide flange, 19 mm deep unless noted otherwise on Drawings.
.2 Hat-Shaped Furring Channels: 13 mm wide flange, 22 mm deep unless noted otherwise on Drawings.
.3 Z-Shaped Furring: With slotted or non-slotted web, 32 mm face flange, 22 mm wall attachment flange; depth as indicated on Drawings.
.4 Resilient Furring Channels: Designed to reduce sound transmission; 13 mm deep unless noted otherwise on Drawings.

.5 Carrying Channels: To ASTM C754; 1.37 mm thick cold-formed steel with galvanized or galvalumed finish; having minimum yield strength of 228 MPa; C-Shape with 13 mm flange width, 38 mm deep unless noted otherwise on Drawings.

.6 Furring Brackets: 0.79 mm thick sheet steel; galvanized or galvalumed finish; adjustable, with corrugated-edge.

.7 Flat Strap and Backing Plates: 0.455 mm thick sheet steel; galvanized or galvalumed finish; lengths and widths as indicated on Drawings.

.8 Channel Bridging: 0.455 mm thick sheet steel; galvanized or galvalumed finish; 13 mm wide flange, 19 mm deep unless noted otherwise on Drawings.

.9 Hanger Wire: To ASTM A641/A641M; zinc-coated, soft-annealed, 3.77 mm OD steel wire.

.10 Tie Wire: To ASTM A641/A641M; zinc-coated, soft-annealed, 1.21 mm OD steel wire.

2.5 BOARDS

.1 Gypsum Board - Moisture/Mould Resistant (GB-MR): To ASTM C1396/C1396M; 12.7 mm thick gypsum panel with water- and mould-resistant gypsum core and paper facers, tapered edges; eg. Sheetrock Brand Ultralight Panels Mold Tough by CGC Inc.

.2 Gypsum Board - Fire-Rated (GB-FR): To ASTM C1396/C1396M, Type C; fire-rated gypsum panel with water- and mould-resistant gypsum core and paper facers, tapered edges, ULC labelled; thicknesses as indicated on Drawings; eg. Sheetrock Brand Mold Tough Panels FireCode C by CGC Inc.

.3 Gypsum Board - Abuse-Resistant (GB-AR): To ASTM C1629/C1629M, Type X; Level III - Extreme Duty; 15.9 mm thick; square edges; moisture-resistant core with fiberglass mat facers both sides; DensArmor Plus Impact-Resistant Interior Panel by G-P Gypsum Corporation.

.4 Gypsum Board - Backing Board (GB-BB): To ASTM C1396/C1396M; 12.7 mm thick; paper-faced; square edges.

.5 Gypsum Board - Ceiling Board (GB-CLG): To ASTM C1396/C1396M; 12.7 mm thick; paper-facers, tapered edges; maximum 6.5 kg/m^2 weight; eg. Sheetrock Brand Ultralight Interior Ceiling Board Sag-Resistant by CGC Inc.

2.6 ACCESSORIES

.1 Foam Gasket: 3.2 mm thick adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement; width to suit track depth.

.2 Corner Beads, Casing Beads, Control Joints and Edge Trim: To ASTM C1047; metal type.

.3 Reveals and Trim Reglets: To ASTM C1047; extruded aluminum profiles; as indicated on Drawings.

.4 Nail Fasteners: To ASTM C514; galvanized steel.

.5 Steel Drill Screws: To ASTM C954; galvanized steel.

.6 Self-Tapping Screws: To ASTM C1002, galvanized steel, as follows:
.1 For Securement to Metal Framing: Type S, Fine Thread.
.2 For Securement to Gypsum Backing Board: Type G, Coarse-pitch High-thread.

.7 Adhesive: To CAN/CGSB-71.25-M.

.8 Joint Tape - Mould Resistant: Fiberglass joint tape, 50 mm wide, self-adhering type; eg. Mould Resistant Fiberglass Drywall Tape by CGC Inc.

.9 Joint Compound - Mould Resistant: Ready-mixed drying type drywall compound, to ASTM C475/C475M; eg. Synko Brand Classic All Purpose Drywall Compound by CGC Inc.

.10 Acoustic Insulation: Mineral fibre acoustical batt insulation, as specified in Section 09 81 00.

.11 Acoustical Sealant: Interior general purpose sealant, Type SEAL-INT-GP as specified in Section 07 92 00.

.12 Water: Potable.

2.7 CYCLORAMA TRIM AND ACCESSORIES

.1 Cyclorama Trim: High impact ABS plastic fabrications with tapered edges, consisting of floor cove modules and corner modules; 1 067 mm radius; System 3EZ by Pro Cyc, Inc.

.2 Cyclorama Bonding Agent: Super 77 Spray Adhesive by 3M Canada.

.3 Cyclorama Joint Compound: Durabond 90 Sheetrock Setting-Type Joint Compound by CGC Inc.

2.8 MIXING

.1 Thoroughly mix joint and skim coat materials to homogenous mixture to trowelling consistency.

2.9 FINISHES

.1 Galvanized Coating on Metal Framing Components: To ASTM A653/A653M, Grade Z120; hot dipped zinc alloy coating.

.2 Galvalumed Coating on Metal Framing Components: To ASTM A792/A792M, Grade AZM150; hot dipped aluminum-zinc alloy coating.

3 Execution

3.1 PREPARATION

.1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure.
- .1 Ensure inserts and other provisions for anchorages to building structure have been installed to receive hangers at required spacings.
- .2 Supply concrete inserts and other devices to other related Sections for installation in advance.

3.2 METAL WALL FRAMING

.1 Install metal wall framing to ASTM C754 and CGC Gypsum Construction Handbook.

.2 Where metal framing is installed directly against exterior masonry walls or dissimilar metals at exterior walls, Provide foam gasket between metal framing and exterior wall.

.3 Install studs with flanges pointing in same direction.

.4 Space metal stud framing in straight walls and partitions at maximum 400 mm OC.

.5 Install track floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions of structure.

.6 Where framing extends to overhead structural supports, Provide deflection track to create a slip-type head joints to produce joints at tops of framing system that prevent axial loading of finished assemblies due to deflection of structure.

.7 Screw vertical studs at door opening jambs to jamb anchor clips at door frames. Install track section for cripple studs at head and secure to jamb studs.
- .1 Provide two studs at each jamb.
- .2 Provide cripple studs at head adjacent to each jamb stud, with minimum 13 mm clearance from jamb stud to allow for installation of control joint in finished assembly.

.8 Provide framing below sills of openings to match framing required above opening heads.

.9 Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated. Support closures and make partitions continuous from floor to underside of solid structure.

.10 Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

.11 Curved Walls and Partitions: Conform to GA-226, and as follows:
.1 Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
.2 Begin and end each arc with a stud, and space intermediate studs equally along arcs at maximum 150 mm OC.
.3 On straight lengths of not less than two studs at ends of arcs, place studs at maximum 150 mm OC.

.12 Direct Furring: Attach furring to concrete or masonry with stub nails, screws designed for masonry attachment, or power-driven fasteners spaced at 610 mm OC.

.13 Z-Furring Members:
.1 Erect insulation vertically and hold in place with Z-furring members spaced at 610 mm OC.
.2 Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or power-driven fasteners spaced at 610 mm OC.
.3 At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel.
.4 At interior corners, space second member no more than 305 mm from corner and butt insulation to fit.

.14 Unless indicated otherwise, Provide supplementary framing and furring to conceal pipes, conduit and ducts.

.15 Provide supplementary framing and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings and similar construction.

.16 Install bracing at terminations in assemblies.

.17 Do not bridge building control joints and expansion joints with non-load bearing steel framing members. Frame both sides of joints independently.

.18 Installation Tolerances: Install framing members so fastening surfaces vary not more than 3 mm from plane formed by faces of adjacent framing members.

3.3 SUSPENDED CEILING FRAMING

.1 Install ceiling framing to ASTM C754 and CISCA installation standards.

.2 Isolate suspension system from building structure. Prevent transfer of loading imposed by structural movement.

.3 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum.

.4 Size supplemental suspension members and hangers to support ceiling loads within established performance limits.

.5 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or similar devices.

.6 Secure wire hangers by looping and wire tying, either directly to structure or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate; and in a manner that will not cause hangers to fail or deteriorate.

.7 Do not attach hangers to steel roof decking, or to rolled-in hanger tabs of composite steel floor decking.

.8 Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

.9 Do not connect or suspend steel framing from ducts, pipes or conduit.

.10 For fire-resistance-rated assemblies, wire tie furring channels to supports.

.11 Installation Tolerances: Level to within 3 mm in 3 600 mm, measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 ACOUSTICAL ACCESSORIES

.1 Install resilient channels at maximum 600 mm OC.

.2 Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

.3 Install acoustical sealant within designated sound-rated partitions.

3.5 CYCLORAMA TRIM

.1 Provide cyclorama built-in wall system plumb and level.

.2 Grind flanges and surfaces where joint compound will be installed.

.3 Drill and bolt flanges as close to face of modules as possible, allowing for width of washers.

.4 Apply cyclorama bonding agent in joint areas.

.5 Apply two coats of cyclorama joint compound, letting each coat dry for at least 24 hours before subsequent application.

.6 Apply top coat of standard joint compound and allow to dry.

.7 Sweep dry mortar mix behind floor modules at floor transition. Dampen backside and allow to harden.

3.6 BOARD INSTALLATION

.1 Install board Products to ASTM C840 and the CGC Gypsum Construction Handbook.

.2 Install gypsum ceiling board perpendicular to supports.

.3 Screw fasten boards to furring or framing.

.4 Install abuse-resistant gypsum board on heavy duty metal stud and track framing.

.5 Double Layer Applications: Use gypsum backing board for first layer, place perpendicular to framing or furring members. Place second layer perpendicular to first layer.

.6 Place corner beads at external corners. Place edge trim where gypsum board abuts dissimilar materials. Fasten with nail attachment, unless specified otherwise.

.7 Provide bulkheads where changes of ceiling or height occur.

.8 Install access panels when and where directed by affected Subcontractors. Refer to Section 08 31 00.

3.7 BOARD FINISHING

.1 Tape, fill and sand exposed joints, edges, and corners to a smooth surface.

.2 Leave surfaces smooth, even, plumb and true, ready to receive final finishes specified in other Sections.

.3 Except as specified below, finish gypsum board to GA-214, Level 4.
.1 Provide Level 1 finish on concealed surfaces, such as in plenum spaces above ceilings, and behind cabinetry.
.2 Provide Level 2 finish on surfaces designated to receive tile finishes.
.3 Provide Level 5 finish on surfaces designated to receive dry erase wall covering.
.4 Provide Level 5 finish on glass mat faced gypsum surfaces designated to receive painted finish.

3.8 CONTROL JOINTS

.1 Provide control joints where indicated on Drawings, and where:
.1 Ceiling, partition or furring abuts a structural element,
.2 Ceiling, partition or furring abuts dissimilar construction,
.3 Construction changes within plane of the partition or ceiling,
.4 Partition or furring run exceeds 9 000 mm,
.5 Ceiling dimensions exceed 15 000 mm in either direction,
.6 Wings of "L-", "U-" and "T"-shaped ceiling areas are joined, and
.7 Expansion or control joints occur in the structural elements of the building.

.2 Break continuity of gypsum board and framing system at control joints.

.3 Provide continuous control joint profile.

3.9 RELIEF JOINTS

.1 Provide relief joints where indicated on Drawings, and where gypsum board assemblies abut dissimilar construction.

.2 Stop gypsum board 6 mm from abutting construction at dissimilar building elements, unless indicated otherwise.

.3 Provide a thermal break where gypsum board comes into contact with frames. Adhere self-adhering tape to casing bead and compress during installation of gypsum board.

.4 Provide reveal mouldings where gypsum board ceilings meet curved wall surfaces, and where indicated on Drawings.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 04 00 00 - Masonry.

.3 Section 07 92 00 - Joint Sealants.

.4 Section 09 21 16 - Gypsum Board Assemblies.

.5 Section 09 65 19 - Resilient Tile Flooring.

.6 Section 09 68 13 - Tile Carpeting.

1.2 REFERENCES

.1 ANSI A108.01-2016: General Requirements: Subsurfaces and Preparations by Other Trades.

.2 ANSI A108.4-2009: Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.

.3 ANSI A108.5-1999: Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar (Reaffirmed 2010).

.4 ANSI A108.10-1999: Installation of Grout in Tilework (Reaffirmed 2010).

.5 ANSI A108.13-2005: Installation of Load Bearing, Bonded, Waterproof Membrane for Thin-Set Ceramic Tile and Dimension Stone (Reaffirmed 2016).

.6 ANSI A108.17-2005: Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone (Reaffirmed 2016).

.7 ANSI A118.1-2012: Specifications for Dry-Set Portland Cement Mortar.

.8 ANSI A118.4-2012: Specifications for Modified Dry-Set Cement Mortar.

.9 ANSI A118.7-2010: Specifications for Polymer Modified Cement Grouts for Tile Installation (Reaffirmed 2016).

.10 ANSI A118.10-2014: Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

.11 ANSI A118.12-2014: Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

.12 ANSI A136.1-2008: Specifications for Organic Adhesives for Installation of Ceramic Tile (Reaffirmed 2013).

.13 ANSI A137.1-2012: Specifications for Ceramic Tile.

.14 ASTM C144-18: Standard Specification for Aggregate for Masonry Mortar.

.15 ASTM C207-18: Standard Specification for Hydrated Lime for Masonry Purposes.

.16 ASTM C627-18e1: Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.

.17 ASTM C847-18: Standard Specification for Metal Lath.

.18 ASTM F1869-16a: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.19 ASTM F3191-16: Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.

.20 CAN/CGSB-25.20-95: Surface Sealer for Floors.

.21 CSA A3001-18: Cementitious Materials for Use in Concrete.

.22 TTMAC Specification Guide 09 30 00 - Tile Installation Manual 2019-2021.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: A 300 x 300 mm size panel, complete with selected grout colour; mounted to 19 mm thick plywood backer.

1.4 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Latest edition of TTMAC Hard Surface Maintenance Guide; sufficient quantities for inclusion in operation and maintenance manuals.

1.5 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Two percent or 4.0 m^2, whichever is greater, of each type and colour of installed tile; clearly marked to identify:
.1 Manufacturer's name,
.2 Product's name,
.3 Product colour and pattern.

.3 Package tiles neatly in original containers, to prevent damage.

1.6 QUALIFICATIONS

.1 Installers: Skilled workers trained and experienced in tiling and members of TTMAC.

1.7 DELIVERY STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products in a dry area, protected from freezing, staining and damage.

.3 Store cementitious materials on a dry surface.

1.8 AMBIENT CONDITIONS

.1 Do not install tiles at temperatures less than 12 degrees C.

.2 Maintain temperatures at or above 12 degrees C until cementitious materials have fully cured.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of mortars, grouts and adhesives having Product considered acceptable for use:
.1 Custom Building Products.
.2 Flextile.
.3 Laticrete.
.4 Mapei.

.5 Proma Adhesives, Inc.
.6 TEC.

.2 Manufacturers of tile-setting accessories having Product considered acceptable for use:
.1 Bengard.
.2 Profilitec.
.3 Schlüter Systems (Canada) Inc.

.3 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Traffic Level Performance (ASTM C627): Moderate Class.

2.3 TILE MATERIALS

.1 Porcelain Floor Tile (PFT-1): To ANSI A137.1; 305 x 610 mm size porcelain tile; Tune as distributed by Centura Floor & Wall Fashions, colours as selected by Consultant.

.2 Porcelain Floor Tile (PFT-2): To ANSI A137.1; 48 x 48 mm size unglazed porcelain dot-mounted mosaic tile factory mounted to 303 x 505 mesh backer sheets; Quebec Series as distributed by Olympia Tile + Stone International, Inc., colours as selected by Consultant.

.3 Porcelain Floor Tile (PFT-3): To ANSI A137.1; 48 x 48 mm size glazed porcelain dot-mounted mosaic tile factory mounted to 303 x 505 mesh backer sheets; Ontario Series as distributed by Olympia Tile + Stone International, Inc., colours as selected by Consultant.

.4 Porcelain Floor Tile (PFT-4): To ANSI A137.1; 457 x 914 mm size, 10 mm thick porcelain tile; Brit Stone as distributed by Centura Floor & Wall Fashions, colours as selected by Consultant.

.5 Ceramic Wall Tile (CWT-1): To ANSI A137.1; 100 x 400 mm size ceramic wall tile, Bright finish; Colour & Dimension Collection as distributed by Olympia Tile + Stone International, Inc., 4 colours as selected by Consultant.

.6 Cut Base Tile: 100 mm high, full-length, site-cut from floor tile, and having at least one factory-formed edge along each tile's length; type, size, colour and texture to match adjacent flooring material.

2.4 MORTAR AND GROUT MATERIALS

.1 Portland Cement: To CSA A3001, Type GU.

.2 Hydrated Lime: To ASTM C207, Type N-Normal.

.3 Sand: To ASTM C144, passing 16 mesh.

.4 Dry-Set Portland Cement Mortar: To ANSI A118.1.

.5 Latex-Portland Cement Mortar: To ANSI A118.4.

.6 Cementitious Grout: To ANSI A118.7; rapid setting type, polymer-modified sanded grout; eg. Ultracolor Plus FA by Mapei, colours as selected by Consultant.

2.5 ACCESSORIES

.1 Crack Isolation Membrane: To ANSI A118.12, High Performance Rating; loadbearing membrane.

.2 Reinforcing Mesh: 50 x 50 mm size; 1.6 mm thick steel wire mesh; welded fabric, galvanized.

.3 Metal Lath: To ASTM C847; 1.4 kg/m^2 galvanized steel lath.

.4 Tape: 50 mm fibre mesh tape, as recommended by backer board manufacturer.

.5 Organic Adhesive: To ANSI A136.1; Type 1 for wet areas and Type 2 for dry areas.

.6 Latex Additive: Formulated for use in portland cement mortars and grout.

.7 Water: Clean, cold and potable.

.8 Joint Sealants: As specified in Section 07 92 00, Types as follows:
.1 Floor Tiling: Type SEAL-INT-FT.
.2 Wall Tiling: Type SEAL-INT-WT.

.9 Tile Sealer: To CAN/CGSB-25.20, Type 1 - Penetrating.

2.6 MANUFACTURED COMPONENTS AND ACCESSORIES

.1 Edge and Transition Strips: Roll-formed stainless steel edge strips, 3 mm wide at top edge; with integral perforated anchoring leg for setting the strip into the setting material; height as required; Brushed finish; eg. SCHIENE-EB by Schlüter Systems (Canada) Inc.

.2 Tapered Transition Strips - To Other Floor Finishes: Roll-formed stainless steel transition strips; profile and height as indicated; with integral perforated anchoring leg for setting the strip into the setting material; sloped transition and decorative edge strip for transition from tile to lower finish; Brushed finish; eg. RENO-EBU by Schlüter Systems (Canada) Inc.

.3 Tapered Transition Strips - To Concrete Floors: Extruded aluminum transition strips; with integral perforated anchoring leg for setting the strip into the setting material; sloped transition and decorative edge strip for transition from tile to lower finish; height as required; Satin Anodized finish; eg. RENO-RAMP AE by Schlüter Systems (Canada) Inc.

.4 Decorative Edge Trim: Extruded aluminum decorative edge trim with integral perforated anchoring leg for setting the strip into the setting material; complete with pre-formed corners; satin anodized finish; eg. RONDEC-DB 14 AE by Schlüter Systems (Canada) Inc.

.5 Expansion and Control Joints for Thin-Set Applications: Roll formed stainless steel profiles joined by a soft CPE movement joint material, with integral perforated anchoring legs for setting the joint into the setting bed; height as required to suit application; insert colour as selected by Consultant; eg. DILEX-EKSN by Schlüter Systems (Canada) Inc.

.6 Waterproofing Membrane System: To ANSI A118.10; soft polyethylene membrane with fleece webbing laminated on both sides; use special cut-width rolls and special shapes for corners and pipe sleeves; KERDI by Schlüter Systems (Canada) Inc.

2.7 MIXES

.1 Scratch Coat (by volume): One part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used per manufacturer’s instructions. Adjust water volume depending on moisture content of sand to obtain consistency and workability.

.2 Slurry Bond Coat: Mix Portland cement and water to a creamy paste consistency. Include latex additive where required by TTMAC Detail.

.3 Levelling Coat (by volume): One part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used per manufacturer’s instructions.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Ensure substrates have been prepared to ANSI A108.01.

.3 Ensure substrates are clean, dimensionally stable, cured and free of contaminants such as oil, sealers and curing compounds.

.4 Ensure concrete has cured for minimum 28 days.

.5 Ensure concrete floors have not been treated with proprietary curing compounds.

.6 Ensure concrete floors are steel trowelled to a fine broom finish.

.7 Ensure concrete slabs have been finished with maximum permissible variation of 3 mm in 3 000 mm from required plane, and not more than 1.5 mm in 305 mm when measured from high points in surface.

.8 Conduct moisture vapour emission rate tests on concrete slabs-on-fill to ASTM F1869. Do not proceed with flooring installation until tests indicate MVER $\leq$ 1.45 kg per 100 m^2 for a 24 hour period.

.9 Determine absorptive nature of substrates by conducting porosity tests to ASTM F3191.

3.2 PREPARATION

.1 Protect surrounding work from damage or disfiguration.

.2 Thoroughly clean substrates to remove grease, oil and dust film.

.3 Prepare substrate as recommended by manufacturer for absorptive conditions determined by porosity test.

.4 Apply latex modified cementitious levelling coat wherever concrete slab does not meet specified tolerances for flatness and levelness, and where slight irregularities exist. Limit levelling coat thickness to less than 8 mm.

.5 Install crack isolation membrane over existing concrete slabs to ANSI A108.17. If crack isolation membrane is applied over rough surface, apply 6 mm thick sand-bed under crack isolation membrane.

.6 Waterproofing Membrane: To ANSI A108.13, and as follows:
- .1 Fully adhere waterproof membrane to substrate with tile setting adhesive, with no air pockets.
- .2 Overlap and seal membrane seams minimum 50 mm.
- .3 Alternately, tightly butt adjacent sheets and cover with 125 mm wide strip of waterproofing membrane sealed to primary membranes.
- .4 Provide strips of waterproofing where required to span expansion joints or terminate waterproofing into movement-joint type tile-setting accessories, as detailed per manufacturer’s instructions.
- .5 Adhere waterproofing membrane to fixtures, joints around pipes and opening frames with transparent waterproof sealant.

.7 Cover backer board joints with fibre mesh tape set in latex-Portland cement mortar.

3.3 INSTALLATION

.1 Install Products to TTMAC Specification Guide 09 30 00, as scheduled below.

.2 Apply tile using water-resistant organic adhesives to ANSI A108.4.

.3 Apply tile using dry-set Portland cement mortar or latex-Portland cement mortar beds to ANSI A108.5.

.4 Install tiles with straight, uniform joints, to tile manufacturers' recommended joint widths.

.5 Fit tile units around corners, fitments, fixtures, drains and other built-in objects to maintain uniform joint appearance.

.6 Make cut edges smooth, even and free from chipping. Do not split tile.

.7 Lay out tiles according to patterns indicated on Drawings. Ensure perimeter and cut tiles are minimum half size.

.8 Set tiles in place while bond coat is wet and tacky, prior to skinning over. Slide tile back and forth to ensure a proper bond and level surface. Avoid lippage.

.9 Clean backs of tiles and back butter tiles to ensure a 95 percent bond coverage.

.10 Clean excess mortar from surface prior to final set.

.11 Sound tiles after setting materials have cured and replace hollow sounding tile before grouting.

.12 Exterior Surfaces and Wet Areas (Thin Set Method): Notch adhesive in straight lines, backbutter tile and set on freshly trowelled thin-set mortar. Move tile back and forth perpendicular to notches.

.13 Ungauged Slate, Marble, Stone and Large Ceramics: Immediately prior to setting, backbutter tile through a push box or box screed to achieve a uniform thickness of tile and mortar.

.14 Install site-cut tiles with site-cut edges concealed within either a grouted joint or a metal trim. Visually expose only factory-made edges.

.15 Keep two-thirds the depth of grout joints free of setting material.

3.4 MOVEMENT JOINTS

.1 Install control and expansion joints to TTMAC Detail 301MJ.

.2 Keep control joints and expansion joints free of setting materials.

.3 In addition to the guidelines outlined in TTMAC Specification Guide 09 30 00, Provide movement joints over cold joints, saw cuts, at columns and at wall plane changes.

3.5 TILE-SETTING ACCESSORIES INSTALLATION

.1 Install tile-setting accessories in continuous lengths, to level straight lines by pressing the perforated anchoring leg of the accessory solidly into the tile setting adhesive.

.2 Butt ends of units tightly together with hairline joint. Trowel an additional layer of tile setting material over the anchored leg of the accessory prior to placement of tiles.

.3 Unless specified otherwise, solidly embed tiles over anchoring leg of installed trim with surface of tile flush with top of tile-setting accessories.

.4 Leave 3 mm joint between tile and tile-setting accessories for filling with grout.

.5 Install pre-formed corners, end-caps and trim at changes in direction and at terminations. Mitered joints will be rejected.

.6 Expansion and Control Joints: Solidly embed tiles over installed edge strips with joint surface either flush with top of joint or 1 mm below top of tile.

3.6 GROUTING

.1 Allow proper setting time prior to grouting.

.2 Preseal tiles requiring protection from grout staining.

.3 Apply cementitious grout to ANSI A108.10.

.4 Force grout into joints to ensure dense finish.

.5 Remove excess and polish with clean cloths.

3.7 FIELD QUALITY CONTROL

.1 Inspect completed work and replace broken, cracked or damaged tile.

3.8 TOLERANCES

.1 Level tiles to conform to a 1 mm tolerance over a 3 mm joint.

3.9 CLEANING

.1 Refer to Section 01 74 00.

.2 Apply tile sealer to floor tiles.

3.10 PROTECTION

.1 Protect finished areas from traffic until setting materials have sufficiently cured.

.2 Protect grouted areas from traffic for 24 hours after grouting.

.3 Provide protective covering until Owner occupancy.

.4 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for at least 14 days after installation.

3.11 SCHEDULE

.1 Tile Installed Over Masonry or Concrete Walls - Thin-Set Method: TTMAC Detail 303W.

.2 Tile Installed Over Gypsum Board - Thin-Set Method: TTMAC Detail 304W.

.3 Tile Bonded to Concrete Slab - Thin-Set Method: TTMAC Detail 311F (A - Interior/Exterior), (C - Crack Concrete Interior/Exterior - Full Coverage) or (D - Uncoupling Over Green/Young Concrete).

.4 Large Format Tile on Interior Floors: TTMAC Detail 329 LFT.

.5 Large Format Tile on Interior Walls: TTMAC Detail 330 LFTW.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 - Gypsum Board Assemblies.

.2 Section 09 81 00 - Acoustic Insulation.

.3 Section 09 84 13.13 - Fixed Sound-Absorptive Cementitious Panels.

.4 Section 26 50 00 - Lighting.

1.2 REFERENCES

.1 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A641/A641M-19: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.4 ASTM C635/C635M-17: Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.5 ASTM C636/C636M-19: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

.6 ASTM E1264-19: Standard Classification for Acoustical Ceiling Products.

.7 CISCA Ceiling Systems Handbook, 2012 Edition.

.8 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.9 ULC List of Equipment and Materials.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate 140 x 290 mm size sample of each specified acoustic lay-in tile, indicating texture, pattern, colour and edge profile.

1.4 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Minimum two full bundles for each lay-in tile ceiling Product, colour and pattern; clearly marked to identify:
.1 Manufacturer's name,
.2 Product's name,
.3 Product colour and pattern.

.3 Store bundles in original undamaged packages, in a warm, dry area.

1.5 QUALIFICATIONS

.1 Installers: A firm specializing in erecting suspended metal ceiling grid and installing lay-in tile ceilings, having minimum 3 years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products undamaged original containers.

.3 Store Products in warm, dry area.

1.7 EXISTING CONDITIONS

.1 Where existing ceilings require patching, use existing matching acoustic tiles removed from other areas.

.2 Protect material designated for re-use.

.3 Arrange for Consultant to inspect and accept existing materials designated for reuse prior to installation.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Armstrong World Industries.
.2 CertainTeed Canada, Inc.
.3 CGC Inc.
.4 Rockfon.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Acoustic Ceiling Tile (ACT-1): To ASTM E1264, Type III, Form 2, Pattern C E; wet-formed mineral fiber non-sagging lay-in tile, complete with anti-mould and mildew treatment, and sag resisting treatment; as follows:
.1 Size: 610 x 1 220 mm size.
.2 Thickness: 19 mm.
.3 Pattern: Medium texture, fissured.
.4 Edge: Square.
.5 Weight: 6.74 kg/m^2.
.6 Finish: Factory-applied latex paint, White colour.
.7 Fire Resistance (CAN/ULC-S102): Class A.
.8 Noise Reduction Coefficient: 0.70.
.9 Light Reflectance: 0.85.
.10 Manufacturer and Product Name: eg. School Zone Fine Fissured - 1714 by Armstrong World Industries.

.2 Acoustic Ceiling Tile (ACT-2): To ASTM E1264, Type XII, Form 2, Pattern E; suspended fiberglass plank, complete with anti-mould and mildew treatment, and sag resisting treatment; as follows:
.1 Size: 1 220 x 2 440 mm.
.2 Thickness: 22 mm.
.3 Pattern: Fine texture.
.4 Edge: Reverse tegular.
.5 Weight: 2.73 kg/m^2.
.6 Finish: Acoustically transparent scrim with factory-applied latex paint, White colour.
.7 Fire Resistance (CAN/ULC-S102): Class A.
.8 Noise Reduction Coefficient: 0.95.

.9 Light Reflectance: 0.90.
.10 Manufacturer and Product Name: eg. Capz Optima - 3933 by Armstrong World Industries.

.3 Acoustic Ceiling Tile (ACT-3): To ASTM E1264, Type XII, Form 2, Pattern E; suspended fiberglass plank, complete with anti-mould and mildew treatment, and sag resisting treatment; as follows:
.1 Size: 1 220 x 1 220 mm.
.2 Thickness: 22 mm.
.3 Pattern: Fine texture.
.4 Edge: Reverse tegular.
.5 Weight: 2.73 kg/m^2.
.6 Finish: Acoustically transparent scrim with factory-applied latex paint, White colour.
.7 Fire Resistance (CAN/ULC-S102): Class A.
.8 Noise Reduction Coefficient: 0.95.
.9 Light Reflectance: 0.90.
.10 Manufacturer and Product Name: eg. Capz Optima - 3932 by Armstrong World Industries.

.4 Acoustic Ceiling Tile (ACT-4): To ASTM E1264, Type IV, Form 2, Pattern E; wet-formed mineral fiber non-sagging lay-in tile, complete with anti-mould and mildew treatment, and sag resisting treatment; as follows:
.1 Size: 610 x 1 220 mm.
.2 Thickness: 25 mm.
.3 Pattern: Smooth texture.
.4 Edge: Square tegular.
.5 Finish: Acoustically transparent scrim with factory-applied latex paint, White colour.
.6 Fire Resistance (CAN/ULC-S102): Class A.
.7 Weight: 4.88 kg/m^2.
.8 Noise Reduction Coefficient: 0.85.
.9 Light Reflectance: 0.86.
.10 Manufacturer and Product Name: eg. Calla - 2823 by Armstrong World Industries.

.5 Suspended Metal Ceiling Grid: To ASTM C635/C635M, Class HD; commercial quality, cold rolled steel, non-fire rated; main tees, cross tees and grid adapters with exposed 24 mm T-shape, 43 mm high; die cut and interlocking components; baked enamel finish; eg. Prelude XL by Armstrong World Industries.

.6 Exposed Perimeter Metal Trim: Extruded aluminum, C-shape straight profile, 19 mm wide, 100 mm high; complete with pre-mitred inside and outside corner units; baked enamel finish; eg. Axiom Classic - AX4STR by Armstrong World Industries.

.7 Accessories: Stabilizer bars, clips, splices, edge mouldings, caps, cross tree plugs, threaded studs and hold down clips required for suspended grid system; same material and finish as suspended grid.

.8 Support Channels and Hangers: Galvanized steel, to rigidly secure ceiling system with maximum deflection of L/360.

.9 Hanger Wire: To ASTM A641/A641M; zinc-coated, soft-annealed, 3.77 mm OD steel wire.

.10 Tie Wire: To ASTM A641/A641M; zinc-coated, soft-annealed, 1.21 mm OD steel wire.

2.3 FINISHES

.1 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.2 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

.3 Baked Enamel Coating on Ceiling Grid and Trim: One coat of zinc oxide primer sprayed and baked followed by two coats of semi-gloss enamel sprayed and baked; White colour.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify layout of hangers will not interfere with other work.

.3 Verify ducts, pipes, fittings and other penetrations have been properly installed.

3.2 SUSPENDED CEILING GRID SYSTEM

.1 Install suspended ceiling grid system to ASTM C636/C636M and CISCA installation standards.

.2 Provide support channel and hanger assemblies necessary for suspended planks.

.3 Suspend planks from support assembly using caps, cross tree plugs, and threaded studs, mounted at height above finished floor as indicated on Drawings.

.4 Hang ceiling grid directly from structural elements, independent of walls, columns, metal deck, ducts, pipe fittings and conduit. Provide additional support channels and hangers as required.

.5 Space hangers at maximum 1 220 mm OC along supporting grillage, and not more than 150 mm OC from ends. Do not place hangers in front of access panels.

.6 Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers to span the extra distance.

.7 Install additional hangers and reinforcing to accommodate loads being carried.

.8 Provide suspension hanger at each corner of suspended fixtures, and at maximum 610 mm OC around perimeter of fixture.

.9 Locate ceiling grid system on room axis leaving equal border units according to reflected ceiling plan.

.10 Install main tees suspended at maximum 1 220 mm OC and maximum 600 mm from wall.

.11 Install cross tees and grid adapters perpendicular to main tees, and interlock with main tees.

.12 Frame around fixtures and openings.

.13 Install edge moulding at intersection of ceiling and vertical surfaces.

.14 Install exposed perimeter trim at exposed system edges where noted on Drawings.

.15 Form expansion joints as detailed. Form to accommodate plus or minus 25 mm movement. Maintain visual closure.

3.3 LAY-IN TILE

.1 Fit lay-in tiles in place, free from damaged edges.

.2 Neatly cut lay-in tiles to accommodate necessary penetrations.

.3 Cut and rabbet lay-in tiles at border areas and vertical surfaces.

.4 Lay directional patterned units one way with pattern parallel to longest room axis. Fit border neatly against abutting surfaces.

.5 Install hold-down clips to retain lay-in tiles tight to grid system within 6 000 mm of exterior door.

3.4 MECHANICALLY FASTENED CEILINGS

.1 Attach acoustic tile by concealed mechanical fastening or approved adhesive, where noted.

.2 Completed installation shall be square and level, with tight joints.

.3 Lay out ceiling system symmetrical within each area to obtain uniform borders at least half acoustic tile size.

3.5 TOLERANCES

.1 Variation from Flat and Level Surface: $\leq$ 3 mm in 3 000 mm.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 04 00 00 - Masonry.

.3 Section 09 21 16 - Gypsum Board Assemblies.

.4 Section 09 30 00 - Tiling.

.5 Section 09 65 19 - Resilient Tile Flooring.

.6 Section 09 68 13 - Tile Carpeting.

1.2 REFERENCES

.1 ASTM F1861-21: Standard Specification for Resilient Wall Base.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate 100 mm long sample sets, illustrating manufacturer's complete line of available colour selections.

1.4 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.5 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Three percent or 6 m^2, whichever is greater, of each Product, colour and pattern; clearly marked to identify:
.1 Manufacturer's name,
.2 Product's name,
.3 Product colour and pattern.

.3 Package Products neatly in original containers, to prevent damage.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver and store Products undamaged in original wrapping or cartons.

.3 Store Products for minimum 3 days prior to installation in a warm, dry room; stacked not more than four boxes high.

1.7 AMBIENT CONDITIONS

.1 Maintain ambient air temperature of 20 degrees C three days prior to, during, and 48 hours after installation of flooring materials.

.2 Maintain ambient air relative humidity between 35 percent and 55 percent RH.

.3 Do not install Products in conditions of high humidity or where exposed to cold drafts.

.4 In hot weather, protect Products from direct sunlight.

.5 Provide adequate ventilation.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Armstrong World Industries.
.2 Roppe Corporation.
.3 Tarkett Johnsonite.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Resilient Base (RB-STR): To ASTM F1861, Type TP, Group 1, Style A - Straight; 3.2 mm thick thermoplastic rubber, 102 mm high; top set; colours as selected by Consultant.

.2 Resilient Base (RB-COVE): To ASTM F1861, Type TP, Group 1, Style B - Cove; 3.2 mm thick thermoplastic rubber, 102 mm high; top set; complete with pre-moulded end stops and external corners; colours as selected by Consultant.

.3 Transition Strips (TS): Thermoset vulcanized rubber, smooth, purpose made to accommodate wheeled traffic and prevent tripping; tapered designs to suit nature of transition; colours as selected by Consultant.

.4 Adhesive: Non-flammable, solvent free contact adhesive, neoprene water-based formulation, Off-white colour; eg. Johnsonite #946 Premium Contact Adhesive by Tarkett Johnsonite.

.5 Filler: Premixed latex filler, White colour.

.6 Primers: Acrylic, waterproof type; as recommended by manufacturer.

.7 Sealers and Wax: As recommended by manufacturer.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify surfaces are dry, true, even and smooth.

.3 Verify surfaces are free of gaps, holes and depressions.

.4 Verify surfaces are free of paint, grease and oil.

3.2 PREPARATION

.1 Clean substrate to remove deleterious matter which would impair adhesion of Products.

.2 Prepare substrate to a smooth and flat surface, as follows:
.1 Remove ridges and bumps by grinding or other means.
.2 Fill low spots, cracks, joints, holes, and other defects with filler.
.3 Apply, trowel and float filler to leave smooth, flat, hard surface.
.4 Prohibit traffic until filler is cured.
.5 Vacuum clean substrate.

.3 Prime substrates to ensure proper adhesion of Products.

3.3 INSTALLATION

.1 Install Products on solid backing.

.2 Bond Products tight to surfaces.

.3 Mitre internal corners.

.4 At exposed ends and external corners, conform to the following:
.1 Coved Base: Use pre-moulded units.
.2 Straight Base: V-cut back of base strip to two-thirds of its thickness, and fold to desired shape.

.5 Scribe and fit base to door frames and other interruptions.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean, seal and wax installed Products.

3.5 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation with suitable and durable materials, until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 09 30 00 - Tiling.

.3 Section 09 65 13 - Resilient Base and Accessories.

.4 Section 09 68 13 - Tile Carpeting.

1.2 REFERENCES

.1 ASTM F710-21: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.2 ASTM F1700-20: Standard Specification for Solid Vinyl Floor Tile.

.3 ASTM F1869-16a: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.4 ASTM F2170-19a: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

.5 ASTM F2678-16(2021): Standard Practice for Preparing Panel Underlayments, Thick Poured Gypsum Concrete Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring.

.6 ASTM F3191-16: Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate 300 x 300 mm size samples of each specified Product, illustrating manufacturer's complete line of available colours and patterns.

1.4 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.5 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Three percent or 6 m^2, whichever is greater, of each resilient flooring Product, colour and pattern; clearly marked to identify:
.1 Manufacturer's name,
.2 Product's name,
.3 Product colour and pattern.

.3 Package tile products neatly in original containers, to prevent damage.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver and store Products undamaged in original wrapping or cartons.

.3 Store Products for a minimum of three days prior to installation in warm dry room with boxes stacked not over four high.

1.7 AMBIENT CONDITIONS

.1 Maintain ambient air temperature of 20 degrees C three days prior to, during and 48 hours after installation of flooring materials.

.2 Maintain ambient air relative humidity between 35 percent and 55 percent RH.

.3 Do not lay flooring in conditions of high humidity or where exposed to cold drafts.

.4 In hot weather, protect flooring from direct sunlight.

.5 Provide adequate ventilation.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Gerflor.
.2 Polyflor Canada, Inc.
.3 Six Degrees Flooring Surfaces.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Luxury Vinyl Tile (LVT): To ASTM F1700, Class III, Type B, Embossed Surface; heterogeneous vinyl plank, as follows:
.1 Thickness: 2.5 mm.
.2 Wear Layer Thickness: 0.7 mm.
.3 Plank Sizes: As selected by Consultant.
.4 Colours and Patterns: Four colours, as selected by Consultant.
.5 Manufacturer and Product Name: eg. Expona Design by Polyflor Canada, Inc.

.2 Adhesive: Vinyl acrylic wet-lay, pressure-sensitive adhesive, containing between 55 to 65 percent solids, Off-White colour, Creamy consistency; eg. Ultrabond ECO 360 by Mapei.

.3 Underlayment Patching Compound: Self-drying, hydraulic cement-based underlayment, having a trowel-applied consistency; mould- and mildew-resistant; capable of achieving a true feather edge; zero VOC content; eg. Feather Finish by Ardex Americas.

.4 Primers: Acrylic, waterproof type; as recommended by flooring manufacturer.

.5 Sealers and Wax: As recommended by flooring manufacturer.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify surfaces are dry, true, even and smooth.

.3 Verify surfaces are free of gaps, holes and depressions.

.4 Verify surfaces are free of paint, grease and oil.

.5 Verify concrete slabs have cured for minimum 28 days.

.6 Verify concrete slabs have a pH level between 7 and 9.

.7 Conduct moisture vapour emission rate tests on concrete slabs-on-fill to ASTM F1869. Do not proceed with installation until tests indicate MVER $\leq$ 2.27 kg per 100 m^2 for a 24 hour period.

.8 Conduct relative humidity tests on concrete slabs to ASTM F2170. Do not proceed with flooring installation until tests indicate RH $\leq$ 75 percent.

.9 Determine absorptive nature of substrates by conducting porosity tests to ASTM F3191.

3.2 PREPARATION

.1 Prepare substrate as recommended by manufacturer for absorptive conditions determined by porosity test. Conform to ASTM F710.

.2 Prepare underlayment patching compounds and surrounding slab surface to ASTM F2678.

.3 Clean substrate to remove deleterious matter that would impair subsequent installation.

.4 Prime substrates to ensure proper adhesion of Products.

3.3 INSTALLATION

.1 Install Products with joints and seams parallel to building lines to produce symmetrical tile patterns.

.2 Spread only enough adhesive to permit installation of Products before initial set.

.3 Set Products in place, press with heavy roller to attain full adhesion.

.4 Provide perimeter tile of similar size within any given area.

.5 Provide accent tiles, feature strips and inserts where indicated on Drawings.

.6 Lay flooring continuously from wall to wall in each area, including beneath casework.

.7 Where adjacent floor finish is dissimilar, terminate resilient tile flooring at centre line of door openings.

.8 Provide transition strip along junction of dissimilar flooring materials.

.9 Scribe flooring to walls, columns, floor outlets and other appurtenances to produce tight joints.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean, seal and wax installed Products.

3.5 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation with suitable and durable protective coverings, or by keeping traffic off floor, until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 09 65 13 - Resilient Base and Accessories.

.3 Section 09 65 19 - Resilient Tile Flooring.

1.2 REFERENCES

.1 ASTM F1869-16a: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.2 ASTM F2170-19a: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

.3 ASTM F3191-16: Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.

.4 CAN/CGSB-71.28-M88: Adhesive, for Direct Glue-Down Carpet Installation.

.5 CRI 104-2002: Standard for Installation Specification of Commercial Carpet.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating physical and performance characteristics; sizes, patterns, colours available, and method of installation.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate complete sets, 150 x 150 mm in size; illustrating colour and pattern selection for each specified carpet tile.

1.5 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.6 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Minimum 4 percent for each carpet tile flooring Product, colour and pattern; clearly marked to identify:
.1 Manufacturer's name,
.2 Product's name,
.3 Product colour and pattern.

.3 Package Products neatly in original containers, to prevent damage.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products in original packaging, with each package having its register number properly marked on each bale.

.3 Protect Products from damage, dirt, stains and moisture.

1.8 AMBIENT CONDITIONS

.1 Maintain ambient air temperature at 21 degrees C for 48 hours before, during and after installation.

.2 Maintain substrate temperature at 10 degrees C.

1.9 WARRANTY

.1 Submit extended warranties in accordance with General Conditions of the Contract.

.2 Installer's Extended Warranty: For a period of two years, covering against loose fitting, breaking or unraveling of seams or breaking away from sub-base, and failure of materials or workmanship which proves detrimental to the appearance or performance of the carpeting.

.3 Manufacturer's Extended Warranty: For a period of 10 years, covering against wear, colour fading and deterioration of backing materials.

2 Products

2.1 MATERIALS

.1 Carpet Tile (CPT-1): Combination of Bikepath Collection and On Line by InterfaceFLOR Commercial, or combination of Frenemy Stock & Stock Brights and Elemental Solids II by Mannington Commercial; 4 colours as selected by Consultant.

.2 Carpet Adhesive: To CAN/CGSB-71.28-M, solvent free, latex based waterproof adhesive; eg. Eco Tech 9600 by Chembond Ltd.

.3 Seam Adhesive: Latex seam sealer or thermoplastic adhesive.

.4 Subfloor Filler: Premixed latex cementitious type.

.5 Transition Strips: Resilient type, as specified in Section 09 65 13.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify concrete slabs have cured minimum 28 days.

.3 Verify concrete slabs have pH level between 5 and 11.

.4 Conduct moisture vapour emission rate tests on concrete slabs-on-fill to ASTM F1869. Do not proceed with installation until tests indicate MVER $\leq$ 2.27 kg per 100 sm for a 24 hour period.

.5 Conduct relative humidity tests on concrete slabs to ASTM F2170. Do not proceed with installation until tests indicate RH $\leq$ 75 percent.

.6 Determine absorptive nature of substrate by conducting porosity tests to ASTM F3191.

3.2 PREPARATION

.1 Prepare substrate as recommended by manufacturer for absorptive conditions determined by porosity test.

.2 Remove subfloor ridges and bumps.

.3 Fill low spots, cracks, joints, holes and other defects with subfloor filler.

3.3 INSTALLATION

.1 Install carpet tile to CRI 104 for Direct Glue-Down Installation Method.

.2 Lay carpet tile in manufacturer's recommended pattern.

.3 Verify carpet tile pattern match to ensure minimal variation between dye lots.

.4 Lay carpet tile with joints and seams parallel to building lines to produce symmetrical tile patterns. Provide perimeter tile of similar size within any given area.

.5 Lay carpet tile continuously from wall to wall in each area, including beneath casework.

.6 Cut and fit carpet tiles around interruptions.

.7 Fit carpet tiles tight to intersection with vertical surfaces without gaps.

.8 Where adjacent floor finish is dissimilar, terminate carpet tile flooring at centre line of door openings.

.9 Provide transition strip along junction of dissimilar flooring materials.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Remove dirt, carpet scraps, and threads from carpet surface.

.3 Clean carpet with a beater-type vacuum cleaner.

.4 Remove soiled spots or adhesive from carpet with a proper spot remover.

.5 Remove loose pieces of face yarn with sharp scissors.

3.5 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation with protective covering, until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 - Gypsum Board Assemblies.

.2 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM E84-22: Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating Product physical properties and performance data.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate 180 x 230 mm size samples, illustrating specified wall covering materials and trims.

1.5 CLOSEOUT SUBMITTALS

.1 Submit maintenance data as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.6 QUALIFICATIONS

.1 Applicator: A firm specializing in applying dry erase wall coverings, having minimum 3 years documented experience.

1.7 MOCK-UPS

.1 Construct mock-ups as specified in Section 01 40 00.

.2 Mock-up: A 1 525 x 1 525 mm size mock-up panel, demonstrating Product application to each required type of wall substrate.

.3 Accepted mock-up will be used as the standard for acceptance of the Work.

.4 Remove and replace installed Product that does not conform to accepted mock-up.

.5 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver and store Products in a clean and dry environment, with temperature maintained above 12 degrees C and relative humidity between 30 and 40 percent RH.

.3 Store Products flat, with roll ends protected from damage. Do not cross stock materials.

.4 Support Products off floor in a manner to prevent sagging, warping and creasing.

1.9 AMBIENT CONDITIONS

.1 Maintain both ambient air and substrate temperatures above 12 degrees C and relative humidity below 40 percent RH for a minimum of 72 hours prior to, during and 72 hours after installation.

.2 Allow wall covering to acclimatize to installation area for 24 hours before application.

.3 Maintain lighting level of 860 lx at substrate surface during installation.

1.10 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of 10 years, covering against Product failure as a result of manufacturing defect.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 WriteWALLS Dry Erase Wallcovering.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Surface Burning Characteristics (ASTM E84): Class A.

2.3 MATERIALS

.1 Dry Erase Wall Covering: Woven, fabric backed, pigmented vinyl laminated with a dry erase clear film; Smooth texture; 1 525 mm wide rolls; Type II weight; suitable as a writable and magnetic surface; W W MAG60-White by WriteWALLS Dry Erase Wallcovering.

.2 Adhesive: Heavy duty clay-based adhesive.

.3 Primer: White pigmented acrylic/latex base primer, specifically formulated for use with vinyl wallcoverings.

.4 Marker Tray: Extruded aluminum, box style; satin anodized finish.

.5 End Caps: Flat-faced plastic end caps for use with marker trays; W W PEC by WriteWALLS Dry Erase Wallcovering.

.6 Metal Trims: Extruded aluminum trims with clear satin anodized finish; types as follows:
.1 Snap-On Trim: W W SOT by WriteWALLS Dry Erase Wallcovering.
.2 J-Cap Trim: W W JCP-V and W W JCP-F by WriteWALLS Dry Erase Wallcovering.
.3 J-Trim: W W JTRIM by WriteWALLS Dry Erase Wallcovering.
.4 H-Trim: W W HTRIM by WriteWALLS Dry Erase Wallcovering.
.5 Inside & Outside Trim: W W IOTRIM by WriteWALLS Dry Erase Wallcovering.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify substrate is clean, dry, smooth, structurally sound and free from surface defects and imperfections.

.3 Verify substrate has been finished to GA-214, Level 5 as specified in Section 09 21 16.

.4 Verify substrate has a moisture content less than 5 percent.

.5 Evaluate painted surfaces for possibility of pigment bleed-through.

3.2 PREPARATION

.1 Prime substrate and allow to dry.

3.3 APPLICATION

.1 Apply wallcovering horizontally to wall substrate, straight and level, set in full-bed of adhesive applied at manufacturer's recommended rate.

.2 Install wall covering rolls in sequence, starting from highest to lowest number and in exact order as they were factory cut from bolt.

.3 Reverse hang alternate strips.

.4 Do not crease wallcovering material.

.5 Double cut seams.

.6 Locate horizontal seams outside of main writing area.

.7 Smooth wallcovering immediately after application, removing air bubbles, wrinkles, gaps and overlaps.

.8 Immediately remove excess adhesive from surfaces.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Leave completed application smooth, clean, without wrinkles, gaps, overlaps or air pockets.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 21 00 - Thermal Insulation.

.2 Section 09 21 16 - Gypsum Board Assemblies.

.3 Section 09 51 23 - Acoustical Tile Ceilings.

.4 Section 09 84 13.13 - Fixed Sound-Absorptive Cementitious Panels.

1.2 REFERENCES

.1 ASTM C423-17: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.2 ASTM E90-09(2016): Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.4 CAN/ULC-S114-2018: Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.5 CAN/ULC-S129-15 (REV1): Standard Method of Test for Smoulder Resistance of Insulation (Basket Method).

.6 CAN/ULC-S702.1-14 (R2019): Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

.7 ULC-S702.2-15: Standard for Mineral Fibre Thermal Insulation for Buildings, Part 2: Installation.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products away from construction activity and sources of ignition.

.3 Protect Products from damage during handling, installation and at point of installation.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers of acoustical insulation having Product considered acceptable for use:
.1 CertainTeed Canada, Inc.
.2 Knauf Insulation.
.3 Owens-Corning Canada Inc.
.4 Rockwool.

.2 Manufacturers of flame-resistant acoustical insulation having Product considered acceptable for use:
.1 Johns Manville.
.2 Owens-Corning Canada Inc.
.3 Rockwool.

.3 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Acoustical Insulation: To CAN/ULC-S702.1, Type 1; mineral fibre acoustical batts, non-rigid, friction fit type, manufactured from glass, rock, or slag fibers; and as follows:
.1 Noise Reduction Coefficient (ASTM C423): NRC $\geq$ 1.10 @ 100 mm thick.
.2 Facing: Unfaced.
.3 Density: $\geq$ 40 kg/m^3.
.4 Combustibility (CAN/ULC-S114): Noncombustible.
.5 Thickness: As indicated on Drawings.
.6 Manufacturer and Product Name: eg. QuietZone by Owens-Corning Canada Inc.

.2 Flame-Resistant Acoustical Insulation: To CAN/ULC-S702.1, Type 1; mineral fibre acoustical batts, non-rigid, friction fit type, manufactured from only rock or slag fibers; acceptable for use in fire-rated partitions; and as follows:
.1 Noise Reduction Coefficient (ASTM C423): NRC $\geq$ 1.10 @ 100 mm thick.
.2 Facing: Unfaced.
.3 Density: $\geq$ 40 kg/m^3.
.4 Combustibility (CAN/ULC-S114): Noncombustible.
.5 Surface Burning Characteristics (CAN/ULC-S102)
.1 Flame Spread Index = 0.
.2 Smoke Developed Index = 0.
.6 Smoulder Resistance (CAN/ULC-S129): 0.09 percent.
.7 Thickness: As indicated on Drawings.
.8 Manufacturer and Product Name: eg. Rockwool AFB by Rockwool.

.3 Mechanical Fasteners: Stainless steel screw type fastener, complete with 75 mm OD moulded plastic disc washer.

.4 Adhesive: Mastic type, synthetic rubber base, fungi resistant, gun or trowel application.

3 Execution

3.1 INSTALLATION

.1 Install Products to ULC-S702.2 and ASTM E90, without gaps and voids.

.2 Fit acoustic insulation tight within spaces, around cut openings, behind and around facility service components within or behind partitions, and tight to items passing through partitions.

3.2 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect acoustic insulation at the end of each Working Day.

.3 Protect acoustic insulation in areas where welding will be carried out.

.4 Replace acoustic insulation damaged by others.

.5 Protect acoustic insulation requiring a thermal barrier in accordance with authorities having jurisdiction.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 09 21 16 - Gypsum Board Assemblies.

.4 Section 09 51 23 - Acoustical Tile Ceilings.

.5 Section 09 81 00 - Acoustic Insulation.

.6 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM C645-18: Standard Specification for Nonstructural Steel Framing Members.

.2 ASTM D1779-98(2017): Standard Specification for Adhesive for Acoustical Materials.

.3 ASTM E84-22: Standard Test Method for Surface Burning Characteristics of Building Materials.

.4 ASTM E90-09(2016): Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.5 CISCA Ceiling Systems Handbook, 2012 Edition.

.6 ULC List of Equipment and Materials.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating materials, component sizes, methods of attachment and Product physical properties.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate 150 x 150 mm size samples, illustrating full range of exposed texture and conditions of panel edges and ends.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Ensure Products delivered to Place of the Work have maximum 12 percent moisture content.

.3 Store Products on raised platforms clear of ground, adequately protected from weather using waterproof coverings.

.4 Protect edges and surfaces from marring, soil and damage.

.5 Cover bottom of stacks with moisture-proof membrane, allowing adequate air circulation to prevent condensation.

.6 Protect Products from water damage.

1.6 AMBIENT CONDITIONS

.1 Do not install Product until building is enclosed and HVAC system is operational.

.2 Locate Products in area of the Work at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.

.3 Maintain the following environmental conditions for 24 hours before, during and after installation:
.1 Relative Humidity: Between 65 and 75 percent.
.2 Ambient Air Temperature: Between 13 degrees C and 21 degrees C.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Tectum Inc.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 PERFORMANCE CRITERIA

.1 Acoustic Cementitious Panels (ACP-1): Meeting the following performance criteria:
.1 Noise Reduction Coefficient (ASTM E90):
.1 Mounting Method A: NRC = 0.40.
.2 Mounting Method C-40: NRC = 0.85.
.2 Surface Burning Characteristics (ASTM E84):
.1 Flame Spread Index $\leq$ 5.
.2 Smoke Developed Index $\leq$ 5.

.2 Acoustic Cementitious Panels (ACP-2): Meeting the following performance criteria:
.1 Noise Reduction Coefficient (ASTM E90):
.1 Mounting Method A: NRC = 0.60.
.2 Mounting Method C-40: NRC = 1.00.
.2 Surface Burning Characteristics (ASTM E84):
.1 Flame Spread Index $\leq$ 5.
.2 Smoke Developed Index $\leq$ 5.

2.3 MATERIALS

.1 Acoustic Cementitious Panels (ACP-1): 25 mm thick panels composed of aspen wood fibre and magnesium oxysulfate hydraulic cement treated with an organic binder; panel sizes as indicated on Drawings; with bevelled long edges and square ends.

.2 Acoustic Cementitious Panels (ACP-2): 50 mm thick panels composed of aspen wood fibre and magnesium oxysulfate hydraulic cement treated with an organic binder; panel sizes as indicated on Drawings; with bevelled long edges and square ends.

.3 Mouldings: Purpose made plastic mouldings to profiles recommended by panel manufacturer for proposed installation.

.4 Furring Channels: To ASTM C645; 0.455 mm thick sheet steel; galvanized or galvalumed finish; 38 mm deep hat-shaped profile with 13 mm wide flange.

.5 Acoustic Insulation: As specified in Section 09 81 00.

.6 Screws: Self-drilling, self-tapping type, sufficient length to penetrate panel and minimum 13 mm into substrate; colour to match panel finish; as recommended by manufacturer.

.7 Adhesive: To ASTM D1779.

.8 Touch-up Paint: Natural.

2.4 FINISHES

.1 Cementitious Panels: Natural off-white finish, average light reflection 0.60.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Inspect surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and installation.

3.2 INSTALLATION

.1 Install Products straight, square, flat, level and plumb.

.2 Mounting Methods: Tectum Types A and C-40, where indicated on Drawings.

.3 Mounting Method Type A:
.1 Install acoustic cementitious panels directly to wall substrate using continuous beads of adhesive, applied at manufacturer's recommended rate.

.4 Mounting Method Type C-40:
.1 Install furring channels, secured horizontally to substrate at maximum 610 mm OC.
.2 Install 62 mm thick acoustic insulation between furring channels, securely adhered to substrate; as specified in Section 09 81 00.
.3 Install acoustic cementitious panels to furring channels with mechanical fasteners at manufacturer's recommended spacings; compressing acoustic insulation in place.

.5 Ensure screw heads are flush with panel surface.

.6 Cover field cut edges with trim or mouldings.

3.3 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean exposed surfaces of acoustic panels, trims and mouldings.

.3 Touch-up minor damage to finishes.

.4 Remove and replace damaged Products which cannot be successfully repaired to permanently eliminate evidence of damage.

3.4 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect completed installation from damage resulting from subsequent construction activity.

.3 Protect installation from inclement weather, excessive temperature and humidity conditions and dust.

END OF SECTION

1 General

1.1 PRODUCTS FURNISHED OR INSTALLED UNDER OTHER SECTIONS

.1 Carefully examine scope of the Work as indicated on Drawings, and include all finishing, whether specifically mentioned or not, except as specifically excluded below:
- .1 Section 05 12 00 - Structural Steel: Shop priming.
- .2 Section 05 30 00 - Steel Deck: Shop priming.
- .3 Section 05 50 00 - Metal Fabrications: Shop priming.
- .4 Section 06 40 00 - Architectural Woodwork: Shop finishing.
- .5 Section 07 62 00 - Sheet Metal Flashing and Trim: Shop finishing.
- .6 Section 07 84 00 - Firestopping: Integral colour.
- .7 Section 07 92 00 - Joint Sealants: Integral colour.
- .8 Section 08 12 13 - Hollow Metal Frames: Galvannealed coating.
- .9 Section 08 13 13 - Hollow Metal Doors: Galvannealed coating.
- .10 Section 08 31 00 - Access Doors and Panels: Shop priming.
- .11 Section 08 33 23 - Overhead Coiling Doors: Shop finishing.
- .12 Section 08 51 13 - Aluminum Windows: Anodized coating.
- .13 Section 08 62 26 - Flat Glass Unit Skylights: Shop finishing.
- .14 Section 08 71 00 - Door Hardware: Shop finishing.
- .15 Section 08 90 00 - Louvers and Vents: Anodized coatings and shop finishing.
- .16 Section 09 51 23 - Acoustical Tile Ceilings: Shop finishing.
- .17 Section 09 96 46 - Intumescent Painting.
- .18 Section 10 11 00 - Visual Display Surfaces: Shop finishing.
- .19 Section 10 14 00 - Signage: Shop finishing.
- .20 Section 10 22 26 - Operable Partitions: Shop finishing.
- .21 Section 10 28 13 - Toilet Accessories: Shop finishing.
- .22 Section 12 24 13.16 - Manual Roller Window Shades: Anodized coating.
- .23 Do not paint glass surfaces.
- .24 Do not paint plastic components.
- .25 Do not paint plated, polished or anodized metal components.
- .26 Do not paint stainless steel components.

1.2 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 04 00 00 - Masonry.

.3 Section 05 12 00 - Structural Steel.

.4 Section 05 30 00 - Steel Deck.

.5 Section 05 50 00 - Metal Fabrications.

.6 Section 06 10 00 - Rough Carpentry.

.7 Section 06 20 00 - Finish Carpentry.

.8 Section 08 12 13 - Hollow Metal Frames.

.9 Section 08 13 13 - Hollow Metal Doors.

.10 Section 08 31 00 - Access Doors and Panels.

.11 Section 09 21 16 - Gypsum Board Assemblies.

.12 Section 09 84 13.13 - Fixed Sound-Absorptive Cementitious Panels.

1.3 REFERENCES

.1 MPI Architectural Painting Specification Manual.

.2 MPI Maintenance Repainting Manual.

.3 SSPC Painting Manual, Volume 2 - Systems and Specifications.

1.4 SCHEDULING

.1 Schedule painting operations to prevent disruption to the Work.

.2 Schedule painting and coating operations in occupied facilities to prevent disruption of occupants at existing facility. Conduct painting and coating after facility's normal operating hours or on weekends in accordance with Owner's operating requirements.

.3 Schedule work such that finished surfaces have dried before occupants are affected.

.4 Schedule site finishing of doors and frames prior to door, glass and hardware installation.

.5 Obtain written authorization from Consultant for changes in work schedule.

1.5 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturers' standard data sheets for each finishing Product being used, indicating relevant MPI finish system, volatile organic compound (VOC) content and volume solids (VOL SOL) content.

1.6 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: A full range of colour selector samples for each type of coating required.

.3 Verification Samples: If requested by Consultant, prepare 1 000 x 1 000 mm size sample panels. Apply finish to actual substrate material or to an acceptable alternate material if required to be portable.

1.7 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Minimum 4 L of each Product, colour and sheen used.

.3 Supply extra stock materials in unopened, new containers, clearly labelled as to manufacturer, Product, colour and sheen.

1.8 QUALIFICATIONS

.1 Applicators: A firm specializing in commercial painting and finishing of buildings in accordance with MPI Architectural Painting Specification Manual and MPI Maintenance Repainting Manual, having minimum 10 years documented experience.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Deliver Products in original containers with unbroken seals and labelled to indicate name of manufacturer, brand, colour and quality of contents.

.3 Store thinners, loose soaked rags and similar combustible materials in closed containers. Remove from Place of the Work or store in an assigned area.

.4 Provide adequate safe-guards against spontaneous combustion of finishing materials.

.5 Arrange for properly enclosed and heated space, satisfactory to Consultant, to be used as paint shop. Store Products at minimum 10 degrees C.

1.10 AMBIENT CONDITIONS

.1 Conform to MPI Architectural Painting Specification Manual.

.2 Apply water-based paints only when temperature of surfaces to be finished and surrounding air temperatures are between 10 degrees C and 30 degrees C.

.3 Apply solvent-thinned paints only when temperature of surfaces to be finished and surrounding air temperatures are between 6 degrees C and 32 degrees C.

.4 Do not apply finishes in snow, rain, fog or mist.

.5 Do not apply finishes when relative humidity exceeds 85 percent RH; or at temperatures less than 2 degrees C above dew point; or to damp or wet surfaces.

2 Products

2.1 MANUFACTURERS

.1 Manufacturer: Use only Products from manufacturers listed in MPI Architectural Painting Specification Manual for specified paint and finish system.

.2 Single-Source Responsibility: Provide primers and undercoats from same manufacturer as finish coats.

2.2 DESCRIPTION

.1 Gloss Ratings: Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following gloss level categories, as defined in MPI Architectural Painting Specification Manual:
- .1 Gloss Level G1: Matte or Flat finish.
- .2 Gloss Level G2: Velvet finish.
- .3 Gloss Level G3: Eggshell finish.
- .4 Gloss Level G4: Satin finish.
- .5 Gloss Level G5: Semi-Gloss finish.
- .6 Gloss Level G6: Gloss finish.
- .7 Gloss Level G7: High-Gloss finish.

.2 Colours: A maximum of 5 exterior colours and 20 interior colours may be required. There may be more than two colours used in each room or space.

2.3 PERFORMANCE CRITERIA

.1 Volatile Organic Compound Content (VOC): Use only paints and coatings having volatile organic compound (VOC) content as follows:
- .1 Gloss Level G1: < 50 g/L.
- .2 Gloss Levels G2-G7: < 150 g/L.

.2 Volume Solids Content (VOL SOL): Use only paints and coatings having volume solids (VOL SOL) content as follows:
- .1 Alkyd Paints and Coatings: $\geq$ 45 percent.
- .2 Latex Paints and Coatings: $\geq$ 40 percent.

2.4 MATERIALS

.1 Paints and Coatings: Use only Products meeting specified performance criteria and listed in most current Approved Products List included in MPI Architectural Painting Specification Manual, for each specified paint and finish system.

.2 Paint Accessory Materials: Linseed oil, shellac, turpentine and other materials of commercial quality.

2.5 MIXING

.1 Pigments shall be fully ground and shall maintain a soft paste consistency in the vehicle during storage, that can and will be dispersed readily and uniformly by paddle to a complete, homogeneous mixture.

.2 Carefully mix and prepare paint materials according to manufacturer's directions.

.3 Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

.4 Stir material before application to produce a mixture of uniform density. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

.5 Use only thinners approved by paint manufacturer, and only within recommended limits.

.6 Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of same material are applied. Tint undercoats to match colour of finish coat, but with sufficient differences in shade of undercoats to distinguish each separate coat.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Measure moisture content of surfaces using an electronic moisture metre. Do not apply finishes unless moisture content of surfaces are below recommended maximum values.

3.2 PREPARATION

.1 Prepare surfaces to MPI Architectural Painting Specification Manual.

.2 Prepare existing surfaces designated to be re-finished to MPI Maintenance Repainting Manual.

.3 Mask out surrounding surfaces not to receive paint, to protect from overspray or overbrushing.

.4 Remove hardware and accessories, plates, machined surfaces, lighting fixtures and similar items already installed but not intended to be painted.

.5 Remove mildew, efflorescence and foreign materials from surfaces using appropriate methods.

.6 Correct minor defects and deficiencies in surfaces which affect application of paints and coatings.

.7 Clean and prepare surfaces to be painted according to manufacturers' instructions for each particular substrate condition and finish system.

.8 Provide barrier coats over incompatible primers.

.9 Clean ungalvanized ferrous metal surfaces designated to receive site finish. Use solvent or mechanical cleaning methods to SSPC Painting Manual, Volume 2 - Systems and Specifications.

.10 Clean galvanized surfaces with non-petroleum-based solvents. Surface to be free of oil and surface contaminants. Remove pretreatment from galvanized steel metal fabricated from coil stock by mechanical methods.

3.3 APPLICATION

.1 Apply Products to MPI Architectural Painting Specification Manual.

.2 Protect adjacent surfaces and areas, including equipment, labels and signage from damage during painting operations. Use drop cloths, shields, masking, templates or other suitable protective means.

.3 Make Good damage caused by failure to protect surfaces.

.4 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work areas as required.

.5 Use methods best suited for substrate and type of material being applied.

.6 Do not use compressed air or aerosol methods of application without prior written approval of Consultant.

.7 Spread finishes evenly and flow on smoothly without runs or sags.

.8 Apply Products no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of entire system as recommended by manufacturer.

.9 Apply Products under adequate illumination.

.10 Sand lightly between coats to achieve required finish.

.11 Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.

.12 Back prime interior wood work with enamel primer sealer paint.

.13 Back prime exterior wood work with exterior primer paint.

.14 Pigmented (Opaque) Finishes: Completely cover substrate to a smooth, opaque surface of uniform finish, colour, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be accepted.

.15 Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, colour irregularity, runs, brush marks, orange peel, nail holes or other surface imperfections.

.16 Match approved samples for colour, texture and coverage. Remove, refinish or repaint work not complying with specified requirements.

3.4 FACILITY SERVICES

.1 Unless otherwise specified or noted, paint "unfinished" conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and texture to match adjacent surfaces, in the following areas:
  .1 Where exposed-to-view in exterior and interior areas.
  .2 In high humidity interior areas.
  .3 In mechanical and electrical rooms.

.2 Remove finished louvres, grilles, covers, and access panels on facility service components from location and paint separately. Finish paint primed equipment to colour selected by Consultant.

.3 Paint inside of air ducts, convection and baseboard heating cabinets where visible behind louvers, grilles and diffusers for minimum 460 mm or beyond sight line, whichever is greater with primer and one coat of matt black (non-reflecting) paint.

.4 Paint inside of light valances gloss white.

.5 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.6 Paint red or band fire protection piping and sprinkler lines. Keep sprinkler heads free of paint.

.7 Paint yellow or band natural gas piping.

.8 Backprime and paint face and edges of plywood service panels a semi-gloss, gray colour before installation of telephone and electrical equipment. Leave equipment in original finish except for touch-up as required. Paint conduits, mounting accessories and other unfinished items.

.9 Paint exterior steel electrical light standards.

.10 Do not paint outdoor transformers and substation equipment.

.11 Colour code equipment, piping, conduit and exposed ductwork in accordance with colour schedule. Colour band and identify with flow arrows, names and numbering.

.12 In unfinished areas, leave exposed conduits, piping, hangers, ductwork and other facility service components in original finish. Touch-up scratches and marks.

.13 Touch-up scratches and marks on factory painted finishes and equipment with paint as supplied by equipment manufacturer.

.14 Do not paint over nameplates.

3.5 FIELD QUALITY CONTROL

.1 Inspect surfaces, preparation and paint applications.

.2 Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent:
- .1 Brush or roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in painted coatings.
- .2 Evidence of poor coverage at fastener heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
- .3 Damage due to touching before paint is sufficiently dry or other contributory cause.
- .4 Damage due to application on moist surfaces or caused by inadequate protection from weather.
- .5 Damage or contamination of paint due to blown contaminants (dust, spray paint, etc).

.3 Painted surfaces will be rejected if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:
- .1 Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 1 000 mm.
- .2 Visible defects are evident on horizontal surfaces when viewed at normal veiwing angles from distance of not less than 1 000 mm.
- .3 Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.

.4 When final coat on any surface exhibits a lack of uniformity of colour, sheen, texture and hiding across full surface area.

.4 Make Good rejected surfaces. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags or damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.6 ADJUSTING

.1 Following completion of painting and finishing operations, reinstall removed items.

.2 Remove protective covers and masking from protected surfaces.

.3 Repaint damaged surfaces to satisfaction of Consultant.

3.7 CLEANING

.1 Refer to Section 01 74 00.

.2 Remove paint where spilled, splashed, splattered or sprayed using means and materials that are not detrimental to affected surfaces.

.3 Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.

.4 Remove combustible rubbish materials and empty paint cans each day and safely dispose of in accordance with authorities having jurisdiction.

.5 Clean equipment and dispose of wash water / solvents as well as other cleaning and protective materials, paints, thinners, paint removers and strippers in accordance with authorities having jurisdiction.

.6 Leave the Work clean and free from dirt and debris.

3.8 WASTE MANAGEMENT

.1 Paint, stain, wood preservative finishes and related materials (thinner, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from authorities having jurisdiction.

.2 Separate and recycle waste materials. Where paint recycling is available, collect waste paint by type and deliver to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.4 To reduce the amount of contaminants entering waterways, sanitary sewers, storm sewers or into the ground strictly adhere to the following procedures:
.1 Retain cleaning water for water-based materials to allow sediments to be filtered out. Do not clean equipment using free draining water.
.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal or appropriate cleaning and laundering.
.4 Dispose of contaminants in an approved legal manner in accordance with applicable regulatory requirements dealing with hazardous waste.
.5 Empty paint cans are to be dry prior to disposal or recycling.
.6 Close and tightly seal partly used cans of materials, including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

.5 Set aside and protect surplus and uncontaminated finish materials not required by Owner and deliver or arrange collection of verifiable re-use or re-manufacturing.

3.9 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect other surfaces from paint or damage.

.3 Repair damage.

3.10 FINISH SCHEDULE

.1 Provide indicated paint and finish systems for identified substrates to MPI Architectural Painting Specification Manual.

.2 Refinishing Existing, Previously Finished Surfaces:
- .1 Refer to MPI Maintenance Repainting Manual Section for refinishing existing finishes.
- .2 Use finish coat of respective new surface finish system for minor repair of existing finishes.
- .3 Use system primer where existing finishes are damaged down to bare surface.

.3 Exterior Painting and Finishing Schedule
- .1 Concrete Vertical Surfaces
  - .1 Opaque Painted Finish: EXT. 3.1C - W.B. LIGHT INDUSTRIAL COATING (over w.b. alkali resistant primer), Premium Grade; Gloss Level G3.
- .2 Structural Steel
  - .1 Corrosion-Resistant Opaque Painted Finish: EXT. 5.1B - W.B. LIGHT INDUSTRIAL COATING (over inorganic zinc), Premium Grade; Gloss Level G5.
- .3 Metal Fabrications
  - .1 Opaque Painted Finish: EXT. 5.1D - ALKYD (over alkyd metal primer), Premium Grade; Gloss Level G5.
- .4 Galvanized and Galvannealed Metal
  - .1 Opaque Painted Finish: EXT. 5.3B - ALKYD (over cementitious primer), Premium Grade; Gloss Level G6.
- .5 Dressed Lumber and Panels
  - .1 Opaque Painted Finish: EXT. 6.3A - LATEX (over alkyd/oil primer), Premium Grade; Gloss Level G5.
  - .2 Semi-Transparent Stained Finish: EXT. 6.3E - VARNISH, S.B. (over s.b. stain), Premium Grade; Gloss Level G5.
  - .3 Opaque Stained Finish: EXT. 6.3K - SOLID COLOR STAIN, W.B. (over alkyd/oil primer), Premium Grade; Gloss Level G1.

.4 Interior Painting and Finishing Schedule
- .1 Concrete Surfaces (except floors)
  - .1 Epoxy Finish: INT. 3.1G - EPOXY-MODIFIED LATEX (for smooth concrete), Premium Grade; Gloss Level G6.
  - .2 Opaque Painted Finish: INT. 3.1M - INSTITUTIONAL LOW ODOR / VOC, Premium Grade; Gloss Level G4.
- .2 Concrete Floors
  - .1 Epoxy Finish: INT. 3.2C - EPOXY, Premium Grade; Gloss Level G5.
- .3 Sound-Absorptive Cementitious Panels
  - .1 Opaque Painted Finish: INT. 3.3G - INSTITUTIONAL LOW ODOR / VOC, Premium Grade; Gloss Level G3.
- .4 Concrete Masonry Units
  - .1 Opaque Painted Finish: INT. 4.2E - INSTITUTIONAL LOW ODOR / VOC (over latex block filler), Premium Grade; Gloss Level G4.
  - .2 Epoxy Finish: INT. 4.2J - EPOXY-MODIFIED LATEX (over latex block filler) FOR DRY ENVIRONMENTS, Premium Grade; Gloss Level G6.

.5 Structural Steel, Steel Joists, Steel Deck and Metal Fabrications
  .1 Opaque Painted Finish - Overhead Applications: INT. 5.1C - W.B. DRY FALL (over q. d. alkyd primer), Budget Grade; Gloss Level G5.
  .2 Opaque Painted Finish: INT. 5.1E - ALKYD (over q.d. alkyd primer), Premium Grade; Gloss Level G5.
  .3 Epoxy Finish: INT. 5.1K - EPOXY-MODIFIED LATEX (over w.b. rust-inhibitive primer), Premium Grade; Gloss Level G6.
.6 Galvanized and Galvannealed Metal
  .1 Opaque Painted Finish: INT. 5.3N - INSTITUTIONAL LOW ODOR / VOC (over w. b. galvanized primer), Premium Grade; Gloss Level G5.
.7 Dimension Lumber and Panels
  .1 Semi-Transparent Stained Fire Retardant Finish: INT. 6.2FF - FIRE RETARDANT, PIGMENTED, W.B., Premium Grade; Gloss Level G4.
  .2 Semi-Transparent Stained Finish: INT. 6.2J - POLYURETHANE VARNISH (over s.b. stain), Premium Grade; Gloss Level G4.
  .3 Opaque Painted Finish: INT. 6.2L - INSTITUTIONAL LOW ODOR / VOC (over latex primer), Premium Grade; Gloss Level G5.
.8 Dressed Lumber, Panels and Veneers
  .1 Semi-Transparent Stained Finish: INT. 6.3EE - POLYURETHANE VARNISH (over w.b. stain), Premium Grade; Gloss Level G4.
  .2 Semi-Transparent Stained Fire Retardant Finish: INT. 6.3RR - FIRE RETARDANT, PIGMENTED, W.B., Gloss Level G4.
  .3 Opaque Painted Finish: INT. 6.3V - INSTITUTIONAL LOW ODOR / VOC (over latex primer), Premium Grade; Gloss Level G5.
.9 Gypsum Board
  .1 Epoxy Finish: INT. 9.2F - EPOXY-MODIFIED LATEX (over latex primer/sealer), Premium Grade; Gloss Level G6.
  .2 Opaque Painted Finish: INT. 9.2M - INSTITUTIONAL LOW ODOR / VOC (over latex primer/sealer), Premium Grade; Gloss Levels as follows:
    .1 Ceiling Applications: G1.
    .2 Other Applications: G3.

.5 Specialty Painting Systems
  .1 Pro Cyc Cyclorama Trim and Green Screen Surfaces: FLUORESCENT FINISH; as follows:
    .1 Primer: Pro Cyc Grey Bonding Primer; one coat,
    .2 Green Screen Finish: Pro Cyc Virtual Green Chroma Key Green Screen Paint, Gloss Level G1; two coats.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 ASTM E2924-14(2020): Standard Practice for Intumescent Coatings.

.2 SSPC-PA 2-2015: Procedure for Determining Conformance to Dry Coating Thickness Requirements.

.3 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, including information on physical properties, installation instructions and general requirements for each specified intumescent material.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: 300 x 300 mm size sample of each type of intumescent coating, applied to a rigid backing, in colour and finish indicated.

1.5 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines, including procedures for stain removal, repairing surface, and general cleaning; sufficient quantity for inclusion in operation and maintenance manuals.

1.6 QUALIFICATIONS

.1 Applicator: A firm experienced in applying intumescent coatings, having minimum 10 years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Store Products in a dry, enclosed area protected from exposure to moisture.

.3 Maintain temperatures between 16 degrees C and 32 degrees C.

1.8 AMBIENT CONDITIONS

.1 Refer to Section 01 60 00.

.2 Do not install coating when ambient temperature is below 4 degrees C or above 43 degrees C.

.3 Maintain this temperature range 7 days before, during, and 48 hours after coating application.

.4 Ensure adequate ventilation is maintained during and after coating application. Comply with WHMIS requirements and manufacturer's instructions.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Products considered acceptable for use:
.1 3M Company Canada.
.2 AD Fire Protection Systems Inc.
.3 Carboline Company.
.4 Isolatek International.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Intumescent Coating: Multi-component seamless intumescent coating system, consisting of a primer, intermediate, finish and tinted top coats, applied to sufficient thicknesses to achieve required fire resistance ratings and W/D factors.

2.3 REGULATORY REQUIREMENTS

.1 Conform to applicable regulatory requirements for surface burning characteristics when tested to CAN/ULC-S102.

2.4 MATERIALS

.1 Ferrous Metal Primer: Two-component, high solids, low-VOC, corrosion-resistant epoxy; eg. Carboguard 880 by Carboline; Gray colour.

.2 Galvanized Metal Primer: Two-component polymeric epoxy amine, 99 percent solids by volume; eg. Rustbond by Carboline; Translucent Green colour.

.3 Intermediate Coat - Exterior Applications: Single-component intumescent, 67 percent solids by volume; eg. Nullifire S605 by Carboline, Pale Green colour.

.4 Intermediate Coat - Interior Applications: Single-component intumescent, 67 percent solids by volume; eg. Nullifire S606 by Carboline, Pale Pink colour.

.5 Finish Coat: Two-component polyamido-amine epoxy, 98 percent solids by volume; eg. Carboguard 1340 by Carboline; Clear Amber colour, Gloss finish.

.6 Tinted Top Coat: Two-component urethane, Semi-Gloss finish, colours as selected by Consultant; eg. Carbothane 133 VOC by Carboline.

2.5 MIXING

.1 Thoroughly mix ingredients in proper quantities needed for immediate use.

.2 Provide uniformity of mix and colouration.

.3 Discard mixed material 45 minutes after initial mixing at an air temperature of 25 degrees C.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify ferrous metal surfaces have been prepared using SSPC SP-6, Commercial Blast Cleaning method.

3.2 PREPARATION

.1 Clean substrate surface free of foreign matter.

.2 Spray apply ferrous metal primer to 0.02 mm dry film thickness.

.3 Spray apply galvanized metal primer to 0.05 mm dry film thickness.

.4 Allow primer to cure.

3.3 APPLICATION

.1 Apply intumescent coatings to ASTM E2924 and SSPC Steel Structures Painting Manual, Volume 2.

.2 Spray apply intermediate coating to primed substrate in multiple coats, to a dry film thickness sufficient to achieve required fire resistance rating and W/D factor of steel member being protected. Refer to UL Directory under relevant UL design. Allow each coat to cure prior to applying subsequent coats.

.3 Spray apply finish coating over cured intermediate coating to 0.05 mm dry film thickness.

.4 Apply tinted top coating over cured finish coating, applied to 0.125 mm dry film thickness.

.5 Terminate in straight lines, at masking tape line.

.6 Thoroughly air cure applied Products.

.7 Prevent contamination during application and prior to completion of curing process. Close area of application for minimum 24 hours after application.

.8 Ensure cured intumescent coatings have a smooth, flat and even surface, without visually noticeable runs, sags, waves and other imperfections.

3.4 FIELD QUALITY CONTROL

.1 Arrange for manufacturer's representative to be present at start of installation.

.2 Field inspection will be performed by an independent inspector, as specified in Section 01 40 00.

.3 Verify dry film thicknesses with positector or similar dry film thickness testing device to SSPC-PA 2.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Remove temporary protective coverings and clean intumescent coatings prior to final inspection.

3.6 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect intumescent coatings from damage and wear during construction with temporary protective coverings.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 06 20 00 - Finish Carpentry.

.3 Section 06 40 00 - Architectural Woodwork.

.4 Section 09 21 16 - Gypsum Board Assemblies.

.5 Section 10 22 26 - Operable Partitions.

1.2 REFERENCES

.1 AAMA 611-14: Voluntary Specification for Anodized Architectural Aluminum.

.2 ANSI A208.1-2009: Particleboard.

.3 ASTM A424/A424M-18: Standard Specification for Steel, Sheet, for Porcelain Enameling.

.4 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.5 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.6 PEI 1002: Manual and Performance Specifications for Porcelain Enamel Writing Surfaces.

.7 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.8 CAN/ULC-S706.1-2020: Standard for Wood Fibre Insulating Boards for Buildings.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating materials, layouts, component dimensions and thicknesses, details of connections and fastening, trim and hardware, and shop-applied finishes.

1.4 CLOSE-OUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

.3 Additionally, apply removable maintenance instruction labels to each markerboard.

1.5 MOCK-UPS

.1 Construct mock-ups as specified in Section 01 40 00.

.2 Mock-Up Panel: A 1 000 x 1 000 mm size mock-up panel; comprised of one markerboard and tackboard; demonstrating quality of each material, trim pieces and method of joining adjacent panels.

.3 Accepted mock-ups will be used as the standard for acceptance of the Work.

.4 Remove and replace installed Product that does not conform to accepted mock-up.

.5 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.6 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Manufacturer's Extended Warranty: Warrant markerboards for a period of 10 years against defects other than those due to normal usage and wear, including fading, crazing, chipping, peeling and surface becoming slick, glassy or otherwise unsuitable for use.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
- .1 ASI Visual Display Products, Inc.
- .2 Claridge.
- .3 Delta Products, Ltd.
- .4 Global School Products Inc.
- .5 Martack Specialties Ltd.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Use only matching components from a single manufacturer's series of Products.

2.3 REGULATORY REQUIREMENTS

.1 Test Products for surface burning characteristics to CAN/ULC-S102.

2.4 MATERIALS

.1 Extruded Aluminum: To ASTM B221M, 6063 alloy, T5 temper.

.2 Porcelain Enameled Sheet Steel: To ASTM A424/A424M, Type I, Commercial Steel.

.3 Sheet Steel: To ASTM A653/A653M, Commercial Steel (CS), Types A, B, and C; galvannealed.

.4 Cork: Natural cork, Tan colour.

.5 Fibreboard: To CAN/ULC-S706.1, Type I; impregnated, sound absorbing type.

.6 Particleboard: To ANSI A208.1, Grade M-2.

2.5 MANUFACTURED UNITS

.1 Markerboard: Sandwich type construction, as follows:
- .1 Face Panel: 0.76 mm thick porcelain enameled sheet steel; writable and washable surface, acid-resistant; White colour.
- .2 Core: 11 mm thick fibreboard.
- .3 Back-up Balancing Sheet: 0.4 mm thick sheet steel.

.2 Tackboard: 13 mm thick; factory laminated; as follows:
- .1 Tackable Surface: 6 mm thick cork.
- .2 Back-up Panel: 6 mm thick particleboard.

.3 Aluminum Trim: 1.5 mm thick extruded aluminum profiles; eg. Series 9300 by ASI Visual Display Products, Inc., comprised of:
.1 Perimeter and divider trim,
.2 Map rail, with integral tan cork insert, end stops and two combination roller map hooks for every 1 830 mm of map rail,
.3 Concealed mechanical joining system, including 25 mm wide integrally slotted PVC inserts laminated into ends of panels, and 2.0 mm thick galvanized steel splines.
.4 Marker tray, with contour fitting end castings; flat type.

2.6 FABRICATION

.1 Chalkboards and Markerboards: Factory laminate core to face panel and back-up balancing sheet under heat and pressure.
.1 Provide permanent music score lines to one markerboard in each Music Room.

.2 Tackboards: Factory laminate tackable surface to back-up panel under mechanical pressure, using waterproof adhesive.

2.7 FINISHES

.1 Anodized Coating on Extruded Aluminum: To AAMA 611, AA-A41 Clear etched and anodized satin finish, free from extruding draw marks and surface scratches.

.2 Porcelain Enamel Coating on Sheet Steel: To PEI 1002; with gloss factor between 6 - 8 when measured with 45 degree glossometer.

.3 Galvannealed Coating on Sheet Steel: To ASTM A653/A653M, Grade ZF120; wiped zinc-iron alloy coating, with streak-free matte grey appearance.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Verify millwork units designated to incorporate visual display surfaces are installed.

3.2 INSTALLATION

.1 Install components to ensure a rigid, straight, square and plumb installation with horizontal lines level.

.2 Securely attach aluminum trims, ensuring fastenings are concealed.

.3 Adhere tackboards to wall surface with approved adhesive in egg-size blobs at approximately 200 mm OC. Press tackboards firmly into adhesive, ensuring proper adhesion.

.4 Join markerboards together using concealed mechanical joining system to ensure a flush butted joint, with hairline appearance.

3.3 ADJUSTING

.1 Leave visual display boards in a state suitable for immediate use by Owner.

3.4 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean down, remove dirt and leave elements in first class condition.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 08 13 13 - Hollow Metal Doors.

.3 Section 09 21 16 - Gypsum Board Assemblies.

1.2 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating materials, dimensions, thicknesses, design style, fonts and font sizes, finishes, methods of attachment and special details.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: One full size sample of each sign type, illustrating size, thickness, method of attachment, font style and size, and finishes.

1.4 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Maintenance Data: Manufacturer's standard care, maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.5 QUALIFICATIONS

.1 Manufacturer: A firm specializing in manufacturing building signage, having minimum 5 years documented experience.

2 Products

2.1 DESCRIPTION

.1 Stairwell Signage: To applicable regulatory requirements.

.2 Braille: Raised bead type, to AODA requirements.

2.2 MANUFACTURED UNITS

.1 Text Door Sign Plates: Surface engraved type; 2.0 mm thick dual-layered acrylic with 30 degree bevelled edges; as follows:
.1 Length: As required to fit text, minimum 300 mm;
.2 Height: 57.2 mm high;
.3 Text: 25 mm high Helvetica upper and lower case letters;
.4 Fastening: Pre-drilled 5 mm OD holes to accommodate countersunk fasteners, centered along left and right edges;
.5 Colours: As selected by Consultant from manufacturer's complete colour selection;
.6 Text: As determined by Owner.

.2 Pictogram Door Sign Plates: 3.2 mm thick plexiglass, square edged, hot stamped or silk screened image on rear face, 150 mm high; pre-drilled 5 mm OD holes to accommodate countersunk fasteners, centered along left and right edges; sizes, colours, sizes, and graphic symbols as selected by Consultant.

2.3 ACCESSORIES

.1 Fasteners: Countersunk screw-type with tamperproof heads, complete with plastic wall plugs when required for securement to wall surfaces; suitable sizes for intended application. Do not use through-fastening types.

.2 Adhesive: As recommended by sign manufacturer.

2.4 FABRICATION

.1 Fabricate sign plates with letters and numbers centered within sign plate's length and height.

.2 Provide countersunk holes for screw fasteners.

3 Execution

3.1 INSTALLATION

.1 Install signs straight, plumb and level.

.2 Secure signs secured in a manner to prevent distortion or displacement.

.3 Finished work shall be free of defects, warping, open seams and rattles.

.4 Provide double-sided foam tape adhesive on rear face of sign plates prior to securing with mechanical fasteners.

.5 Provide routing or mortising for items required to be mortised, rebated or otherwise housed within material.

.6 Replace Products that are bent, scratched or damaged.

.7 Provide fasteners to full required complement, properly tightened.

.8 Exposed fasteners shall be neatly executed and shall match adjacent surfaces.

.9 Install braille signage adjacent to sign plates.

.10 Do not fasten signage through acoustically-rated or fire-rated doors.

3.2 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect installed Products with temporary removable film until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 05 50 00 - Metal Fabrications.

.3 Section 09 21 16 - Gypsum Board Assemblies.

.4 Section 10 28 13 - Toilet Accessories.

1.2 REFERENCES

.1 AAMA 2605-17a: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).

.2 ANSI A208.1-2009: Particleboard.

.3 ASTM A240/A240M-22b: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.4 ASTM A276/A276M-17: Standard Specification for Stainless Steel Bars and Shapes.

.5 ASTM A653/A653M-22: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.6 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.7 ASTM B456-11e1: Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating typical panel construction, hardware, and accessories.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating compartment layouts and dimensions, internal reinforcement, component sizes, support details, and door swings.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 ASI Group Global.
.2 Hadrian Manufacturing Inc.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Toilet Compartments: Prefinished sheet steel construction, smooth texture; floor-mounted, headrail-braced design.

2.3 MATERIALS

.1 Steel Sheet: To ASTM A653/A653M, galvannealed coating; sizes and thicknesses as specified below.

.2 Stainless Steel Sheet and Plate: To ASTM A240/A240M, Type 304; sizes and thicknesses as specified below.

.3 Stainless Steel Bar and Shapes: To ASTM A276/A276M, Type 304; sizes and thicknesses as specified below.

.4 Chrome-Plated Steel Sheet: To ASTM B456; sizes and thicknesses as specified below.

.5 Extruded Aluminum: To ASTM B221M, 6063-T5 alloy; sizes and thicknesses as specified below.

.6 Particleboard: To ANSI A208.1, Grade M-3; sizes and thicknesses as specified below.

.7 Fasteners: Stainless steel; tamper-resistant; complete with plastic anchors.

2.4 COMPONENTS

.1 Doors - Regular Stalls: 25 mm thick, 610 mm wide, 1 473 mm high; comprised of 0.76 mm thick steel sheet faces, with honeycomb core and internal reinforcement.

.2 Doors - Barrier Free Stalls: 25 mm thick, 860 mm wide, 1 473 mm high; comprised of 0.76 mm thick steel sheet faces, with honeycomb core and internal reinforcement.

.3 Panels: 25 mm thick, 1 473 mm high, width to suit application; comprised of 0.76 mm thick steel sheet faces, with honeycomb core and internal reinforcement.

.4 Pilasters: 32 mm thick, height and width to suit application; comprised of 0.9 mm thick steel sheet faces, with honeycomb core and internal reinforcement.

.5 Head Rails: Hollow, 32 x 62 mm size aluminum tubing, with anti-grip strips and cast socket wall brackets.

.6 Floor Mounting Bar: 6 x 25 mm stainless steel mounting bar.

.7 Pilaster Shoes: 125 mm high, formed stainless steel.

.8 Splash Plates: 760 mm wide, 1 070 mm high; 1.2 mm thick stainless steel sheet; rounded corners; for screw fastener application.

.9 Hinges: Chrome-plated non-ferrous cast pivot hinges, gravity type, adjustable for door close positioning; complete with nylon bearings.

.10 Privacy Astragals: Chrome-plated non-ferrous privacy astragal.

.11 Latch: Chrome-plated non-ferrous slide bolt with combination door stop and keeper with rubber bumper.

.12 Door Pull: Chrome-plated cast zinc alloy handle; through-door fastening.

.13 Panel and Pilaster Brackets: 3.0 mm thick heavy-duty extruded aluminum stirrup brackets, 50 mm long; pre-drilled; brightened and polished finish.

.14 Headrail Brackets: Die cast aluminum alloy brackets, pre-drilled.

.15 Door Bumper: Chrome plated non-ferrous casting with rubber shock absorbing bumper insert.

2.5 FABRICATION

.1 Bond cores and reinforcements to sheet steel faces under pressure using waterproof adhesive.

.2 Fabricate doors with a 100 x 1 450 mm solid particle board reinforcement down the full length on the hinge side, and a 75 x 860 mm solid piece of structural honeycomb next to particle board.

.3 Provide a 152 x 152 mm solid piece of particle board reinforcement in doors located where the latch is to be positioned.

.4 Fill doors, dividing panels and pilasters with honeycomb core.

.5 Miter and weld overlapping steel edges.

.6 Provide headrail fitted snugly over top of each pilaster, and secured to pilasters and wall using recommended fittings.

.7 Fabricate barrier-free stall doors to swing out.

2.6 FINISHES

.1 Galvannealed Coating on Sheet Steel: To ASTM A653/A653M, Grade ZF001; zinc-iron coating with streak-free matte grey appearance.

.2 Powder Coated Finish on Sheet Steel: To AAMA 2605; electrostatically spray-applied polymer powder, factory-applied to minimum 0.05 mm dry film thickness; colour as selected by Consultant.

.3 Stainless Steel: To AISI No. 4 - Brushed.

.4 Chrome/Nickel Plating on Metal Components: To ASTM B456, Type SC 2; electrodeposited nickel plus chromium coating; Polished.

3 Execution

3.1 INSTALLATION

.1 Install partitions secure, straight, plumb, square and level.

.2 Attached panel brackets securely to walls using anchor devices.

.3 Install splash panels on partitions adjacent to urinals. Fasten with stainless steel screws spaced 20 mm OC.

.4 Anchor urinal screen panels to walls with two panel brackets and vertical upright consisting of pilaster rigidly anchored to floor and ceiling.

.5 Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

.6 Equip each door with two hinges, privacy astragals, one door latch, and one door bumper.

.7 Equip out-swinging doors with two door pulls, mounted one on each side.

3.2 ADJUSTING

.1 Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 5 mm.

.2 Field touch-up of scratches or damaged enamel finish will not be permitted.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 12 00 - Structural Steel.

.2 Section 05 50 00 - Metal Fabrications.

.3 Section 06 10 00 - Rough Carpentry.

.4 Section 09 51 23 - Acoustical Tile Ceilings.

.5 Section 10 11 00 - Visual Display Boards.

1.2 REFERENCES

.1 ASTM E84-22: Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 ASTM E90-09(2016): Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 ASTM E557-12(2020): Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.

.4 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating partition operation, hardware and accessories, electric operating components, track switching components, colours and finishes available.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating opening sizes, track layout, details of track and required supports, track switches, track loads, stacking sizes, adjacent construction and finish trim.

1.5 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate 300 x 300 mm size samples, illustrating surface finish, quality, colour, texture and weight.

1.6 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: Manufacturer's standard 5 year extended warranty, covering against manufacturing defects.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Corflex Inc.
.2 Moderco, Inc.
.3 Modernfold.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 REGULATORY REQUIREMENTS

.1 Conform to applicable regulatory requirements for combustibility and surface burning characteristics.

2.3 PERFORMANCE CRITERIA

.1 Sound Transmission Coefficient (ASTM E90): STC $\geq$ 52.

.2 Surface Burning Characteristics of Vinyl Fabric (ASTM E84 and CAN/ULC-S102): Class A, as follows:
.1 Flame Spread Index $\leq$ 25.
.2 Fuel Contributed Index $\leq$ 35.
.3 Smoke Developed Index $\leq$ 50.

.3 Install partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

2.4 MATERIALS

.1 Tackboard Surfacing: As specified in Section 10 11 00.

.2 Markerboard Surfacing: As specified in Section 10 11 00.

.3 Vinyl Fabric: To CCC-W-408A, Type II, Heavy Duty; 680 g/m^2 weight; complete with mildew resistant polyvinyl fluoride finish for washability and flame retardation; colour as selected by Consultant.

2.5 MANUFACTURED UNITS

.1 Operable Partition:
.1 Operation: Manual, stacking configuration as indicated on Drawings, with expandable closure panel.
.2 Panel Configuration: $\geq$ 76 mm thick, single panels, top supported, steel construction with steel facers welded to panel frame, automatic sound seals providing handless operation.
.3 Panel Width: $\leq$ 1 220 mm.
.4 Panel Faces: Full height markerboards and tackboards, factory-applied to both panel faces, configuration as indicated on Drawings.
.5 Hinges: Full-leaf butt hinges attached directly to panel frame and supported by anchor plates contained within panel frame.
.6 Track: 4.6 mm thick roll-formed steel; eg. #14 Suspension System by Modernfold.
.7 Trolleys: Four wheels, steel with self-lubricating bearings; two sets per panel.
.8 Ceiling Trim: Metal ceiling closure, with baked enamel finish, White colour.
.9 Acoustic Seals: Steel, with baked enamel finish, vertical tongue and groove joints with vinyl acoustical contacts; mechanically-retractable top and bottom seals with 6 mm vinyl strips; bottom seals capable of fixing panels in position without use of handles.
.10 Product and Manufacturer Name: eg. Acousti-Seal Legacy Single Panel System by Modernfold.

3 Execution

3.1 EXAMINATION

.1 Refer to Section 01 71 00.

.2 Confirm track supports are laterally braced and will permit track to be level within 6 mm of required position and parallel to floor surface.

.3 Confirm floor flatness of 3 mm per 3 000 mm, non-cumulative.

3.2 PREPARATION

.1 Prepare opening to ASTM E557.

3.3 INSTALLATION

.1 Install Products to ASTM E557.

.2 Fit and align partition assembly level and plumb.

.3 Provide lateral restraint to secure partition panels to floor when in closed position. Partition can not move as a result of lateral impacts or applied forces.

3.4 ADJUSTING

.1 Adjust partition assembly to ensure smooth operation from stacked to drawn position.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean finish surfaces and partition accessories.

3.6 DEMONSTRATION

.1 Conduct training and demonstration as specified in Section 01 79 00.

.2 Demonstrate operation and maintenance procedures for operable partitions.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 04 00 00 - Masonry.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 07 92 00 - Joint Sealants.

.4 Section 08 80 00 - Glazing.

.5 Section 09 21 16 - Gypsum Board Assemblies.

.6 Section 09 30 00 - Tiling.

.7 Section 10 14 00 - Signage.

.8 Section 10 21 13.13 - Metal Toilet Compartments.

1.2 REFERENCES

.1 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A240/A240M-22a: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.4 ASTM A269/A269M-15a(2019): Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.5 ASTM A276/A276M-17: Standard Specification for Stainless Steel Bars and Shapes.

.6 ASTM A1008/A1008M-21a: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

.7 ASTM B456-17(2022): Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.8 ASTM F2285-04(2016)e1: Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating materials, sizes, finishes, details of function and methods of attachment.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate sets of 300 x 300 mm size samples, demonstrating available colours and finishes.

1.5 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Operation and Maintenance Data: Manufacturer's standard operating instructions, and standard care, maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

.3 Keys: Two keys for each lockable accessory, master keyed.

2 Products

2.1 OWNER-SUPPLIED PRODUCTS

.1 Refer to Section 01 60 00.

.2 Owner-supplied Products: Paper towel dispensers and soap dispensers.

2.2 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 ASI Group Canada.
.2 Bobrick Washroom Equipment, Inc.
.3 Bradley.
.4 Frost Products Limited.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.3 MATERIALS

.1 Steel Sheet: To ASTM A1008/A1008M, Commercial Steel (CS) Types A, B, and C; cold-rolled steel sheet in thicknesses as specified below.

.2 Stainless Steel Plate, Strip and Sheet: To ASTM A240/A240M, Type 304; sizes and thicknesses as specified below.

.3 Stainless Steel Tubing: To ASTM A269/A269M, Grade TP316; thicknesses, diameters, and sizes as specified below.

.4 Stainless Steel Bars and Shapes: To ASTM A276/A276M, Type 304; sizes and profiles as indicated.

.5 Mirrored Glass: Type GL-2 as specified in Section 08 80 00.

.6 Adhesive: Two-component epoxy type, waterproof.

.7 Fasteners, Screws, and Bolts: Galvanized steel, tamper-proof, security type; sizes to suit applications.

.8 Expansion Shields: Fibre, lead, or rubber as recommended by accessory manufacturer for component and substrate.

.9 Joint Sealant: Interior mildew-resistant sealant, Type SEAL-INT-MR as specified in Section 07 92 00.

2.4 MANUFACTURED UNITS

.1 Grab Bars: 38 mm OD, 1.2 mm thick stainless steel tubing; peened non-slip finish; round or oval concealed flange attachments, straight and L-shaped configurations in sizes indicated on Drawings.

.2 Toilet Tissue Dispenser: Surface mounted, large capacity design; 1.2 mm thick stainless steel construction with twin moulded plastic spindles; capable of holding two jumbo toilet tissue rolls; 520 mm long, 283 mm high, 145 mm deep; with spring loaded access tray, tumbler lock and viewing slot; eg. Code 169 by Frost Products Ltd.

.3 Sanitary Napkin Disposal: Surface mounted design, 203 mm wide, 337 mm high, 115 mm deep; complete with 0.76 mm thick welded stainless steel construction, with self-closing lid and pivoting bottom with friction catch, and permanent die embossed bilingual lettering; eg. Code 622 by Frost Products Ltd.

.4 Toilet Backrest: 32 mm OD stainless steel tubing having minimum 1.6 mm thick walls; with 16 mm thick, 255 x 102 mm size solid plastic laminate panel; concealed mounting with flange attachments, spaced at 305 mm OC; 200 mm extension from wall face; eg. Code 1028 by Frost Products Ltd.

.5 Flat Framed Mirror: 610 x 915 mm size, one piece stainless steel frame with mitred corners and bright annealed finish; vandal-resistant three-way mounting; 4 mm thick mirrored glass with shock resistant primary back and fully galvanized back panel; eg. Code 941-2436 by Frost Products Ltd.

.6 Fixed-Tilt Framed Mirror: 406 x 762 mm size, one piece stainless steel frame with mitred corners and bright annealed finish; fixed tilt; 4 mm thick mirrored glass with shock resistant primary back and fully galvanized back panel; eg. Code 941FT by Frost Products Ltd.

.7 Stainless Steel Shelf: 460 mm long, 140 mm deep, 102 mm high; 0.76 mm thick stainless steel with rounded corners, surface mounted; eg. Code 950-18 by Frost Products Ltd.

.8 Shower Curtain Rod: 32 mm OD, minimum 1 525 mm long, sufficient length to suit opening; 1.2 mm thick stainless steel shower rod with exposed fasteners; eg. Code 1145-S by Frost Products Ltd.

.9 Shower Curtain Hooks: Metal, chrome plated finish; 12 per set, one set required per shower curtain rod; eg. Code 1144-501 by Frost Products Ltd.

.10 Shower Curtain: 1 220 x 1 980 mm size, 0.2 mm thick non-combustible PVC, waterproof, mildew-proof, suede embossed finish; colour as selected by Consultant from manufacturer's extended range; aluminum-reinforced grommets concealed in a extra-strength header; eg. Code 1144-502 by Frost Products Ltd.

.11 Folding Shower Seat: Full wall-mounted L-shaped shower seat with one-piece 8 mm thick phenolic seat; 25 mm OD stainless steel support tubing and flanges; configuration as noted on Drawings; eg. Code 975 by Frost Products Ltd.

.12 Garment Hooks - Fixed: Stainless steel double-hook, with concealed fasteners and mounting bracket; eg. Code 1139-SS by Frost Products Ltd.

.13 Garment Hooks - Collapsable: Single hook, spring-loaded safety type designed not to support loads exceeding 11 kg; White epoxy-coated hook on stainless steel base; eg. Code 1150 by Frost Products Ltd.

.14 Towel Bar: 914 mm long, comprised of a 19 mm square stainless steel tube, with stainless steel support arm flanges projecting 89 mm from wall surface; complete with steel mounting plates and concealed fasteners; eg. Code 1143S by Frost Products Ltd.

.15 Shower Soap Dish: 158 x 158 mm size, 38 mm deep; stainless steel, recessed design, eg. Code 1132S by Frost Products Ltd.

.16 Custodial Utility Shelf: 1.2 mm thick stainless steel, 914 x 203 mm size, surface mounted; complete with 3 mop / broom holders, two pail hooks and an 8 mm OD chrome plated drying rod; eg. Code 1115 by Frost Products Ltd.

2.5 FABRICATION

.1 Weld and grind smooth joints of fabricated components.

.2 Use mechanical fasteners only where approved.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Do not apply manufacturer's or brand names on face of units.

2.6 FINISHES

.1 Shop Primed Coating on Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

.2 Galvanized Coating on Steel Components: To ASTM A123/A123M, Grade Z275; hot dipped zinc alloy coating.

.3 Galvanized Coating on Steel Hardware: To ASTM A153/A153M, Classes B3, C or D; hot dipped zinc alloy coating.

.4 Chrome/Nickel Plating on Metal Components: To ASTM B456, Type SC 2; electrodeposited nickel plus chromium coating; Polished.

.5 Stainless Steel: To AISI No. 4 - Brushed.

.6 Baked Enamel Coating on Steel Components: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

3 Execution

3.1 PREPARATION

.1 Provide templates and rough-in measurements as required.

3.2 INSTALLATION

.1 Install Products and Owner-supplied Products rigidly in place using tamper-proof fasteners, as follows:
- .1 Stud Walls: Install steel back plate to stud prior to application of wall board. Provide plate with threaded studs or plugs.
- .2 Hollow Masonry Units, Existing Plaster or Gypsum Board: Use toggle bolts drilled into cell or wall cavity.
- .3 Solid Masonry Units or Concrete: Use bolt with lead expansion sleeve set into drilled hole.
- .4 Toilet and Shower Compartments: Use male-female through bolts.
- .5 Grab Bars: Use built-in anchors.

.2 Set square items plumb.

.3 Install framed mirrors on concealed wall hangers, secured in place with theft-proof locking screws.

.4 Provide two shower curtains per barrier free shower, with sufficient overlap to ensure privacy.

3.3 PROTECTION

.1 Refer to Section 01 76 00.

.2 Protect Product surfaces with removable protective film until Owner occupancy.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 04 00 00 - Masonry.

.3 Section 06 10 00 - Rough Carpentry.

.4 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

.1 AAMA 2605-17a: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).

.2 ASTM A1008/A1008M-21a: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

.3 ASTM B456-17(2022): Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.4 ASTM D3363-2020: Standard Test Method for Film Hardness by Pencil Test.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating materials, layouts, dimensions, anchorage details, and details for base, trim and end panels.

1.4 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate copies of manufacturer's standard colour charts, indicating available colour selections.

1.5 EXTRA STOCK MATERIALS

.1 Supply extra stock materials as specified in Section 01 78 00.

.2 Extra Stock Materials: Hooks, hinges, doors, bodies, base and end panels, sufficient quantity to reconstruct 10 additional lockers, colour to match those installed; clearly marked to identify:
.1 Manufacturer's name,
.2 Product's name,
.3 Product colour.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 ASI Group Storage.
.2 Hadrian Manufacturing Inc.
.3 General Storage Systems.

.4 Buddsteel.
.5 Lincora Group.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 MATERIALS

.1 Sheet Steel: To ASTM A1008/A1008M, Commercial Steel (CS) Types A, B, and C; cold-rolled steel sheet; thicknesses as specified below.

2.3 COMPONENTS

.1 Frame: Welded construction; 1.52 mm thick sheet steel, formed channel sections, complete with punched ventilation slots; powder coated finish.

.2 Compartment Doors: Welded construction; 1.52 mm thick sheet steel outer panel and 0.91 mm thick sheet steel full door size inner panel; rigid box construction; powder coated finish.

.3 Compartment Sides and Backs: 0.91 mm thick sheet steel; stiffening ribs on sides and flanges on backs; powder coated finish.

.4 Compartment Shelves: 1.52 mm thick sheet steel, flanged, complete with channel formation at front; powder coated finish.

.5 Compartment Tops: 1.52 mm thick sheet steel, flanged, complete with channel formation at front; powder coated finish.

.6 Compartment Bottoms: Injection moulded copolymer polypropylene; having a minimum load capacity of 90 kg; impact resistant; Black colour.

.7 Metal Base: 1.52 mm thick sheet steel, recessed construction; 100 mm high; powder coated finish.

.8 Sloping Tops: 1.2 mm thick sheet steel; powder coated finish.

.9 End Panels and Miscellaneous Trim: 1.52 mm thick sheet steel; complete with necessary clips and other attachment devices; powder coated finish.

.10 Latching: Single-point, padlock type flange; in recessed chrome-plated steel pocket.

.11 Coat Hooks: Zinc-plated metal coat hooks.

.12 Hinges: 1.52 mm continuous hinges integral to frame and secured to door using theft-proof fasteners; powder coated finish.

2.4 FABRICATION

.1 Verify site dimensions prior to fabrication.

.2 Fabricate the work true to dimensions, square, plumb and level.

.3 Accurately fit members with hairline joints. Secure intersecting members with appropriate fastenings.

.4 Fabricate the finished work free from distortion and defects detrimental to appearances and performance.

.5 Incorporate ventilation slots at top and bottom of doors or frames.

.6 Close door on frame with closure strike the full height of door. Fit outer face of door flush with outside face of frame.

.7 Provide two rubber door grommets on lock side of frame.

.8 Form and factory punch bodies with necessary assembly holes.

.9 Flange tops and shelves on all four sides with a channel formation at front of shelves.

.10 Provide two shelves and 3 coat hooks per compartment. Compartment tops and bottoms are not considered shelves.

.11 Provide recessed, mechanically-fastened number plate on door, numbered as directed by Consultant.

.12 Provide hidden nylon friction door stop to ensure proper door closure and quiet operation.

2.5 FINISHES

.1 Powder Coated Finish on Sheet Steel and Metal Components: To AAMA 2605; electrostatically sprayed polymer powder, factory-applied to 0.075 mm dry film thickness; graffiti- and abrasion-resistant with 4H Hardness rating to ASTM D3363; colours as selected by Consultant.

.2 Chrome/Nickel Plating on Metal Components: To ASTM B456, Type SC 2; electrodeposited nickel plus chromium coating; Polished.

3 Execution

3.1 INSTALLATION

.1 Install Products true to dimensions.

.2 Accurately secure joints and intersecting members with concealed attachment system.

.3 Install Products square, plumb and forming a rigid structure.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 06 10 00 - Rough Carpentry.

1.2 REFERENCES

.1 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

.2 CSA G40.20-13 (R2018): General Requirements for Rolled or Welded Structural Quality Steel.

.3 NFPA 701-2004: Methods of Fire Tests for Flame Propogation of Textiles and Films.

.4 CAN/ULC-S109-14 (R2019): Standard Method for Flame Tests of Flame-Resistant Fabrics and Films.

1.3 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Selection Samples: Duplicate 300 x 300 mm size samples of curtain fabric, illustrating weight, knap, and available colours.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Package, crate and brace products to prevent distortion in shipment and handling.

.3 Protect products with sturdy wrappings.

.4 Label packages and crates with manufacturer's name, model number, quantity, and shipment date.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Edwards Door Systems Ltd.
.2 Northeast Stage.
.3 Quality Stage Drapery Ltd.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 REGULATORY REQUIREMENTS

.1 Curtain Fabric: Flame-proof when tested to NFPA 701 and CAN/ULC S109.

.2 Drapery Panels: Provide on each panel a sewn on label next to the flame test swatches, clearly indicating:
.1 Manufacturer’s Name.
.2 Material Used.
.3 Material Colour.
.4 Fabrication Date.
.5 Flame Resistance Compliance.
.6 Finished Panel Size.

.3 Each drapery panel shall have a minimum of six 40 mm wide x 130 mm long flame test swatches sewn to an offstage, bottom corner, made from the same fabric used to construct the drape and used for flame testing purposes.

2.3 MATERIALS

.1 Curtain Fabric: 848 g/m^2 100 percent cotton velour; fire-retardant to NFPA 701 and CAN/ULC S109; colour and pattern as selected by Consultant.

.2 Backdrop Fabric: 543 g/m^2 100 percent cotton; fire-retardant to NFPA 701 and CAN/ULC S109; Black colour.

.3 Extruded Aluminum: To ASTM B221, 6061 alloy, T5 temper.

.4 Sheet Steel: To CAN/CSA-G40.20-M.

2.4 COMPONENTS

.1 Proscenium Drapery: Two main drape panels, coloured curtain fabric, sewn with 150 percent fullness; heading to have a flat fold pleat reinforced with a minimum 75 mm jute webbing; #2 Black Brass grommets installed 25 mm in from each end with additional grommets equally spaced at 300 mm OC; 150 mm lead hem and a 25 mm double side hem sewn with upholstery thread to match fabric colour; panels sewn together with a 5 thread heavy duty surger; half and full panels only, with no horizontal seams; 125 mm double stitched hem, with continuous jack chain.

.2 Proscenium Valance: One valance panel; coloured curtain fabric, sewn with 150 percent fullness; heading to have a 3 fold pinch pleat ; panels sewn together with a serger; bottom hem 75 mm double stitched; pin on hooks inserted in top of drapery 38 mm from top of valance.

.3 Backdrop Drapery: Single panel suitable for walk-draw operation, coloured backdrop fabric, sewn with 150 percent fullness; heading to have a flat fold pleat reinforced with a minimum 75 mm jute webbing; #2 Black Brass grommets installed 25 mm in from each end with additional grommets equally spaced at 300 mm OC; 150 mm lead hem and a 25 mm double side hem sewn with upholstery thread to match fabric colour; panels sewn together with a 5 thread heavy duty surger; half and full panels only, with no horizontal seams; 125 mm double stitched hem, with continuous jack chain.

.4 Proscenium and Backdrop Track: 1.9 mm thick galvanized steel, entirely enclosed except for slot in bottom, each half to be in one continuous piece except where splicing clamps are required; eg. Model 700 by Quality Stage Drapery Inc.

.5 Valance Track: Extruded aluminum, complete with glides mounted to underside of proscenium bulkhead; eg. Model 402 by Quality Stage Drapery Inc.

.6 Drapery Carriers: Plated steel construction, with two nylon wheels held to a block by a corrosion-resistant nickel-plated rivet, each wheel rolling on two separate parallel threads; free moving plated swivel complete with trim chain attached to accommodate curtain S-hook. Provide two master carriers complete with trim chains; end stops for placement at each track end; end pulleys equipped with ball bearing wheels; adjustable floor pulley, 6 mm OD fiberglass reinforced, stretch resistant operating cord.

3 Execution

3.1 INSTALLATION

.1 Install Products level, true, and tightly fitted to adjacent surfaces; for long life under hard use.

.2 Suspend valance track on wood blocking in the proscenium opening.

.3 Suspend drapery track to rear face of proscenium opening using L-shaped brackets spaced at 800 mm OC.

.4 Suspend backdrop track in location indicated on Drawings, using L-shaped brackets spaced at 800 mm OC.

.5 Install drapery panels on track carriers using S-hooks.

.6 Install drapery panels to hang between 5 mm and 25 mm from the stage floor when in playing position. Use trim chain with S-hooks on carriers as required.

3.2 ADJUSTING

.1 Verify that installed Products function properly and smoothly.

.2 Adjust equipment to ensure satisfactory operation.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

.1 AAMA 611-14: Voluntary Specification for Anodized Architectural Aluminum.

.2 ASTM B209/B209M-21: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

.4 NFPA 701-2004: Methods of Fire Tests for Flame Propogation of Textiles and Films.

.5 CAN/ULC-S109-14 (R2019): Standard Method for Flame Tests of Flame-Resistant Fabrics and Films.

1.3 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating materials, components and accessories, component sizes, available fabrics and finishes, and installation instructions.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings as specified in Section 01 33 00.

.2 Shop Drawings: Project-specific drawings, illustrating wall opening dimensions, shade sizes, operator details, top rail, anchorage details, joint locations, hardware and accessory details, conditions between adjacent units, corner conditions and required clearances.

1.5 SAMPLES

.1 Submit samples as specified in Section 01 33 00.

.2 Verification Samples: Duplicate samples of the following:
.1 Shade Fabric: 200 x 200 mm size samples of each specified fabric.
.2 Visually-Exposed Components: 300 mm long samples of each visually-exposed component, illustrating material, colour, surface texture and sheen.
.3 Prefinished Metal: 50 x 100 mm size samples, illustrating specified finish and colour.

1.6 SOURCE QUALITY CONTROL SUBMITTALS

.1 Submit source quality control submittals as specified in Section 01 33 00.

.2 Fire Test Reports: Manufacturer's standard fire test reports, prepared by independent testing agency deemed acceptable by authorities having jurisdiction, indicating fire hazard classification of shade fabric meets regulatory requirements.

1.7 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Section 01 78 00.

.2 Operation and Maintenance Data: Manufacturer's standard operating instructions, and maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.

1.8 QUALIFICATIONS

.1 Supplier: A manufacturer-certified firm, approved to supply specified Products and to honour warranty claims.

.2 Installer: A manufacturer-certified firm, trained and experienced in installing specified Products.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 60 00.

.2 Protect Products with suitable heavy weight wrapping before delivery to Place of the Work.

.3 Store Products at Place of the Work in a designated area, allowing for natural ventilation over finished surfaces.

1.10 WARRANTY

.1 Submit extended warranty in accordance with General Conditions of the Contract.

.2 Extended Warranty: For a period of 10 years, covering complete replacement cost of defective Product, including removal and disposal of defective assembly, and installation of replacement Product. Covered defects to include the following:
.1 Fading of shade fabric colour,
.2 Shrinkage of shade fabric,
.3 Loss of flame-retardant properties of shade fabric,
.4 Punctures, rips or tears in shade fabric, and
.5 Mechanical failure of operating mechanisms.

2 Products

2.1 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
.1 Altex Decorations Ltee.
.2 Concord Shading Systems Inc.
.3 Elite Shades.
.4 Hunter Douglas Architectural.
.5 Legrand Canada.
.6 MechoShade Systems, Inc.
.7 Sun Glow Window Covering Products of Canada Ltd.

.2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 Roller Window Shades: Manual pull-down, spring-activated retracting operation; single sprocket roller shade, rectangular-shaped, with infinite positioning; each unit consisting of two end brackets, shade roller tube, cassette fascia, concealed hembar and sun control fabric; sizes as indicated on Drawings.

2.3 PERFORMANCE CRITERIA

.1 Fire Classification of Fabrics: Flame-retardant and fire-resistant to CAN/ULC-S109 and NFPA 701.

2.4 MATERIALS

.1 Extruded Aluminum: To ASTM B221M, 6063 alloy, T5 temper; unless specified otherwise.

.2 Sheet Aluminum: To ASTM B209/B209M, 3003 alloy, H14 temper.

.3 Plastic: ABS type.

.4 Sun Control Fabric: Vinyl-coated polyester yarn, consisting of 79 percent vinyl and 21 percent dernier polyester core yarn; 3 percent openess factor, complete with antimicrobial coating; tensioned prior to heat setting; colour as selected by Consultant.

.5 Bituminous Coating: Fibrous asphalt emulsion.

.6 Screw Fasteners: Non-corrosive type, size as recommended by shade manufacturer.

2.5 COMPONENTS

.1 End Bracket: 77 x 96 mm, two-piece moulded ABS construction; 64 mm OD nylon drive sprocket; finish to match fascia colour.

.2 Shade Roller Tube: 1.52 mm thick extruded aluminum with 3 internal 4.82 mm high continuous fins spaced 120 degrees apart.

.3 Cassette: Two-piece interlocking 1.9 mm thick extruded aluminum housing, rectangular profile.

.4 Fascia: 1.7 mm thick extruded aluminum complete with three continuous screw flute.

.5 Drive Assembly: Factory set for size and travel of shades, field adjustable; complete with built-in shock absorber designed to prevent breakage.

.6 Hem Bar: 3 x 32 mm size flat extruded aluminum bar; length to suit shade width.

2.6 FINISHES

.1 Anodized Coating on Aluminum: To AAMA 611, AA-M10C21A31, Class II Clear Anodic Oxide coating, No. 17.

3 Execution

3.1 PREPARATION

.1 Apply heavy coat of bituminous paint on aluminum surfaces placed in direct contact with concrete, mortar, plaster or dissimilar metals.

.2 Supply fastenings and anchors required to be built in to adjacent work to other Sections.

3.2 INSTALLATION

.1 Install Products in window openings level, plumb, square, rigidly coupled and adequately anchored, maintaining uniform clearances, accurate alignment levels and parallel with window plane.

.2 Conform to manufacturer’s Product data and accepted Shop Drawings.

.3 Conceal brackets and rollers with closure panels for full width of opening.

.4 Install hembar in fabric hem pocket and secure to avoid displacement.

3.3 TOLERANCES

.1 Gap Variation Along Perimeter: $\leq$ 6 mm per 2 440 mm of shade height.

.2 Offset from Level: $\leq$ 3 mm.

.3 Conform to manufacturer's edge clearance requirements for shades exceeding a 1:3 width-to-height ratio.

3.4 ADJUSTING

.1 Adjust Products to ensure smooth and trouble free operation without binding.

.2 Adjust shade and fabric to hang flat without buckling or distortion.

3.5 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean exposed surfaces using non-abrasive materials and methods.

3.6 DEMONSTRATION

.1 Refer to Section 01 79 00.

.2 Demonstrate proper operation and maintenance of roller shades.

END OF SECTION

Part 1 - General

1.1 REFERENCE

.1 Division 00 and Division 01 apply to and are a part of each Electrical Division Section.

1.2 APPLICATION

.1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section of Electrical Divisions and is to be read accordingly.

1.3 SUBMITTALS

.1 Submit shop drawings for products of this Section.

.2 Additionally as part of shop drawing submission process, submit following to Consultant for review:

.1 sample of each proposed type of access door if supplied under work of this Division, as well as electronic copies of reflected ceiling plan drawings and wall elevation drawings showing proposed access door locations;

.2 dimensioned location drawings indicating required sleeves and formed openings in structural poured concrete or precast concrete construction or in roofing, and locations of cutting or drilling required for Electrical Divisions work;

.3 samples of materials and any other items as specified in succeeding Sections of Electrical Divisions;

.4 weight loads of selected equipment (upon request);

.5 equipment nameplate and warning sign proposed nomenclature, print type, symbols, sizing and colours;

.6 fire stopping installation drawings with ULC certifications;

.7 copies of prior to start of construction approvals from local governing authorities having jurisdiction.

.3 Prior to application for Substantial Performance of the Work, submit following to Consultant for review (note: funds will be withheld until each of following items have been completed and documented to satisfaction of Consultant):

.1 fire alarm system testing and verification report of each component of work; devices to be certified working and in proper order;

.2 final distribution system testing and arc flash study performed and documented to satisfaction of Consultant;

.3 structured network cabling system tested and verified to be operating and performing in accordance with specified standards.

1.4 CONTINUITY OF SUPPLY FOR STANDARDIZATION

.1 Utilize materials of one manufacturer for aspects of work, where practical. Utilize one common manufacturer for wiring devices, such as switches and receptacles, whether installed loose or in a pre-manufactured component. Coordinate with each supplier and ensure conformance with this requirement. Identify deviations to Consultant and obtain approval of change prior to proceeding with work.

1.5 HAZARDOUS MATERIALS

.1 Hazardous materials and infectious materials are known to be present on site in existing buildings, including but not limited to following:

.1 aspergillus;

.2 mould;

.3 asbestos;

.4 PCBS;

.5 lead;

.6 mercury.

.2 Division 01 identifies specific requirements and if such materials are present, include for costs to be educated and trained on special working conditions, to work in areas with hazardous materials including protective clothing, gear, tenting, enclosures, etc., and perform necessary partitioning/tenting/ventilation work to isolate areas and maintain disturbances of such materials to a minimum. Comply with infection control requirements and those of governing local Health and Welfare authority. An asbestos abatement report is available for review from Consultant. Unless otherwise noted, any abatement removal is responsibility of another Division of Work.

.3 If proper abatement procedures are not followed, be responsible for bearing full cost of a full time qualified abatement inspector chosen by Owner. In areas where work is being done above or below an area being occupied, any slab penetrations into vertically adjacent occupied space are to utilize a proper enclosure in area of that work on that occupied floor. Be responsible for failure to comply with special requirements in working in areas of hazardous materials.

.4 Include for company specializing in removal and disposal of materials containing PCB's to remove and dispose off-site luminaire ballasts containing PCB's. Check luminaires being deleted for ballasts containing PCB's. Disconnect and dispose off-site such ballasts. Only companies that are certified and comply with Ministry of Environment and Ministry of Transport regulations with regards to hazardous waste materials are to be used to perform this Work. Prior to start of Work, submit to Consultant a copy of PCB disposal certificate and identification of Ministry authorized and designated disposal site.

.5 Fluorescent lamps being replaced and containing mercury are to be properly transported offsite and disposed of as per local governing Ministry guidelines.

1.6 **PRODUCT REQUIREMENTS IN SPECIAL AREAS**

.1 Products in non-climate controlled areas are to include weatherproof provisions such as gasketted covers, corrosion resistant hardware, weatherproof finishes, etc. Devices to be manufactured to operate in extreme temperatures.

Part 2 - Products

2.1 **CONDUITS**

.1 EMT (Thinwall), galvanized electrical metallic tubing to CSA C22.2 No. 83, complete with factory made bends where site bending is not possible and joints and terminations made with steel couplers and steel set screw type connectors with insulated throats, and concrete tight where required.

.2 Rigid galvanized steel to CSA C22.2 No. 45, with exterior zinc and interior enamel coatings, galvanized threads where factory cut and red lead coated threads where site cut. Factory made bends where site bending is not possible, factory made and threaded fittings, and connectors, and terminations with rigid couplings, and concrete tight where required.

.3 Galvanized steel flexible liquid tight metallic conduit to CSA C22.2 No. 56, complete with Ideal "Steel Tough" liquid-tight flexible conduit connectors at terminations.

.4 Galvanized steel flexible metallic conduit to CSA C22.2 No. 56, complete with proper and suitable squeeze type connectors at terminations.

.5 CSA approved and labelled, FT-4 rated, rigid plastic (PVC) conduit complete with site made heat gun bends on conduit to 50 mm (2") diameter, factory made elbows in conduit larger than 50 mm (2") diameter, solvent weld joints, factory made expansion joints where required, and terminations made with proper and suitable connectors and adaptors.

2.2 **OUTLET BOXES**

.1 CSA approved stamped galvanized steel outlet boxes for all recessed device installations.

.2 CSA certified rigid plastic (PVC) outlet boxes.

.3 Standard general purpose service floor boxes: CSA approved, UL scrub water compliant, fully adjustable angular and vertically, formed steel/cast iron, round single gang / rectangular or square multi-gang as required, flush in concrete floor installation, boxes complete with conduit knockout openings, adjustable collars, hinged flip open brass covers with provisions for mounting of duplex power receptacles, telephone jacks and data jacks. Provide barriered boxes when boxes contain both power and communication outlets and different voltage levels. Size boxes to suit thickness of floor slab as confirmed with Consultant and also to suit required bending radii of conductors. Refer to drawings for number of gang requirements. Acceptable manufacturers are Hubbell, Legrand and Thomas & Betts. Special floor boxes are specified elsewhere in another Section.

.4 Each outlet box and back box to be suitable in respects for application and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable plaster rings, concrete rings, covers, carpet flanges and any other required accessory.

.5 Electrical boxes exposed exterior of building or in non-climate controlled locations to be weatherproof boxes complete with gasketted covers/faceplates.

2.3 **PULL BOXES & JUNCTION BOXES**

.1 Galvanized or prime coat plated steel, suitable in respects for application and complete with screw-on or hinged covers as required, and connectors suitable for connected conduit.

.2 Eaton Crouse-Hinds, "Condulet", threaded cast Feraloy outlet boxes of an exact type to suit application, each complete with screw-on gasketted cover.

.3 Rigid plastic (PVC), CSA certified, junction boxes and access fittings with solvent weld type joints and screw-on PVC covers.

.4 Physical size of pull boxes to be as required by local governing electrical code to suit number and size of conduits and conductors.

.5 Each box to be suitable in respects for application and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable plaster rings, concrete rings, covers and any other required accessory.

.6 Boxes exposed exterior of building or in non-climate controlled locations to be weatherproof boxes complete with gasketted covers.

2.4 **SLEEVES**

.1 Galvanized steel sleeves as follows:

.1 No. 24 gauge with an integral flange at one (1) end to secure sleeve to formwork construction;

.2 Schedule 40 pipe;

.2 Schedule 40 PVC sleeves.

2.5 **FIRESTOPPING & SMOKE SEAL MATERIALS**

.1 Asbestos-free, elastomeric materials and intumescent materials, tested, listed and labelled by ULC in accordance with CAN 4-S115-M85, and CAN/ULC-S101-M for installation in ULC designated firestopping, and smoke seal systems to provide a positive fire, water and smoke seal and a fire resistance rating (flame, hose stream and temperature) no less than fire rating for surrounding construction.

.2 Fire stopping and smoke seal material system to be specifically ULC certified with designated reference number for its specific installation. As part of shop drawing submission, submit copies of firestopping drawings with ULC certificate and number for each specific installation. Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

.3 Systems to consist of both elastomeric and intumescent materials that are compatible with abutting dissimilar materials and finishes. Coordinate material requirements with trades supplying abutting areas of materials.

.4 Typically, for openings of up to 250 mm (10") in diameter, provide putty pad type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibres or silicone compounds.

.5 Typically, for openings of greater than 250 mm (10") in diameter, and for rectangular openings, provide pillow type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" re-enterable, non-curing, mineral fibre core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag.

.6 Supply products of a single manufacturer for use on work of this Division.

.7 Installer to be manufacturer trained and certified on specific product. Submit copy of certificate with shop drawings.

.8 Include for manufacturer authorized representative to inspect and verify each installation and application. Submit test report signed and verified by system installer’s authorized representative and manufacturer representative.

.9 Acceptable certification to also include certification by Underwriters Laboratories of Northbrook IL, using tests conforming to ULC-S115 and given cUL listing published by UL in their "Products Certified for Canada (cUL) Directory".

.10 Acceptable manufacturers are:

.1 Hilti Canada;
.2 Specified Technologies Inc.;
.3 3M Canada Inc.;
.4 Tremco;
.5 A/D Fire Protection Systems;
.6 Nelson.

2.6 **FASTENING & SECURING HARDWARE**

.1 Concrete inserts - Crane Canada Ltd., No. 4-M for concrete work for single or double conduit, cable tray, etc., runs and equipment. Unistrut Ltd. multiple type inserts for runs of three (3) or more conduits etc., or where a grid support system is required.

.2 Concrete fasteners - "WEJ-IT" anchors, lead cinch anchors and/or "STAR" or "PHILLIPS" self-drilling anchors.

.3 Masonry inserts - "WEJ-IT" expansion shields and machine bolts or, for light loads, fibre or lead plugs and screws.

.4 Drywall or plaster wall and/or ceiling fasteners - 2-wing spring toggles.

.5 Structural steel - Crane Canada Ltd., beam clamps.

.6 Metal framing channels - 40 mm (1-5/8") width, galvanized steel channels complete with required fittings and ancillary hardware; acceptable manufacturers are:

.1 Unistrut;

.2 Thomas & Betts;

.3 Hilti;

.4 Eaton B-Line.

.7 Metal "J" hooks or Panduit "J-Pro" cable support systems for communications system cabling in accessible ceiling spaces were conduit or cable tray is not being provided. Obtain written approval of Consultant for use of J-hooks.

.8 Velcro tie wraps for bundling and securing cables.

2.7 ACCESS DOORS

.1 Access doors to be provided under work of Division 08 by General Trades Contractor.

.2 Coordinate with Mechanical Contractor and General Trades Contractor to ensure that access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and that work involving both mechanical and electrical services to where possible be accessible from common access door. Coordinate work to ensure that same common location access doors are not supplied by more than one Division.

.3 Size access door to suit concealed work for which they are supplied and wherever possible they are to be of standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

.4 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.

.5 Identify on reflected ceiling plans and wall elevation drawings, coordinated locations of proposed access door locations and submit to Consultant for review.

2.8 IDENTIFICATION NAMEPLATES

.1 Laminated plastic (Lamacoid) black-white-black with bevelled edges, stainless steel screws, and proper identification engraving. Each nameplate to be sized to suit equipment for which it is provided, and required wording. Confirm nomenclature with Consultant. Various colour configurations to be used to differentiate systems. Confirm exact colour scheme with Consultant and/or Owner.

.2 Brother "P-Touch", portable electronic labelling system complete with self-adhesive, permanent printed labels with required nomenclature.

2.9 SYSTEM BACKBOARDS

.1 FSC (Forest Stewardship Council), G1S (good one side) construction grade fir plywood, containing no added urea formaldehyde, flame retardant prime coat painted on exposed surfaces, minimum 20 mm (3/4") thick, as sized on drawings and with flame spread rating in accordance with local governing building code requirements.

2.10 MOTOR STARTER PANELS

.1 Minimum No. 14 gauge sheet steel panels complete with steel angle reinforcing, framing and suitable splitter trough, fully primed and enamel painted, sized to accommodate starters required with spare space and capacity for at least two additional units.

2.11 SPRINKLER PROTECTION

.1 Provide drip shields for protection of surface mounted equipment enclosures from water spray and dripping of liquids. Features of shields include:

.1 factory constructed by respective equipment manufacturers;

.2 constructed from non-combustible materials (sheet steel);

.3 enamel painted to match equipment;

.4 surfaces and edges filled/sanded smooth prior to painting;

.5 supported from equipment with structural steel rods/metal framing or other method approved by Consultant;

.6 structural support finish painted to match shield.

.2 Include with equipment shop drawings, detailed dimensions of drip shields and methods of supporting.

.3 Equipment with top cable/conduit entries to include additional sealing of entries with gasketting and/or waterproof sealant to prevent water from entering enclosure.

.4 Design ventilation louvers such that live components are not exposed to water spray and dripping liquids.

.5 Above requirements are additional minimum "sprinkler protection" standards for equipment specified as EEMAC/NEMA 1, 2 or 12.

.6 Obtain CSA approval where required by local governing authorities.

2.12 **ROOFTOP CONDUIT SUPPORT SYSTEM**

.1 Cooper B-Line "Dura - Blok" series rooftop support systems with features as follows:

.1 CSA approved and/or ULC listed and labelled;

.2 non-penetrating of roof;

.3 vibration dampening;

.4 does not float;

.5 suitable for outdoor wet and freezing environments without damage caused by weather or freeze and thawing when exposed to de-icing chemicals;

.6 environmental friendly;

.7 constructed of recycled rubber.

.2 Materials:

.1 Dura-Blok Curb base made of 100% recycled rubber and polyurethane pre-polymer with a uniform load capacity to suit specific load application of support (minimum 744 kg/m [500 pounds/linear foot]); each base to have a reflective red stripe.

.2 DB Series base: Dimensions: 150 mm (6") wide by 125 mm (5") tall by required overall length (minimum 225 mm [9"]); this is to be minimum dimensions, but base requirements must be increased to suit specific applications as recommended by system manufacturer; includes low base steel frame C channel 1.9 mm (14 gauge) - 25 mm (1") high strut galvanized per ASTM A653; and pipe roller assembly.

.3 Attaching hardware: Zinc-plated threaded rod, nuts and attaching hardware per ASTM B633.

.4 Conduit clamps: single pipe supports constructed of galvanized steel and sized to accommodate sizing of installed conduits.

.3 Confirm with system manufacturer that selected products provide proper support for application.

.4 Acceptable manufacturers are as follows:

.1 Cooper B-Line;

.2 Clearline Technologies (C-Port);

.3 Erico (Caddy Pyramid).

Part 3 - Execution

3.1 **GENERAL CONDUIT INSTALLATION REQUIREMENTS**

.1 Install conduit concealed in finished areas, and concealed to degree made possible by finishes in partially finished and unfinished areas. Conduit may be exposed in unfinished areas such as Electrical and Mechanical Rooms, unless otherwise noted on drawings or specified herein. Refer to and examine architectural drawings and room finish schedules to determine finished, partially finished or unfinished areas of building. Documents do not identify exact routing. Where shown, routing is diagrammatic, identifying general requirements of routing and locations. Include for necessary offsets, fittings, transformations and similar items required as a result of obstructions and other architectural or structural details not shown.

.2 Where conduits are exposed, arrange them to avoid interference with other work, parallel to building lines and install as high as possible. Do not install conduits within 150 mm (6") of "hot" pipes or equipment unless conduits are associated with equipment. Independently run conduit to be supported from wall/ceiling structure, not from ceiling hangers, ductwork, piping, cable trays, formed steel decking, etc. Do not run conduits within 900 mm (3') of equipment access opening covers.

.3 So as not to impair required strength of structure, following criteria to be generally followed but which is to be reviewed and coordinated with Consultant prior to start of Work:

.1 where conduits pass by a column, stay at least two times thickness of slab and drop away from column;

.2 where conduits terminate adjacent to a column or wall, bring conduit in toward column/wall as close to 90° to face of column as possible within two times thickness of slab and drop away from column;

.3 maximum size of conduit in structural slabs is 1/5 of solid portion of slab thickness;

.4 where more than two conduits are adjacent to each other, they are to be spaced greater of 3 diameters or 100 mm (4") apart;

.5 total of depth of conduits crossing over each other is to be less than one-third thickness of slab;

.6 place conduit in middle third of thickness of slab; do not lay conduit directly on reinforcing steel;

.7 do not run conduit adjacent to parallel reinforcing bars;

.8 do not run conduit longitudinally in beam without approval of Owner and review with Consultant; pass through beams at right angles to span of beam;

.9 where conduits pass through beams, maintain at least twice depth of beam separation away from supports;

.10 do not run conduits in slab beside a drop or beam within twice depth of slab from edge of drop or beam;

.11 do not run conduits through shear walls or columns without approval of Owner and review with Consultant;

.12 do not place conduit in structural elements in parking garage structures, water retaining structures or structures subjected to de-icing chemicals, without approval of Owner and review with Consultant.

.4 Conduits are sized on drawings, but in absence of type and sizing, type and size to suit intended application in accordance with applicable local governing electrical code requirements. Sizes identified on drawings are minimum sizes and are not to be decreased unless approved by Owner and reviewed with Consultant.

.5 Minimum conduit size shall be 3/4" unless otherwise noted.

.6 Where receptacle type devices are located in existing floors and/or where feeds are required to furniture systems in open spaces, and where chasing of floor slab to run conduit is not acceptable to Owner after review with Consultant provide fire rated "poke-thru" assembly installed through floor and feed from conduit runs provided in ceiling space of floor below.

.7 Mounting heights of devices may be typically identified on drawings, but such dimensions are for general pricing only. Review exact mounting heights with Consultant prior to roughing-in, refer to Architectural drawings and comply with local governing codes and standards including building code barrier free requirements.

3.2 INSTALLATION OF CONDUIT

.1 Provide conduit for conductors except armoured cable and copper sheathed mineral insulated conductors, and except where duct or similar raceway materials are provided.

.2 Provide conduit as follows:

.1 for interior building surface mounted services greater than 600 V - rigid galvanized steel;

.2 for branch circuit conductors underground inside building, and underground outside building beneath concrete, asphalt, and similar paving material-rigid PVC;

.3 for exposed conduit mounted at a height of less than 1200 mm (4') in electrical, mechanical or other service areas - rigid galvanized steel;

.4 for short branch circuit connectors to motorized equipment and distribution transformers (minimum length 450 mm (18"), maximum length 600 mm (24") with 180° loop where possible) - galvanized steel flexible liquid-tight conduit;

.5 for branch circuit conductors associated with isolated power systems and located in a concealed space in a wall or in a concrete floor slab-rigid PVC with separate insulated ground conductor;

.6 at points, where conductors cross building expansion joints - galvanized steel flexible conduit with no less than 600 mm (24") of extra curve;

.7 for branch circuit conductors in poured concrete slab - rigid PVC;

.8 for interior conduit above 50 mm (2") diameter containing distribution conductors or communication systems conductors (fire alarm, telephone etc.) (except as noted above) - EMT with separate insulated ground conductor;

.9 for corrosive environments - epoxy coated rigid steel;

.10 for conductors except as noted above or elsewhere in this Specification - EMT.

.3 Run rigid conductors in rigid type conduits suitable for application. Do not use flexible conduit.

.4 Secure conduit located in poured concrete work in place in a manner such that conduit will not float or move when concrete is poured. Adequately protect such conduit from damage prior to and during concrete pour, and from concrete and water penetration.

.5 Review with Consultant prior to Start of Work, maximum allowable size of conduit for installation in poured concrete. Placement of reinforcing steel in structural concrete work will take precedence over placement of conduit. Spaced adequately multiple runs of conduit in poured concrete work, as reviewed with Consultant.

.6 Install flexible polyethylene conduit in continuous lengths wherever possible and "snake" conduit in trench. Where joints are necessary, make same with nylon inserts and stainless steel gear type clamps. Terminate with rigid conduit threadless connectors. Grade bed to provide proper drainage of conduits.

.7 Support underground conduit on a well-tamped flat bed of earth, free from rocks or protrusions of any kind. Grade and slope bed to provide conduits and ducts with proper drainage. Coordinate with General Trades Contractor for provision of means to carry away drainage water. Obtain required approvals of work from local governing electrical utility and review with Consultant prior to back filling and covering. Provide pull cord in each duct run.

.8 Provide manufactured expansion joints in rigid PVC plastic conduit at spacing as recommended by conduit manufacturer.

.9 Provide a separate ground conductor in plastic conduits.

.10 Support and secure surface mounted and suspended single or double runs of metal conduit at support spacing in accordance with local governing electrical code requirements by means of galvanized pipe straps, conduit clips, ringbolt type hangers, or by other proper manufactured devices.

.11 Support multiple mixed size metal conduit runs with Unistrut Ltd., Electrovert Ltd. "CANTRUSS" or Burndy Ltd. "FLEXIBLE" conduit racks spaced to suit spacing requirements of smallest conduit in group.

.12 Unless otherwise noted, provide conduit fittings constructed of same materials as conduit and which are suitable in respects for application.

.13 Provide proper adaptors for joining conduits of different materials.

.14 Cut square and properly ream site cut conduit ends.

.15 Provide conduit as sized on drawings. Size conduit not sized on drawings in accordance with latest edition of local governing electrical code with consideration that sizes of branch circuit conductors indicated are minimum sizes and must be increased as required to suit length of run and voltage drop in accordance with voltage drop schedule found on drawings or at end of this section. Where conductor sizes are increased to suit voltage drop requirements, increase scheduled or specified conduit size to suit. Unless otherwise noted on drawings or required by local governing electrical code or specified elsewhere, conduit to be of minimum size 13 mm (1/2") diameter. Structured network cabling system conduit to be of minimum 19 mm (3/4") diameter, unless otherwise noted.

.16 Site made bends for conduit to maintain full conduit diameter with no kinking, and conduit finishes are not flake or crack when conduit is bent.

.17 Plug ends of roughed-in conduits which are exposed during construction with approved plugs.

.18 Ensure that conduit systems which are left empty for future wiring are clean, clear, capped and properly identified at each termination point. Provide end bushing and suitable fish wires in such conduits.

.19 Provide empty conduits to ceiling spaces from flush mounted panelboards located below and/or near hung ceiling. Refer to drawing detail.

.20 Conduits shall be colour coded with paint located at junction boxes and every 5 feet along each run as follow:

- .1 Yellow - Line voltage
- .2 Red - Fire alarm
- .3 Blue - Low voltage emergency lighting
- .4 Green - Network cabling

3.3 EXPANSION FACILITIES FOR CONDUIT CROSSING BUILDING EXPANSION JOINTS

.1 Wherever concealed or surface mounted conduits cross building expansion joints, provide expansion facilities to permit free movement without imposing additional stress or loading upon support system, and to prevent excessive movement at joints and connections, in accordance with drawing details and local governing inspection approvals.

3.4 INSTALLATION OF OUTLET BOXES & BACK BOXES

.1 Provide an outlet box or back box for each luminaire, wiring device, telephone outlet, fire alarm system component, communications systems components, and each other such outlet.

.2 Size boxes to accommodate exact supplied components and for bending radii of installed cables. Confirm requirements with respective system vendors.

.3 Outlet boxes flush mounted in interior construction, surface mounted in concealed interior locations, to be stamped and galvanized steel outlet boxes unless otherwise noted.

.4 Provide sealing around boxes in walls where insulation and vapour barrier is present or for walls of rooms that are sealed. Maintain sealing system of wall.

.5 Outlet boxes in underground plastic conduit systems to be rigid PVC plastic outlet boxes, unless otherwise noted.

.6 Outlet boxes for flush floor mounted devices to be concrete tight formed galvanized steel fully adjustable flush floor boxes. Locate in to position and install in accordance with manufacturer instructions. Coordinate installation with trades pouring concrete floor slab or trade responsible for floor construction.

.7 Provide a barriered outlet box for switches connected to normal and emergency power and share a common faceplate.

.8 Provide outlet boxes for special wiring devices, for special equipment and special applications. Refer to requirements specified in other Sections and/or on drawings.

.9 Size and arrangement of outlet boxes to suit device which they serve.

.10 Mounting heights and locations for outlet boxes are typically indicated on drawings, however confirm exact location and arrangement of outlets prior to roughing-in. Architectural drawings and Consultant’s instructions have precedence over electrical drawing diagrammatic layouts and specified mounting heights and locations.

.11 Do not install outlet or back boxes "back-to-back" in walls and partitions. Stagger such outlets and seal against noise transmission in accordance with drawing details. "Thru-wall" type boxes will not be permitted for any application.

.12 Provide blank coverplates on existing obsolete boxes which are to remain in position.

.13 Provide blank coverplates over boxes left empty for future installation of devices. Clearly identify each box as to its intended use, to Owner’s approval and reviewed with Consultant.

3.5 INSTALLATION OF PULL BOXES & JUNCTION BOXES

.1 Provide pull boxes in conduit systems wherever shown on drawings, and/or wherever necessary to facilitate conductor installations. Generally, conduit runs exceeding 30 m (100") in length, or with more than two - 90° bends, are to be equipped with a pull box installed at a convenient and suitable intermediate accessible location.

.2 Size boxes to accommodate exact supplied system and for bending radii of installed cables. Confirm requirements with respective system vendors.

.3 Provide junction boxes wherever required and/or indicated on drawings and as required by local governing electrical code.

.4 Provide sealing around boxes in walls where insulation and vapour barrier is present or for walls of rooms that are sealed. Maintain sealing system of wall.

.5 Boxes in rigid conduit and EMT inside building to be stamped galvanized or prime coated steel.

.6 Boxes in exterior rigid conduit and boxes in perimeter wall where insulation and vapour barrier is present, to be "Condulet" cast gasketted boxes, unless otherwise noted.

.7 Boxes in plastic conduit to be rigid PVC plastic boxes complete with required couplings.

.8 Pull boxes and junction boxes to be accessible after work is completed.

.9 Accurately locate and identify concealed pull boxes and junction boxes on "As-built" record drawings.

.10 Clearly identify main pull or junction boxes (excluding obvious outlet boxes) with painted cover plate and machine printed labels. Text shall be minimum 3/8” high bold text font for legibility. Labelling to identify system, and source panel circuits for power wiring. Junction box covers to be colour coded as follow:

.1 Yellow - line voltage

.2 Red - Fire alarm

.3 Blue - Low voltage emergency lighting

.11 Cover boxes in fire walls with aluminium tape and seal with caulking.

3.6 **INSTALLATION OF SLEEVES**

.1 Where conduits, round ducts and conductors pass through structural poured concrete, provide sleeves of type suitable for application, and approved by local governing codes.

.2 Sleeves in concrete slabs, except as noted below, are to be No. 24 gauge or equivalent, with an integral flange to secure sleeves for formwork construction.

.3 Sleeves in waterproof concrete slabs and in other slabs where waterproof sleeves are required are to be lengths of Schedule 40 pipe sized to extend 100 mm (4'') above floor.

.4 Sleeves in poured concrete walls and foundation are to be Schedule 40 pipe.

.5 Size sleeves, unless otherwise noted, to leave 13 mm (1/2") clearance around conduit, duct, conductor, etc. Void between sleeves and conduit, duct, conductors, etc., to be packed and sealed for length of sleeves as in accordance with article titled "Firestopping and Smoke Seal Materials" specified here in this Section. Ensure that sleeves set in exterior walls are packed and sealed with governing authority approved materials suitable for application and that both ends of sleeves are packed watertight with approved permanently flexible and water tight materials. Exact responsibility of work to be coordinated with General Trades Contractor.

.6 Submit to concrete reinforcement detailer at proper time, drawings indicating required sleeves, recesses and formed openings in poured concrete work. Completely and accurately dimension such drawings and relate sleeves, recesses and formed openings to suitable grid lines and elevation datum.

.7 Supply sleeves of a water protecting type in accordance with detail found on drawings for installation in following locations:

.1 in Mechanical and Fan Room floor slabs, except where on grade;

.2 in slabs over Mechanical, Fan, Electrical and Telephone Equipment Rooms or closets;

.3 in floors equipped with waterproof membranes.

.8 "Gang" type sleeving to be permitted only with approval of Owner and reviewed with Consultant.

.9 Terminate sleeves for work which is exposed, so that sleeve is flush at both ends with wall, partition, or slab surface such that sleeve may be covered completely by escutcheon plates.

3.7 INSTALLATION OF FIRESTOPPING & SMOKE SEAL MATERIALS

.1 Where electrical work penetrates or punctures fire rated construction, provide ULC certified, listed and labelled firestopping and smoke sealing packing material systems to seal openings and voids around and within raceway and to ensure that continuity and integrity of fire separation is maintained. Submit to Consultant, copies of certificates of compliance from an independent testing agency, attesting that fire stopping and smoke seal materials meet ULC requirements. Openings not in immediate vicinity of working areas are to be firestopped and sealed same day as being opened.

.2 Install fire stopping and smoke seal materials for each installation in strict accordance with specific ULC certification number and manufacturer instructions. Comply with local governing building code requirements and obtain approvals from local building inspection department. Ensure that openings through fire separations do not exceed maximum size wall opening, and maximum and minimum dimensions indicated in ULC Guide No. 40 U19 for Service Penetration Assemblies and fire stopping materials.

.3 Ensure that continuity and integrity of fire separation is maintained and conform to requirements of latest edition of ULC publication "List of Equipment and Materials, Volume II, Building Construction".

.4 Comply with following requirements:

.1 Manufacturer’s installation instruction for each specific application.

.2 Clean areas and surfaces before materials are installed.

.3 Examine substrates, openings, voids, adjoining construction and conditions under which firestop and smoke seal system is to be installed. Confirm compatibility of surface.

.4 Verify penetration items are securely fixed and properly located with proper space allowance between penetrations and surfaces of openings.

.5 Report any unsuitable or unsatisfactory conditions to Consultants in writing, prior to commencement of work. Commencement of work will mean acceptance of conditions and surfaces.

.6 Mask where necessary to avoid spillage and over coating onto adjoining surfaces. Remove stains on adjacent surfaces.

.7 Prime substrates in accordance with product manufacturer’s written instructions.

.8 Provide temporary forming as required and remove only after materials have gained sufficient strength and after initial curing.

.9 Tool or trowel exposed surfaces to neat, smooth, and consistent finish.

.10 Remove excess compound promptly as work progresses and upon completion.

.5 Notify Consultant when work is complete and ready for inspection, and prior to concealing or enclosing firestopping and smoke seal materials and service penetration assemblies. Arrange for final inspection of work by local governing authority inspector prior to concealing or enclosing work. Make any correction required.

.6 On completion of firestopping and smoke sealing installation, submit a letter of Assurance to Consultant certifying the firestopping and smoke sealing installation has been carried out throughout the building to service penetrations and that installation has been performed in strict accordance with requirements of local governing building code, any applicable local municipal codes, ULC requirements, and manufacturer’s instructions.

.7 Manufacturer’s authorized representative to inspect and verify each installation and provide a test report signed by installing trade and manufacturer’s representative. Test report to list each installation and respective ULC certification and number.

.8 Where work requires removal of existing firestopping materials and replacement of firestopping materials after cabling changes have been made, ensure that replacement material is same material and manufacturer of existing if any remains in place, or ensure that all existing material is removed before installation of replacement material.

3.8 **INSTALLATION OF FASTENING & SECURING HARDWARE**

.1 Provide fasteners and similar hardware required for conduit, duct, raceway, conductors, etc. and for equipment hanger and/or support material unless otherwise noted.

.2 Accurately and properly set concrete inserts in concrete framework. Where multiple type inserts are used, space same to suit requirements of smallest conduit, etc., in group.

.3 Fasten hanger and support provisions to masonry with expansion shields and machine bolts, or, for light loads, use plugs, and screws.

.4 In drywall or plaster walls and/or ceilings use two wing toggles and for heavy loads, provide steel anchor plates with two or more toggles to spread load.

.5 Provide beam clamps for attaching hanging and/or support provisions to structural steel, or where approved by Owner and reviewed with Consultant, weld hanging and support provisions to structural steel.

.6 Install devices in accordance with manufacturer’s instructions to suit each respective application.

.7 Explosive powder actuated fasteners are not permitted unless specific written approval for their use and type has been obtained from Consultant.

.8 Under no circumstances use ceiling suspension hangers or grids for suspension of conduit and conductors. Install supports to permanent structure of building, limited to areas that will not damage structural stability.

.9 Provide "J" hooks in accessible ceiling spaces where conduit is not provided for structured cabling runs or other telecommunication cabling, as approved by Consultant.

.10 Comply with J-hook manufacturer loading limitations and spacing criteria. Do not exceed 1.2 m (4') spacing interval. Add additional J-hooks if cabling sags, at discretion of Consultant. Drill anchors for J-hooks into slab not into post tensioned beams. Do not install more than one system on each J-hook.

.11 Install Velcro tie wraps on bundled telecommunication cables and do not over tighten. Provide FT6/CMP rated wraps in plenum type spaces as per local building code requirements.

.12 Comply with Structural Engineer’s limitations for maximum penetrations of securing hardware into concrete slabs.

3.9 **INSTALLATION OF IDENTIFICATION NAMEPLATES**

.1 For each piece of electrical distribution equipment from electrical source of supply up to and including panelboards, for special control panels and cabinets, and for each other piece of electrical equipment, provide engraved Lamacoid identification nameplates secured to apparatus with stainless steel screws. Nameplates to indicate source of electrical supply and include Consultant’s equipment identification number.

.2 Equip large multiple cell or component apparatus such as switchboards and distribution panels with main nameplates identifying equipment, voltage characteristics, capacity and source of supply, and with sub-nameplates clearly identifying each cell or component and panel tag and location.

.3 Panelboard nameplates to identify panelboard number as designated on drawings, unless otherwise instructed. Nameplates for disconnect switches, control panels, and cabinets to outline their service and source of supply.

.4 In areas where equipment having removable doors that can be commonly installed on different equipment, ensure that each door is identified to which piece of equipment it is associated with, such that nameplates are with correct equipment.

.5 Faceplates for all wiring devices shall include source panel/circuit on machine printed clear self-adhesive label.

.6 Nameplates to be mechanically secured lamacoid and be colour coded as follows:

.1	Normal Power	Black with white letters;
.2	Emergency Power	Red with white letters;
.3	Isolated Power	Red with white letters;
.4	Vital Power	Yellow with white letters;
.5	UPS Power	Orange with white letters.

.7 Above identification nameplate and nomenclature requirements are for typical requirements for pricing only.

.8 In pull boxes, junction boxes and at terminations, identify feeders by use of plastic plates indicating system voltage and circuit designations. Plates to be 25 mm (1") in diameter and have letter stamped 9 mm (5/8") high. Colour coding to be:

.1 Phase A - red;
.2 Phase B - black;
.3 Phase C - blue;
.4 Neutral - white;
.5 Ground - green.

.9 Review print size type and size, colours, sizing and nomenclature of nameplates with Consultant prior to ordering. Submit sample board.

3.10 INSTALLATION OF TERMINAL BACKBOARDS

.1 Provide specified terminal backboards for communication systems and electrical distribution equipment.

.2 Securely wall mount each backboard with proper fasteners to suit wall construction.

.3 Unless otherwise noted, size backboards to sufficiently provide adequate terminal space for each system, plus 20% space for future additions.

3.11 INSTALLATION OF ROOFTOP SUPPORT SYSTEM

.1 Install rooftop support system for conduits/raceways in accordance with manufacturer instructions and recommendations to suit type of raceway and roofing materials.

.2 If gravel top roof, remove gravel from around and under pipe support. Coordinate work with building roofing vendor confirmed with Owner and reviewed with Consultant.

.3 Consult existing roofing vendor for roof membrane compression capacities and roof loading limitations. Comply with restrictions.

.4 Use properly sized clamps to suit conduit sizes. Ensure that installation and use of system does not invalidate existing roof warranties.

.5 Engage existing roofing vendor to inspect installation and verify that installation has not damaged roof.

3.12 BRANCH CIRCUIT BALANCING

.1 Connect branch lighting and power circuits to panelboards so as to balance actual loads (wattage) within 5%. If required, transpose branch circuits when work is complete to meet this requirement.

.2 Perform necessary tests to show compliance with above requirement. Make such tests after building is occupied.

3.13 **DISCONNECTION, REMOVAL & RELOCATION WORK**

.1 Where indicated on drawings or where required to perform Work of this Project, disconnect and remove items of existing obsolete electrical work. Relocate required devices as required to accommodate work of other Divisions. Where luminaires, switches, receptacles, and other devices and/or equipment is removed, disconnect at point of electrical supply, remove obsolete wiring and conduit up to source, unless otherwise noted, and make system safe to Owner satisfaction and as reviewed with Consultant. Remove obsolete conduit/raceways in accessible ceiling spaces, exposed locations, etc. Where existing obsolete conduit and similar raceway material cannot be removed, such as embedded in concrete, cut back and cap obsolete conduit and raceways. Refer to specific notes on drawings.

.2 When respective work is deleted, such deletions are to in no way affect operation of any existing interconnected mechanical or electrical components that remain. When existing circuits are being disconnected, maintain supervision of area to ensure that such circuits do not affect essential existing circuits being retained.

.3 Refer to architectural drawings which define extent of areas being demolished in existing building. Review drawings and site and include for demolition and/or renovation of services as required to accommodate alterations detailed.

.4 Unless otherwise noted, obsolete materials which are removed and are not to be relocated or reused are to become your property. Remove from site and properly dispose. Obtain from Owner and coordinate with Consultant, a list of existing electrical items which are to be removed and turned over to Owner. Said items are to remain property of Owner.

.5 Where existing services pass through or are in an area to serve items which are to remain, or pass through areas that are to be deleted, maintain services, but re-route as required. Include for rerouting existing services concealed behind existing finishes and which become exposed during renovation work, so as to be concealed behind new or existing finishes. Confirm with Owner services which are to be kept in service and operational.

.6 Revise panelboard directories accordingly, if affected by any renovation, disconnection, or removal of work. Use Owner’s actual room names/numbers.

.7 Protect existing devices being relocated or deleted to ensure that they are not damaged. Test such devices prior to disconnection and de-energization, to ensure that each device is in proper working condition. Ensure that motors are in proper rotation direction. Examine each device for damage. Report devices not working or with damage to Consultant prior to initiating any work. It will be assumed that devices are in proper working order and good condition if not reported.

.8 Provide junction boxes, outlet boxes, wiring, plates, etc., as necessary for complete relocation of devices. Clean relocated or temporary removed devices and equipment, and ensure that they are in good operating condition before being reinstalled. Where existing luminaires are relocated, clean luminaires and inspect for damage. Re-lamp relocated luminaires. Report defects or damages to Consultant. Do not splice conductors unless approved by Owner and reviewed with Consultant. Utilize junction boxes and terminal devices for proper extension of circuits where approved. Otherwise replace circuits with home run continuous run of suitable lengths.

.9 Provide blank coverplates on existing obsolete boxes which are to remain in position.

.10 After installation is complete, test parts of re-used or relocated electrical equipment and correct faults and grounds. Include for fire alarm verification company to verify any relocated devices and downstream affected devices, and verify system as required by local fire authority to suit actual relocation work. For other existing systems, engage manufacturers authorized representative or Owner's system maintenance contractor, to inspect and verify relocated devices. Coordinate and confirm exact requirements with Owner and/or Consultant. Document testing in test reports, signed by testing technician. Submit copies to Consultant.

.11 Interior, exterior or underground electrical services (including auxiliary services, telephone, fire alarm, P.A. System, etc.) to operating parts of building are not to be hampered under any conditions and to that effect, necessary work may have to be carried out on an overtime basis, at no additional cost to this project. Existing risers are to be maintained in service as required to feed other areas of building(s). Do not interrupt any services without prior written approval by Owner and reviewed with Consultant. Submit formal requests to Consultant outlining in detail requirements of proposal and wait for instructions from Consultant.

.12 Be present when new doors or openings are being cut into existing walls and ceilings. Should any damage occur to electrical system, restore system to a safe and sound condition.

.13 Where references are made on drawings that existing receptacles, etc., be extended and/or relocated to suit new construction, receptacles, etc., are to be tested and if found defective, be replaced with new devices. Cracked or broken cover plates are to be replaced and match Architectural finishes. Contractor may optionally replace existing basic receptacles, switches, and faceplates with devices matching existing devices.

.14 Be responsible for disconnecting power supply to branch circuits controlling lighting, receptacles, panels, mechanical equipment, etc., for safe removal of equipment, conduit, wiring, boxes, etc., affected by demolition.

.15 Close openings in boxes, panels, etc., that result from removal of equipment, conduit, wiring, fixtures, etc. Close openings in a proper manner and properly terminate and insulate cables to restore system to a safe operating condition, to Consultant's satisfaction.

.16 Be present and supervise removal of electrical equipment, P.A. speakers, etc., during demolition of ceilings, walls, floors, etc. Existing equipment which is not to be relocated but interferes with demolition, are to be temporarily relocated until demolition work is completed. Services to temporarily relocated equipment are to be maintained at all times.

.17 Remove and re-install existing ceiling tiles as required to perform work. Prior to removal, inspect tiles for damage and report any to Owner and Consultant. Any loose cabling is to be secured, and luminaires additionally supported with cables secured to ceiling slab. After work has been completed and successfully inspected, re-install ceiling tiles to existing standards and re-install devices. Be responsible for replacement of tiles and grid members damaged during work of Electrical Division. Comply with applicable governing authority requirements with regards to ceiling work in special areas.

.18 Where existing surfaces are damaged by Electrical Divisions work and/or where existing devices are removed from wall, ceilings, floors and other surfaces, and such deleted devices are not being replaced in same locations, patch locations of these removed devices and re-finish. Patching and finishing is to be provided by tradesmen skilled in particular trade or application worked on, to Consultant's approval. Where openings are left in existing ceiling tiles, replace ceiling tiles with new matching tiles approved by Consultant. Unless otherwise included for in other Divisions, include for:

.1 preparing existing surfaces to be filled and repainted to be cleaned as required to remove dirt, dust, oil, grease, loose paint, rust and any other foreign matter which would prevent proper bonding of new finish; sand glossy surfaces to uniform dull texture;

.2 filling in and patching surfaces with same material as existing surfaces; finished surfaces to match and line with existing adjoining surfaces;

.3 providing fire stopping materials to maintain fire rating of the existing surfaces; refer to specification article titled - Firestopping and Smoke Seal Materials.

.4 using paint rollers and/or brushes to apply and extend paint finish over full height and/or width of area affected, to a straight line in location determined by Consultant;

.5 applying sufficient number of coats such that patched area is indistinguishable to surrounding area;

.6 materials used to be of equivalent quality to existing finishes standards and be compatible with finishes to which they are applied;

.7 finishes to be approved by Owner and reviewed with Consultant.

.19 Check luminaires to be deleted for PCB ballasts. Disconnect and remove such ballasts. As specified previously, include for company specialized in such hazardous materials to remove and dispose such materials off-site in compliance with Ministry of Environment, Ministry of Transport and any other governing authority regulations.

.20 If at any time during course of building work, asbestos containing materials are encountered or suspected, cease work in area in question and immediately notify Consultant. Comply with local governing authority regulations. Do not resume work in affected area without approval from Consultant.

3.14 INTERRUPTIONS TO & SHUT-DOWNS OF SERVICES & SYSTEMS

.1 Shutdowns and interruptions to existing systems and services are to be coordinated fully with and performed at times acceptable to Owner and reviewed with Consultant. Generally, shutdown may be performed only between hours of 12:00 midnight Sunday until 6:00 a.m. Monday morning. Include for costs of premium time to perform work during nights, weekends or other times outside of normal working hours, which may be necessary to comply with stipulations specified herein this Article. Services for operation of existing non-renovated areas of building are to be maintained.

.2 Upon award of contract, submit to Consultant for review and approval, a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform Consultant and Owner in writing 5 working days in advance of proposed shut-down or interruption and obtain written consent to proceed. Do not shut down or interrupt any system or service without written consent. Note that shutdowns of some essential services may require additional advance notification time.

.4 Work associated with shut-downs and interruptions are to be carried out as continuous operations to minimize shut-down time and to reinstate systems as soon as possible. Prior to any shut-down, ensure that materials and labour required to complete work for which shut-down is required are available at site.

3.15 EQUIPMENT BASES & SUPPORTS

.1 Provide equipment bases and supports. Coordinate concrete pour for housekeeping pads and luminaire poles bases with Division 03. Ensure that applicable seismic restraint provisions are provided as per local governing building code.

.2 Secure floor mounted equipment in place on minimum 100 mm (4") high concrete housekeeping pads, minimum 100 mm (4") wider and longer than equipment base dimensions.

.3 Supply dimensioned drawings, templates, and anchor bolts for proper setting of equipment on bases and pads. Be responsible for required levelling, alignment, and grouting of equipment.

.4 Submit to Consultant for review, dimensioned shop drawings of structurally designed bases for support of large, heavy equipment. Indicate on shop drawings total weight of base, reinforcement, and equipment for which it is required.

.5 Unless otherwise noted, support equipment suspended above floor level with suitable welded or bolted prime coat painted structural steel angles or channels bracketed to wall or secured by hanger rods.

3.16 **CONCRETE WORK**

.1 Unless otherwise noted, concrete required for electrical work is to be provided as part of Work of Division 03. Coordinated exact requirements (sizes, locations) with General Trades Contractor.

.2 Layout, mark, coordinate and work with Division 03 contractor as required for installation of concrete necessary for duct banks, housekeeping pads, cubed openings, etc.

3.17 **EXCAVATION & BACKFILL**

.1 Unless otherwise noted, excavation and backfill work required for electrical work is to be done as part of work of Division 02 or 31, except for final hand grading work and backfill to 450 mm (18") above service which is to be done as part of electrical work. Mark out location and routing of excavation required for work as well as required depth. Ensure that bedding is graded to provide proper drainage for ducts as directed by Consultant.

.2 Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Confirm that local utilities have performed locates and marking out. Ensure inverts and locations are correct, prior to commencement of work. Where discrepancies are found, immediately inform Consultant, and await direction.

.3 Ensure that work is inspected by Consultant before covering and backfilling. Failure to do so prior to backfilling will require re-excavating work and re-backfill at no additional cost to Owner.

3.18 **CUTTING, PATCHING & CORE DRILLING**

.1 Unless otherwise noted, General Trades Contractors are responsible for cutting, patching, and core drilling of existing building required for installation of Work.

.2 Where added conduits and/or conductors penetrate existing construction, identify, and mark out locations for openings. Size openings to leave 13 mm (1/2") clearance around conduit and/or conductors. Coordinate work with General Trades Contractor.

.3 Ensure that openings in fire rated construction are sealed as per requirements of article titled "Firestopping And Smoke Seal Materials" specified herein this Section and as per Division 07, as applicable.

.4 Fire stop and seal openings as specified, and patch as required before end of workday. No openings are to be left open overnight unless approved by Owner and coordinated with Consultant.

3.19 **FINISH PAINTING OF ELECTRICAL WORK**

.1 Unless otherwise noted, finish painting of exposed Electrical Divisions work is to be performed as part of work of Division 09.

.2 Provide identification painting for electrical distribution equipment in accordance with application requirements of Division 09. Confirm exact finish colours with Consultant. Equipment requiring special colour identification painting to include but not be limited to following:

.1 pull boxes and junction boxes;

.2 communication system conduit;

.3 genset exhaust piping.

.3 Spray painting is not permitted unless approved in writing by Owner and reviewed by Consultant.

3.20 **PROVISIONS FOR FURNITURE SYSTEMS**

.1 Ensure that rough-in for electrical devices including but not limited to outlets, switches, thermostats, control devices, fire alarm devices and clocks and communications devices are located to avoid wall mounted systems furniture wall strips. Relocate conduit and devices which do not coordinate with systems furniture requirements identified on systems furniture drawings.

.2 Coordinate location of electrical conduits/ducts within floor slabs and mounted to underside of floor slabs, with location of free standing work stations and furniture systems.

.3 Coordinate connection of electrical and communication devices with systems furniture supplier. Generally, supply and installation of power, data and communication wiring and devices are by Electrical Division. Furniture system connection "whips" to be supplied by furniture system vendor and turned over to Electrical Division for installation. Confirm responsibility of supply of whip with General Trades Contractor. Power conductors are to be installed to a wall/ceiling mounted junction box and extended out to furniture system, through empty conduit, raceways, and back boxes provided within furniture system. Branch circuit conductors in furniture system raceways may be AC-90 flexible armoured conductors. Telecommunication (data/voice) conductors are to be complete home runs from LAN closet to work station outlet. Testing and verification of furniture system devices is responsibility Electrical Division. Confirm exact requirements with furniture system trades. Where furniture systems are not supplied with pre-wired devices, be responsible for supply, installation and wiring of required devices.

3.21 **CONDUIT PROVISIONS FOR MISCELLANEOUS SYSTEMS**

.1 Provide following components to accommodate future installation of various miscellaneous systems by system installers who are to provide equipment and wiring:

.1 conduit - diameters as sized on drawings with non-metallic fish wires or pull cords and suitable bushings for conduit terminations, and as specified in Part 2; provide labelling at each end to clearly identify each conduit run with respect to system and path;

.2 outlet boxes - standard galvanized steel, each complete with a blank type faceplate, and as specified in Part 2;

.3 pull boxes, junction boxes, back boxes and sleeves - and as specified in Part 2.

.2 Miscellaneous systems are typically as shown on drawings. Unless otherwise noted on drawings, provide dedicated conduit runs for each system. Coordinate sizes of boxes with respective system vendors to ensure proper sizing to accommodate components and that allows for wiring bending radii. Confirm conduit and box requirements also with system vendors.

.3 Provide pull boxes in conduit runs longer than 30 m (100') or having more than two - 90 bends. Size pull boxes to be at least 8 times entering conduit in length. Pull box sizes to comply with respective system standards.

.4 Leave conduits free and clear of all obstructions and terminate as required. Equip terminations with bushing, and clearly identify each run. Provide fish wires in all empty conduits. Run telecommunications conduits to comply with separation from sources of electromagnetic radiation as per standard ANSI/TIA/EIA-569. Site bend telecommunications conduit elbows to comply with system conduit bending radii requirements.

.5 Review exact requirements and locations of equipment with Consultant and respective system installers prior to roughing-in.

.6 Refer to system riser diagrams on drawings.

.7 Quantities for outlets to be as per floor plan drawings and not riser diagrams.

3.22 **DOOR HARDWARE**

.1 Generally, Division 08 or another Division not under scope of electrical Contractor, is responsible for supply and installation of door alarm contacts, door holders, electric strikes, electromagnetic locks, door operator controls, power supplies, door controllers, central electromagnetic lock release controller and other door hardware. Coordinate and confirm with General Trades Contractor and respective equipment vendors (door hardware / security) exact responsibility of each Division of the Work.

.2 Confirm product and wiring requirements, back box requirements and wiring installation requirements with door hardware trades and with equipment vendors. Provide required wiring in conduit from each device to respective controllers, between each device, and to central control panel and for power connection to such controls and devices. Provide line level voltage power feeds to equipment as required.

.3 For controls and interconnections between devices, when such device terminations are responsibility of others, supply and run interconnecting wiring in conduit to devices and allow spare length of 1.8 m (6’) coiled wiring at each end for final termination to devices by others.

.4 For applications of electro- magnetically held closed doors, engage fire alarm system vendor to provide fire alarm type pull station with auxiliary contacts as required for interconnection of electro- magnetic door hardware and fire alarm system for release of doors. Provide required wiring in conduit and connections. Coordinate pull station requirements with fire alarm system vendor.

.5 Exact type of door alarm contacts to be coordinated with door construction and finishes. Contacts to generally be recessed mounted and wiring be installed in concealed conduits. Confirm exact requirements with door hardware / security vendor and General Trades Contractor.

.6 Where controls are located remotely from door locations, such as in closets, provide wiring in conduit and extend from local above door junction boxes and devices as required with homeruns back to closet location of equipment and leave slack wiring for terminations by others. Confirm exact requirements with door hardware / security vendor and General Trades Contractor.

.7 Drawing details issued with electrical drawings are for pricing reference only and are based on assumptions. Obtain detailed design drawings from successful door hardware / security vendors and provide wiring in conduit to coordinate with and accommodate final systems designs. Coordinate with General Contractor.

.8 Submit as part of shop drawing submission, detailed responsibility matrix identifying wok and responsibilities of each trade and required interconnections.

.9 After installation is complete, test and verify operation of components in coordination with General Contractor and door hardware vendor.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products and accessories.

.2 Submit samples of conductors, when requested by Consultant.

Part 2 - Products

2.1 GENERAL POWER CABLES

.1 CSA approved, ULC labelled and certified. Unless otherwise noted, conductors to be copper and be suitable for applications as noted in governing local electrical code.

.2 RW90 CSA certified, single copper conductor to CSA C22.2 No. 38, 600/1000 volts, maximum 90°C (194°F) conductor temperature, -40°C (-40°F) minimum installation temperature, X-link polyethylene (XLPE) insulation, colour coded.

.3 T90 Nylon, CSA certified, single copper conductor to CSA C22.2 No. 75, 600 volts, maximum 90°C (194°F) dry conductor temperature, -10°C (-14°F) minimum installation temperature, PVC insulated, nylon covered.

.4 AC90 flexible armoured cable with "RW90" conductors and bare copper ground conductor and overall interlocked aluminium tape armour, to CSA C22.2 No. 51 (R2004).

.5 AC90 ISO-BX flexible armoured cable with "RW90" conductors with low temperature Exelene insulation and two additional solid copper bonding conductors (one bare, one insulated) and overall interlocked aluminium tape armour, to CSA C22.2 No. 51 (R2004).

.6 DLO stranded tinned copper conductor, to CSA type RW90, with 90°C rated ethylene propylene rubber insulation and black chlorinated polyethylene overall jacket; flame retardant and suitable for wet locations; rated for up to 2000 volts.

.7 Solid conductors to and including No. 10 AWG; stranded conductors in sizes larger than No. 10 AWG; branch circuit conductors constructed of 98% conductive copper; and approved for minimum 600 volts, with minimum 1000 volts where noted.

2.2 CONNECTORS

.1 Armoured cable connectors must be proper squeeze type connectors and plastic anti-short bushings at terminations.

.2 Connectors for conductors connecting to devices as per local governing electrical requirements to be equal to IDI Electric (Canada) Ltd., "Ideal" No. 451, No. 452 and No. 453, "Wing-Nut", CSA certified, 600 volts, rated pressure type connectors.

2.3 FIRE RATED CABLES

.1 Pentair - Pyrotenax, model "System 1850", CSA certified, ULC listed and labelled, FM Specifications tested, 600 V, type MI, 2 hour fire rated, copper sheathed, copper conductor, highly compressed magnesium oxide mineral insulated power cable. Connectors for copper-sheathed mineral conductors to be cable manufacturer proper connectors and accessories as recommended by manufacturer to suit specific applications.

.2 Pentair - Pyrotenax, model "System 1850 Twisted Pair", CSA certified as FAS, FAS 90 and FAS 105 cable, ULC listed and labelled, 300 V, type MI, 2 hour fire rated, copper sheathed, copper conductor, highly compressed magnesium oxide mineral insulated fire alarm and voice communication cable. Connectors for copper-sheathed mineral conductors to be cable manufacturer proper connectors and accessories as recommended by manufacturer to suit specific applications.

.3 Manufacturer termination kits: Pyropak epoxy sealing compound kits and "Quick Term" connectors; connectors for MI conductors to be cable manufacturer proper connectors and accessories as recommended by the manufacturer to suit specific applications.

.4 Cable clips and straps as recommended by cable manufacturer to suit specific installation application. In applications of dissimilar materials, provide tape to insulate cabling and hardware.

.5 Brass plates for cable openings in ferrous metal enclosures.

.6 Include for required cable manufacturer accessories and identification labelling.

.7 Include for manufacturer authorized technician to be present on site for initial coordination with installing personnel on review of proper installation of cabling runs and termination of cabling. After completion of Work, manufacturer technician to review installation work and provide in writing that installation work has been performed to satisfaction of cable manufacturer.

.8 Acceptable manufacturer of fire rated MI type cables is Pentair Thermal Management.

2.4 STANDARD CONTROL & COMMUNICATIONS CABLES

.1 ULC listed and labelled, CSA certified to C22.2 No. 127, No. 18 AWG "TEW" thermoplastic insulated, solid copper wire rated for 600 volts service, and 105°C (220°F) conductor temperature, complete with required number of copper conductors and colour coding.

.2 Nexans, "Securex II", FAS 105, 300 volts, 105°C (220°F) conductor temperature rated fire alarm system flexible armoured cable with solid copper conductor, shielding, flame retardant PVC insulation and red colour outer overall jacket, ULC listed and labelled and CSA certified to C22.2 No. 208.

2.5 CONDUCTOR PULLING LUBRICANT

.1 IDI Electric (Canada) Ltd., "Ideal Yellow 77" or "Wire Lube" as required.

2.6 TECK CABLES

.1 Nexans, "Firex II Teck" cables as follows:

.1 certified to CAN/CSA C22.2 No.131, Type TECK 90 Cable;

.2 rated for outdoor, weather resistant and wet locations applications;

.3 600/1000 V rated;

.4 Conductor: Bare, Soft drawn, Class B Compact or Compressed Stranded Copper conductors per ASTM;

.5 insulation: chemically cross linked thermosetting polyethylene (XLPE);

.6 bonding conductor (1/C Cable): Soft drawn bare copper;

.7 inner jacket: sunlight resistant PVC jacket tightly applied over assembly, to prevent slipping of core in a vertical position;

.8 armour: flexible interlocked aluminum armour, over inner jacket for mechanical protection;

.9 overall PVC jacket rated -40°C (-40°F).

.10 barrier tape over shield.

.2 Acceptable manufacturers are:

.1 Nexans;

.2 Prysmian Cables (Pirelli);

.3 General Cable;

.4 Aetna Cables;

.5 Kerite Company.

Part 3 - Execution

3.1 **PROJECT CONDITIONS**

.1 If identified in documents, verify that field measurements and conditions are as identified.

.2 Cable routing on drawings is schematic and approximate. Route cable as required to meet project conditions. Determine exact routing and lengths on site.

.3 Confirm fire protection ratings of construction to ensure that rooms and paths of conductors are fire rated in accordance with local governing codes requirements. Include fire rated conductors as required to meet local governing codes requirements.

3.2 **CO-ORDINATION**

.1 Co-ordinate work with work provided under other electrical work and work of other trades.

.2 Determine required separation between cable and other work.

.3 Determine cable routing to avoid interference with other work.

.4 Submit any alternative cable routing to Consultant for review prior to proceeding with work.

3.3 **INSTALLATION OF CONDUCTORS**

.1 Provide required conductors. Ensure fire rated conductors are provided for applications as required by local governing codes, standards and local governing authorities.

.2 In applications where multiple conductors in conduit are being run, provide a trapeze configuration of metal C-channels and threaded rod hangers to support cable/conduit from ceiling slab. Wall mounted cable/conduit brackets and ring type conduit hangers may also be permitted in applications approved by Consultant. Provide required cable support system accessories which are not specified herein or shown on drawings but are required for proper installation.

.3 Conductors, unless otherwise noted, to be as follows:

.1 for connections to electric heating coils in supply air ductwork systems, and for connections to other electric heating equipment where use of 90 degrees C. rated conductors are recommended by heating equipment manufacturer - "RW90";

.2 for conductors requiring fire rating by current regulations and local codes including feeders for emergency systems, fire fighter's elevators, fire alarm systems, other life safety systems and for applicable signal and control circuits of these systems - type "MI" CSA approved, ULC listed and labelled, 2 hour fire rated, copper sheathed mineral insulated copper conductors;

.3 climate controlled areas branch circuit wiring in accessible ceiling spaces and within stud wall construction consisting of drops down to luminaries and drops down stud walls to devices and in furniture systems - "AC90" flexible armoured cable ("BX") (maximum 6m (20') run permitted);

.4 for climate controlled areas wiring except as noted above or specified elsewhere in Specification or as noted on drawings - "T90 Nylon" or "RW90".

.4 Support flexible armoured cable in ceiling spaces and in stud wall construction with steel 2 hole cable straps to "Code" requirements. Flexible armoured cables must run in a neat manner parallel to building lines. Utilize centralized conduit runs to maintain maximum permitted runs of flexible armoured cables as specified. Provide insulating grommet at cut ends of flexible armoured cable to protect conductor insulation.

.5 Install compression connectors with proper dies and compression tool as per connector manufacturer instructions. Install cold shrink tubing and associated materials as per manufacturer instructions.

.6 Low voltage conductors to typically be No. 18 AWG "TEW" except for use in fire alarm system applications, unless otherwise noted. Provide specified fire alarm cables for fire alarm system applications or security system applications as approved by Code and local governing authorities. Conductors not installed in conduit or raceways to be fire insulated rated in accordance with latest governing Code Flame Spread requirements.

.7 When installing type NMD90 conductors through metal studs, provide insulating grommets on stud openings to protect conductor insulation.

.8 Generally, conductor sizes are indicated on drawings. Such sizes are minimum requirements and must be increased, where required, to suit length of run and voltage drop in accordance with applicable conductor voltage drop schedule appended to end of this Section.

.9 Do not use conductors smaller than No. 12 AWG in systems over 30 volts, unless otherwise noted. Do not use conductors smaller than No. 6 AWG for exterior luminaire wiring unless otherwise noted.

.10 Colour code conductors throughout to identify phases, neutrals and ground by means of self-laminating coloured tape, coloured conductor insulation, or properly secured coloured plastic discs. Colours, unless otherwise noted, to be as follows:

.1 Phase A - red;

.2 Phase B - black;

.3 Phase C - blue;

.4 Ground - green;

.5 Neutral - white;

.6 Control - orange.

.11 When pulling wires into conduit use lubricant and ensure that wires are kept straight and are not twisted or abraded.

.12 Control conductors, in addition, to be numbered with Brady Ltd. or Electrovert Ltd. Z type markers.

.13 Colour code conductors for communications systems in accordance with system component manufacturer recommendations.

.14 Neatly secure exposed wire in apparatus enclosures with approved supports or ties.

.15 Install low voltage conductors in conduits, unless otherwise noted within Documents.

3.4 INSTALLATION OF FIRE RATED CONDUCTORS

.1 Submit with shop drawings, copy of manufacturer detailed installation manual and testing procedures. Provide minimum 2 hour fire rated type "MI" CSA approved, ULC listed and labelled, mineral insulated copper conductors for following:

.1 feeders to emergency lighting panel boards;

.2 feeders to fire alarm control panels and transponders;

.3 feeders as required by Code requirements;

.4 fire alarm system feeders as shown interconnecting existing fire alarm system and additional system;

.5 applicable local governing code required applications for control and signalling conductor circuits of and between life safety equipment and systems;

.6 feeders and conductors as noted on drawings.

.2 Provide fire rated type "MI" conductors for specific feeders as required and as noted. Install type "MI" copper sheathed, mineral insulated conductors for applications noted above and as shown on drawings in strict accordance with the manufacturer instructions and recommendations. Refer to latest issue of Pyrotenax MI cable Commercial Wiring Installation Manual. Installation must be in a neat and professional manner as per manufacturer approval. Make arrangements for manufacturer technician to provide onsite services as specified.

.3 Provide Unistrut C-channels, clips, wall brackets, etc., as required and as recommended by cable manufacturer to suit the on-site installation conditions. Provide system of Unistrut hangers and rods spaced at minimum 1.2 m (4') but which must be confirmed with cable manufacturer, for running of cables. Where clips and other hardware are in contact with cables, insulate cables/hardware with suitable tape as per cable manufacturer recommendations for applications of dissimilar metals.

.4 Make terminations of "MI" conductors with manufacturer approved components and "Pyropak" or "Quick Term" connectors in accordance with the manufacturer recommendations. Obtain proper tools for cable terminals from the cable manufacturer. Terminations must be completed immediately once started to avoid moisture ingress from the surrounding air. Connections to ferrous cabinets for single conductor cables shall incorporate brass plates sized as required and as per cable manufacturer requirements. Brass plates shall be complete with required drilled and tapped holes. For 99°C applications, cable lugs shall be temperature rated as such.

.5 When pulling cable, apply pulling tension to the conductor not in the sheath of the cable. Limit cable pulling tension to as recommended by cable manufacturer.

.6 Terminate cable in the equipment with termination kits as per cable manufacturer instructions.

.7 Ground cabling as per cable manufacturer instructions and as per local governing electrical code requirements.

.8 Take necessary precautions when handling cable on reel to ensure that no damage will result in the uncoiling process.

.9 Where cables penetrates fire rated construction, provide ULC listed and labelled, fire stopping and smoke seal materials or fittings to protect integrity of fire rated construction. Install work in compliance with ULC standards and where required by local governing codes, provide tray type suitable for plenum environments.

.10 Test MI cables after installation, in strict accordance with cable manufacturer instructions. Megger terminations to check that insulation resistance is acceptable to cable manufacturer. Prior to completing each termination, test insulation resistance and follow cable manufacturer drying procedures until resistance reaches cable manufacturer listed acceptable level.

.11 Provide for cable manufacturer authorized representative to review the installation, termination, splicing and testing of installed cables. Prepare report consisting of test sheets with results of cables tested and a certificate of verification signed by testing engineer/technician. Report to include copy of cable manufacturer signed inspection letter documenting that work was performed to satisfaction of manufacturer. Submit minimum 3 hard copies and electronic copy to Consultant.

3.5 **INSTALLATION OF TECK CABLES**

.1 Provide cables as required for specific applications. Handle, install, and terminate in accordance with manufacturer recommendations and instructions and as herein specified.

.2 When pulling cable, apply pulling tension to conductor not in sheath of cable. Limit cable pulling tension to as recommended by cable manufacturer.

.3 Terminate cable in equipment with lugs and termination kits as per cable manufacturer instructions.

.4 Installation of cable splices and terminations to be made by personnel skilled in this type of work.

.5 Ground shielding as per cable manufacturer instructions.

.6 Take necessary precautions when handling cable on reel to ensure that no damage will result in uncoiling process.

.7 No splices are allowed unless justified by cable pulling tension calculations and approved in writing by Consultant. Obtain approval of splice location from Consultant.

END OF SECTION

MAXIMUM BRANCH WIRING DISTANCE FOR 120 VOLT SYSTEM AT 3% VOLTAGE DROP

WIRE SIZE	BREAKER SIZE (AMPERES)	15	20	30	40	50	60	70	80	100
	MAX LOAD AT 80% (AMPERES)	12	16	24	32	40	48	56	68	80
No. 12	-	24.4	18.3	-	-	-	-	-	-	-
No. 10	-	38.1	29.0	19.1	-	-	-	-	-	-
No. 8	-	59.4	44.2	30.5	22.9	-	-	-	-	-
No. 6	-	91.4	70.1	47.2	35.1	28.2	23.6	-	-	-
No. 4	-	-	109.7	73.2	54.9	42.7	38.1	32.0	27.4	-
NO. 2	-	-	-	114.3	85.3	68.6	57.9	50.3	41.1	35.0
No. 1	-	-	-	-	103.6	85.3	73.2	61.0	54.9	43.4
No. 1/0	-	-	-	-	128.0	102.9	85.3	73.2	64.0	48.8
No. 2/0	-	-	-	-	-	121.9	100.6	86.9	74.7	60.9
No. 3/0	-	-	-	-	-	-	118.1	102.1	88.4	70.1
No. 4/0	-	-	-	-	-	-	-	120.4	102.9	83.8
250 MCM	-	-	-	-	-	-	-	-	114.3	91.4
300 MCM	-	-	-	-	-	-	-		-	103.6

Note: Distances indicated in metres from panel to load for single phase.

END OF APPENDIX

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products and accessories.

Part 2 - Products

2.1 BASIC MATERIALS

.1 Ground Conductors: Solid copper, insulated and bare to suit application and code requirements; and bond conductors.

.2 Ground Connections:

.1 When making ground and bonding connections, apply a corrosion inhibitor to contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between metals used.

.3 Miscellaneous ancillary components to complete grounding and bonding work to requirements of local governing electrical authority and codes.

Part 3 - Execution

3.1 GENERAL GROUNDING & BONDING REQUIREMENTS

.1 Provide required grounding and bonding work in accordance with drawings, local governing electrical authority, governing authorities having jurisdiction and local governing electrical inspection authority.

.2 Connect grounding conductors to motors 10 hp and above or circuits 20A or above, with a solderless terminal and a bolt tapped to motor frame or equipment housing. Connect to smaller motors or equipment by fastening terminal to a connection box. Connect junction boxes to equipment grounding system with grounding clips mounted directly on box or with machine screws. Completely remove paint, dirt, or other surface coverings at grounding conductor connection points so good metal-to-metal contact is made.

.3 rovide service conductors exceeding 400 amperes with minimum No. 3/0 AWG grounding conductors, unless otherwise noted.

.4 Ground and bond various telecommunications, audio visual systems, security, life safety and control systems in accordance with respective system manufacturers recommendations and in accordance with local governing electrical code requirements.

.5 Ground conductors not sized on drawings are to be sized in accordance with local governing electrical authority requirements. Ground conductor size is to be no smaller than requirements specified herein this article or on drawings.

3.2 ADDITIONAL TELECOMMUNICATIONS GROUNDING

.1 Comply with TIA/EIA-607 grounding and bonding requirements.

.2 Provide wire and hardware required to properly ground, bond, and connect communications raceway, cable tray, metallic cable shields, and equipment to a ground source.

.3 Ground bonding jumpers to be continuous with no splices. Use shortest length of bonding jumper possible.

.4 Bonding Jumpers:

.1 Use insulated ground wire of size and type if identified on Drawings if not identified, comply with local governing code, but which is to be a minimum of No. 6-AWG insulated copper wire.

.2 Assemble bonding jumpers using insulated ground wire terminated with compression connectors.

.3 Use compression connectors of proper size for conductors specified. Use connector manufacturer's compression tool.

.5 Bonding Jumper Fasteners:

.1 Conduit: Fasten bonding jumpers using screw lugs on grounding bushings or conduit strut clamps, or clamp pads on push-type conduit fasteners. When screw lug connection to a conduit strut clamp is not possible, fasten plain end of a bonding jumper wire by slipping this plain end under conduit strut clamp pad; tighten clamp screw firmly. Where appropriate, use zinc-plated external tooth lockwashers.

.2 Wireway and Cable Tray: Fasten bonding jumpers using zinc-plated bolts, external tooth lockwashers, and nuts. Install protective cover; e.g., zinc-plated acorn nuts, on any bolts extending into wireway or cable tray to prevent cable damage.

.3 Ground Plates and Busbars: Fasten bonding jumpers using two-hole compression lugs. Use tin-plated copper or copper alloy bolts, external tooth lockwashers, and nuts.

.4 Unistrut and Raised Floor Stringers: Fasten bonding jumpers using zinc-plated, self-drill screws and external tooth lockwashers.

.6 Ground metallic conduits, wireways, and other metallic equipment located away from equipment racks or cabinets to cable tray pan or telecommunications ground busbar, whichever is closer, using insulated No. 6-AWG ground wire bonding jumpers.

.7 Ground metallic conduit at each end using No. 6-AWG bonding jumpers.

.8 Comply with cable tray manufacturer grounding and bonding recommendations. Bond metallic structures of wireway to provide 100% electrical continuity throughout wireway system.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings of products specified in this Section.

.2 Submit copies of documents requested herein, testing reports, certificate of approvals, and commissioning sheets.

Part 2 - Products

2.1 VIBRATION CONTROL & SEISMIC RESTRAINT

.1 Electrical equipment installation is to meet local governing authority having jurisdiction and code seismic requirements and additional requirements for vibration isolation.

.2 Provide labour, materials, and equipment required and necessary to seismically restrain electrical equipment and equipment bases including concrete pads, and guarantee function of materials and equipment supplied.

.3 Make electrical connections to vibration-isolated equipment with flexible conduit or other flexible means acceptable to Consultant and local governing authority having jurisdiction so as not to restrict maximum anticipated movement of equipment under seismic excitation movement.

.4 In event that inadequate isolation is provided by isolation product Manufacturer isolation package, be responsible for improving isolation to an acceptable standard at no additional cost to contract. Isolation product Manufacturer seismic restraint engineer to verify that seismic restraints and combination isolator/restraints intended for use on project are fit for intended purpose. Be responsible for ensuring that Manufacturer seismic restraints are in compliance with applicable local building code requirements for Place of Work.

.5 Provide additional seismic requirements for suspended electrical raceways, luminaires, and other equipment as per governing local authority requirements and requirements of current codes and by-laws.

.6 Acceptable manufacturers of seismic restraints include:

- .1 Vibro-Acoustics;
- .2 Mason Industries;
- .3 Kinetic Noise Control;
- .4 Eaton B-Line.

Part 3 - Execution

3.1 INSTALLATION

.1 Comply with seismic restraint Engineer and manufacturer installation recommendations.

.2 Obtain required training from Manufacturer representative on any special installation procedures. Install components in accordance with Manufacturer instructions to suit specific installation requirements.

.3 Test, adjust, and certify installation. Submit copies of test report to Consultant.

.4 Refer to Part 2 for specific installation requirements.

3.2 INSPECTION

.1 Inspect for removal of break away hardware to ensure proper torques of installed systems.

.2 For non-visually verifiable product, manufacturers to verify proper torque for a minimum 10% of application. Document torques for applications per Manufacturer instructions.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings of major electrical distribution equipment. Allow in shop drawing process, sufficient time for Consultant to review and make comments and for Contractor and equipment vendors to incorporate Consultant comments, necessary revisions and results of reports into equipment shop drawings. Do not order equipment until shop drawings are acceptable to Consultant. Time for this shop drawing review process will be at Consultant's discretion, but typically allow for 15 working days for initial review submission with additional 10 working days added to accommodate each resubmission.

Part 2 - Products

2.1 GENERAL SCOPE OF WORK

.1 Include for, but not be limited, to following:

.1 product manufacturers providing equipment inspection, testing, start-up, adjustments and verification;

.2 electricians/trades people on site to handle equipment, make temporary connections, operate equipment and make repairs and adjustments and assist Manufacturer / testing organization's personnel during on-site inspection, testing, calibration, start-up, verification work and where supplementary commissioning;

.3 coordination of work with testing company and equipment/system Manufacturer authorized technician in performing adjustments and start-up procedures to equipment/systems;

.4 preparing testing reports and documentation for submission to Consultant.

Part 3 - Execution

3.1 GENERAL ELECTRICAL WORK TESTING

.1 In addition to tests required by local governing authorities having jurisdiction, local codes and regulations, perform following:

.1 after luminaires, switches, receptacles, motors, signals, etc., are installed, whether same are installed as part of this Division or by other Divisions (telephone systems excepted), test work to ensure that there are no leaks, grounds or crosses;

.2 establish and ensure proper motor rotation - measure full load running currents and check overload elements - report to Consultant any discrepancies which are found; existing motors which have been worked on (disconnected and reconnected) must be checked with rotation meter to ensure proper rotation; be responsible for any damage caused by reverse rotation;

.3 demonstrate to Consultant that branch circuit voltage drop is within specified units;

.4 ensure that devices are commissioned and operable.

.2 Document results into distribution system testing report. Report must state that testing was successful and Work complies with project documents, applicable CSA standards, and other applicable governing codes and requirements.

END OF SECTION

Part 1 - General

1.1 **SUBMITTALS**

.1 Submit shop drawings for products specified in this Section.

1.2 **PRODUCT COMPATIBILITY**

.1 Lighting controls and luminaires when integrated together for control purposes must be 100% compatible with each other. Coordinate with ballast/driver and lamp manufacturers, dimmer/occupancy control manufacturers to ensure that components are compatible with each other and that interconnections do not affect performance, life or any warranties.

Part 2 - Products

2.1 **WALL BOX DIMMERS**

.1 Lutron Electronics Co. "Nova-T" Series, ULC listed and labelled, CSA approved wall box dimmers as follows:

.1 of type and size to suit intended loads;

.2 air gap accessible without removing faceplate, to meet UL20 and UL1472 short circuit test requirement for snap switches;

.3 withstand voltage surges up to 600 V and current surges up to 200 A as per ANSI/IEEE C62.41;

.4 voltage regulated;

.5 power failure memory;

.6 LC filtering to minimize RFI;

.7 linear slide with smooth and continuous square law dimming curve operation;

.8 snap on faceplate (seamless multi-gang at locations with multiple devices);

.9 finish to Consultant's direction.

.2 Where noted for applications of multiple wall box dimmers located in one location, provide CSA approved, NEMA 2 type, flush wall mounting, electrical cabinet with hinged locking front door, of painted enamel painted steel construction, complete with conduit knockout entries, flush trim and sized to accommodate dimmers. Refer to applicable drawing detail.

.3 Acceptable manufacturer is Lutron.

2.2 **OCCUPANCY SENSORS (STANDARD)**

.1 Legrand - Watt Stopper, CSA approved devices to provide automatic control of lighting with following components:

.1 power and slave packs;

.2 dual technology occupancy sensors;

.3 controls and daylight sensors;

.4 wiring in conduit and mounting hardware.

.2 Where required, power packs to be self-contained, 347/120 VAC/24 VDC (or of voltage shown on drawings) transformer relay system. Slave packs to contain isolated relay. System to allow one sensor to control luminaires circuited to both essential power circuits and normal power circuits.

.3 For applications in general areas: ceiling mounted, DT-355, dual technology type sensors as follows:

.1 combination passive infrared and ultrasonic technologies;

.2 when both PIR and ultrasonic technologies detect occupancy, lights turn ON automatically; once lights are ON, detection by either technology holds lights ON until occupancy is no longer detected and time delay elapses;

.3 can be set so that only one technology is needed to trigger;

.4 low voltage operation;

.5 360° lens area coverage, extending out up to 6 m (20') and area of 92.9 m^2 (1000 ft^2);

.6 low profile ceiling mounting design;

.7 integral light sensor;

.8 adjustable sensitivity and digital time delay;

.9 walk-through mode;

.10 LED indication of occupancy detection;

.11 isolated relay for interconnection to auxiliary control systems where required.

.4 For sensors mounted in ceiling/wall corners: series DT-200 with features as follows:

.1 combination passive infrared and ultrasonic technologies;

.2 when either or both (user set option) PIR and ultrasonic technologies detect occupancy, lights turn ON automatically; once lights are ON, detection by either technology holds lights ON until occupancy is no longer detected and time delay elapses;

.3 complete with adjustable swivel mounting bracket;

.4 wide dispersion lens area coverage, extending out up to 16 m (55') and area of 185 m^2 (2000 ft^2);

.5 low voltage operation;

.6 low profile design;

.7 integral light sensor;

.8 adjustable sensitivity and digital time delay;

.9 walk-through mode;

.10 LED indication of occupancy detection;

.11 isolated relay for interconnection to auxiliary control systems where required.

.5 For applications in washrooms and small storage rooms: wall mounted "DW-100" Series dual technology sensors as follows:

.1 wall switch sensor turns lights OFF and ON based on occupancy;

.2 factory default operation is for Manual-ON mode, so that users turn light on only when needed;

.3 variety of control options including Auto-ON operation, walk-through and test mode; additional settings allow choice of which sensing technologies hold ON or retrigger lighting;

.4 colour matched lens and low profile design;

.5 wide dispersion lens area coverage, extending out up to 10 m (35') and area of 37 m^2 (400 ft^2);

.6 infrared and ultrasonic technologies;

.7 adjustable time delays and sensitivity;

.8 manual pushbutton operation (override);

.9 low voltage or line voltage operation to suit specific applications;

.10 complete with required mounting accessories.

.6 For corridors or wide space coverage: Ceiling mounted, WT series, ultrasonic technology type sensors as follows:

.1 ultrasonic technologies;

.2 when ultrasonic technology detects occupancy, lights turn ON automatically; once lights are ON, detection holds lights ON until occupancy is no longer detected and time delay elapses;

.3 low voltage operation;

.4 corridor applications to include linear lens area coverage, extending out up to 13.5 m (45') in 2 directions;

.5 wider spaces applications to include wide dispersion coverage to suit space, up to 200 m^2 (2200 ft^2);

.6 low profile ceiling mounting design;

.7 integral light sensor;

.8 adjustable digital time delay;

.9 LED indication of occupancy detection;

.10 isolated relay for interconnection to auxiliary control systems where required.

.7 Override switches to be wall mounting in single gang recessed outlet boxes.

.8 Wiring in conduit, mounting hardware and ancillary devices to be provided as per Manufacturer requirements.

.9 System to be complete with initial 1 year parts and labour warranty, with additional extended 5 years parts warranty.

.10 Where sensors are interconnected to dimming system, ensure that they are 100% compatible with respective control systems, dimmers and ballasts. Confirm with respective equipment manufacturers and obtain in writing that such integrations are acceptable to each manufacturer.

.11 Generally, acceptable manufacturers are:

.1 Legrand-Watt Stopper;

.2 Hubbell;

.3 Sensor Switch;

.4 Leviton;

.5 NX Lighting Controls

Part 3 - Execution

3.1 **INSTALLATION OF WALL BOX DIMMERS**

.1 Provide flush wall box dimmers in locations and connect to control lighting as indicated. Confirm exact locations prior to roughing-in. Equip each dimmer with a faceplate. Confirm faceplate colour prior to ordering.

.2 Install components in accordance with Manufacturer instructions to suit specific installation requirements.

.3 Where identified, provide central enclosure cabinet for mounting dimmers within and connect complete. Clearly identify each dimmer and enclosure with engrave Lamacoid nameplates. Confirm exact nomenclature with Consultant prior to ordering.

.4 When installation is complete, check and test operation of each dimmer and adjust as required.

.5 Ensure that each dimmer is properly sized to suit connected load.

3.2 **INSTALLATION OF OCCUPANCY SENSORS**

.1 Provide occupancy sensors and daylight sensors and associated devices to control lighting in areas as required. Provide power packs as required with suitable voltage and power ratings.

.2 Exact type of occupancy sensors and type of lenses to be verified by manufacturer/supplier to ensure proper coverage in sensed areas only, and compatibility to interconnected systems. Confirm with respective manufacturers.

.3 Be responsible for providing, locating, and aiming appropriate sensors in correct location required for complete and proper volumetric coverage within range of coverage(s) of controlled areas per Manufacturer recommendations. Rooms to have 90-100% coverage to completely cover controlled area to accommodate occupancy habits of single or multiple occupants at any location within room(s). Locations and quantities of sensors shown and/or noted are illustrations only and should only be used as guidelines. Provide additional sensors if required to properly and completely cover respective room.

.4 Verify with Manufacturer factory authorized representative, exact type of sensor to be used in each area, placement of sensors and installation criteria, to best meet requirements of end user. Manufacturer representative should be consulted for more non-typical installation types. Ensure that sensors connected to dimming system are 100% compatible with dimming system.

.5 Where luminaires in rooms/areas are fed from normal and emergency power circuits, provide suitable relays and provisions to ensure that operation of luminaires on emergency power are maintained during loss of normal power.

.6 Proper judgement must be exercised in executing installation so as to ensure that best possible installation in available space and to overcome local difficulties due to space limitations or interference of structural components. Also provide, at Owner's facility, training necessary to familiarize Owner personnel with operation, use, adjustment, and problem solving diagnosis of occupancy sensing devices and systems.

.7 Install devices in accordance with Manufacturer instructions. Provide wiring in conduit. Provide required power connections and interconnection to luminaires and power panels. Provide manual switches to override control system in each area/room as shown.

.8 Confirm finishes of sensors with Consultant prior to ordering.

.9 Confirm mounting heights with Architect and manufacturer prior to roughing-in and installation.

.10 Adjust sensitivity and time delays to best suit Owner furniture layout drawings. Allow for minor adjustments of locations (1 m [3.3']) of sensors.

.11 Refer also to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

END OF SECTION

Part 1 - General

1.1 **SUBMITTALS**

.1 Submit shop drawings for products specified in this Section.

Part 2 - Products

2.1 **BRANCH CIRCUIT PANELBOARDS**

.1 Eaton, "Pow-R-Line" series, factory assembled dead front panelboards as per schedules, manufactured to CSA Standard C22.2 No. 29 and local governing electrical code, and designed for sequence phase connection of branch circuit breakers.

.2 As scheduled, panelboards are of types:

.1 "Pow-R-Line 1", 120/208 V, 3-phase and single phase with minimum "BAB" frame, bolt-on moulded case circuit breakers with a minimum interrupting capacity of 10 kA symmetrical at 208 V, unless otherwise scheduled.

.2 "Pow-R-Line 2" 347/600 V, 3-phase panelboards with minimum "GBH" frame, bolt-on moulded case circuit breakers with an interrupting capacity as scheduled or in absence of direction to be of capacity for intended application to local governing electrical code requirements.

.3 Where ground fault circuit interrupting (GFCI) type breakers are required by code and/or scheduled, provide "Quicklag" ground fault, CSA Class "A", Group 1, combination thermal magnetic bolt-on circuit breakers with solid-state ground fault interrupters.

.4 Panelboards to be equipped with one (1) continuous bus bar per phase. Each bus bar to have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. Bussing to be fully rated and of plated copper construction.

.5 Panelboards are to be complete with:

.1 NEMA 1, box constructed of code gauge galvanized steel with removable box ends, wiring gutter space on sides; conduit entries sealed water-tight;

.2 dead-front construction to shield user from energized parts;

.3 enclosure constructed of code gauge, hot zinc dipped galvanized steel constructed in accordance with UL 50 requirements; trim for flush or surface wall mounting as shown; front panel to not be removable with the door locked;

.4 hinged door with concealed fasteners, concealed hinge, chrome plated door latch and keyed alike lock with key;

.5 steel frame holder and circuit directory card protected by clear acetate and secured to back of door, and Mylar circuit breaker identification strips;

.6 drip shield for surface mounted panelboards;

.7 copper neutral bars;

.8 200% sized neutrals for panels equipped with SPD units and for panels as scheduled;

.9 solidly bonded equipment copper ground bar;

.10 high strength, set screw type, anti-turning wire connectors;

.11 current-carrying parts be insulated from ground and phase-to-phase by high dielectric strength thermoplastic;

.12 filler plates covering unused mounting space;

.13 non-automatic and automatic main breaker to function as an isolating switch, where shown and as required;

.14 ground fault circuit interrupting (GFCI) type breakers to feed devices as scheduled and for applications required by local governing codes;

.15 arc fault circuit interrupter (AFCI) type breakers to feed devices as scheduled and for applications required by local governing codes.

.6 Panels, doors and trim are to be factory painted with ANSI grey enamel finish. Recessed backboxes (tubs) need not be finished painted.

.7 Equip breakers of frame size 225 amperes and greater, with solid state adjustable trip units.

.8 Equip circuit breakers connected to dedicated equipment or devices with handle locks.

.9 Include spare breakers as sized on schedules and future breaker provisions as noted on schedules. Future breaker provisions to include space for breakers, bussing for full panel size and where future breaker sizes are scheduled, required breaker connector kits.

.10 Include spare breakers as sized on schedules and future breaker provisions as noted on schedules. Future breaker provisions to include space for breakers, bussing for full panel size and where future breaker sizes are scheduled, required breaker connector kits.

.11 Where indicated in the panel schedules, panelboards to be complete with integral 3 pole contactor, ratings according to panelboards mains rating complete with 24VAC control circuit for emergency power off (EPO) via remote pushbutton and "Power ON" red indicating light on panel front cover.

.12 Acceptable manufacturers are:

.1 Eaton;

.2 Schneider Electric (Square D);

.3 Siemens Electric Ltd.

2.2 **ENCLOSED CIRCUIT BREAKERS**

.1 Eaton, moulded case, front operated, surface mounted, non-automatic circuit breakers sized on drawings, each secured in NEMA 3R wall mounting enclosure with steel front panel and arranged so that circuit breaker can be padlocked in OFF position. Cover interlocked such that cover cannot be opened if breaker is in ON position.

.2 Acceptable manufacturers are:

.1 Eaton;

.2 Schneider Electric (Square D);

.3 Siemens Electric Ltd.

Part 3 - Execution

3.1 **INSTALLATION OF PANELBOARDS**

.1 Provide factory assembled branch circuit panelboards and install into locations and connect complete. Ensure adequate clearance is provided as per code requirements and as required for access for operation and maintenance. Load panels with breakers as scheduled.

.2 Support cabinets and enclosures independent of connecting conduit, and accurately install with reference to wall finishes.

.3 Equip panelboards with suitable lugs or provisions to accommodate main and branch conductors scheduled.

.4 Coordinate with Mechanical Division trades and Consultant to determine extra mechanical loads and BAS panels requiring use of specified additional 15A circuits and connect complete.

.5 Ground and bond equipment as per local governing electrical code and inspection authority requirements. Refer also requirements of Section titled Grounding and Bonding.

.6 Turn over to Consultant, prior to application for a Certificate of Substantial Performance of Work, a quantity of two (2) panelboard cabinet or enclosure keys per panelboard.

.7 Where two (2) or more panelboards are installed in one (1) cabinet, equip panelboards with double lugs and increase gutter capacity to accommodate additional cabling.

.8 Identify panelboard breakers in a permanent manner, and complete typed panelboard circuit directories identifying circuit number and type and location of loads supplied from each breaker to Consultant's approval.

.9 Include for spaces for future breakers, spare breakers and additional breakers for miscellaneous mechanical loads are included as per schedules and as specified.

.10 Test and verify ground fault circuit interrupting breakers as per manufacturer’s instructions.

.11 Ground and bond panel as per local electrical code requirements. Refer also to requirements of grounding and bonding article.

.12 Contractor to provide 3 spare/empty 1” conduits from top of panel into ceiling space. Spare conduits are in addition to conduits required for construction.

.13 Additionally, refer to testing, coordination and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements. Document test results and submit copy to Consultant.

3.2 **INSTALLATION OF ENCLOSED CIRCUIT BREAKERS**

.1 Provide wall mounted enclosed, circuit breakers for equipment. Include required accessories. Secure to wall construction and connect complete.

.2 Confirm exact locations prior to roughing-in.

.3 Ground and bond equipment as per local governing electrical code and inspection authority requirements. Refer also to requirements of grounding and bonding article.

.4 Provide a lamacoid identification nameplate for each enclosure. Lamacoid label to identify Panel tag, Voltage/phase, Current rating and “Fed from source panel”. Confirm exact nomenclature with Consultant prior to manufacturer.

.5 Additionally, refer to testing, coordination and verification requirements in Section entitled Electrical Work Analysis and Testing and include applicable requirements. Document test results and submit copy to Consultant.

END OF SECTION

Part 1 - General

1.1 **SUBMITTALS**

.1 Submit shop drawings for products specified in this Section.

Part 2 - Products

2.1 **SURFACE SERVICE RACEWAYS**

.1 Legrand-Wiremold, Series 4000, CSA certified, ULC listed and labelled, prime coated galvanized steel, 2-compartment, surface mounted, metal service raceways, complete with following:

.1 duplex grounding receptacles and mounting knockout plates;

.2 data outlet mounting bracket;

.3 telephone outlet mounting bracket;

.4 dual covers (one for power and one for communications);

.5 clips, couplings, brackets, fittings, elbows, boxes, tees mounting hardware, etc., for a complete raceway system;

.6 wiring for power.

.2 Legrand-Wiremold, Series 5400, CSA certified, ULC listed and labelled, 2-compartment, surface mounted, painted non-metallic service raceways, complete with following:

.1 duplex grounding receptacles and mounting knockout plates;

.2 data outlet mounting bracket;

.3 telephone outlet mounting bracket;

.4 clips, couplings, brackets, fittings, elbows, boxes, tees mounting hardware, etc., for a complete raceway system;

.5 wiring for power.

.3 Generally, type of raceways are noted on drawings, but in absence of direction, in areas where multiple services are required, provide multi-compartment raceways to suit application. Where only single service is required, provide single type raceways. Provide stainless steel type raceways in laboratories, testing rooms, and similar type rooms. Confirm exact requirements with Consultant.

.4 Coordinate and measure exact dimensions for lengths, to meet site installation. Where horizontal sections meet vertical sections, provide manufacturer proper connecting fitting such that there are no openings or exposed conductors. Ensure that bending radii requirements of various cabling standards are met.

.5 Coordinate requirements for data/voice jacks and wiring with telecommunications network cabling specialist trade. Size raceways for computer network structured cabling in compliance with EIA/TIA Standards for required Category of cabling as per section titled Structured Cabling System. Increase raceway sizing to suit.

.6 Acceptable manufacturers are:

.1 Legrand-Wiremold;

.2 Thomas & Betts;

.3 Hubbell;

.4 Panduit.

Part 3 - Execution

3.1 **INSTALLATION OF SURFACE SERVICE RACEWAYS**

.1 Provide surface mounted, service raceway assemblies complete with specified and required accessories necessary for a complete electrical raceway system. Site measure for proper lengths. Provide required type and quantity of receptacles. Confirm exact types for each application with Consultant prior to ordering. Confirm finishes with Consultant prior to ordering.

.2 Obtain required training from manufacturer representative on any special installation procedures. Install raceways in accordance with manufacturer instructions to suit specific installation requirements. Use manufacturer recommended tools for cutting and installing raceways.

.3 Assemble and secure raceways, boxes and other components to surfaces in accordance with manufacturer instructions and requirements. Connect complete. Where possible butt raceway ends to adjacent walls, cabinets, counters, etc. Where raceway is to be attached to equipment or sections of millwork, install raceway for full length of equipment/millwork, unless otherwise noted. Mount-faceplates flush to raceway with no gaps. Keep number of elbows, offsets and connectors to a minimum.

.4 Do not exceed wire fill requirements given in manufacturer instructions.

.5 Provide barriers for systems with different voltages in raceway.

.6 Test prewired raceways after installation work is complete.

.7 Provide wiring devices of types and standards as specified in wiring devices section.

.8 Coordinate requirements with structured cabling system vendor to ensure that raceways are suitable for and comply with standard for telecommunication jacks and cabling. Ensure that device mounting brackets are co-ordinated to suit final modular jack being installed.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

.2 Do not order any device unless finishes have been reviewed and approved by Consultant.

Part 2 - Products

2.1 SWITCHES

.1 Switches to be CSA approved, ULC listed and labelled devices.

.2 Hubbell Canada Inc., HBL 1221 Series, CSA approved, heavy duty, industrial grade, back, and side wired, AC quiet action toggle type, 20 ampere, 120-277 V switches. Switches to include steel-nickel plated bridge, nylon toggle, one piece rivet-less copper alloy spring contact arm and terminal plate, silver cadmium oxide contacts, brass binding head screws, one piece integral grounding terminal and stainless steel automatic grounding clips. Provide single way, 2-way, 3-way, and key type to suit specific application requirements.

.3 Hubbell Canada Inc. No. 1221-IL, CSA approved, heavy duty, specification grade, AC quiet action, illuminated polycarbonate handle toggle type, 20 ampere, 120-277 V switches.

.4 Acceptable manufacturers are:

.1 Hubbell Canada Inc.;

.2 Cooper Wiring Devices (Arrow Hart);

.3 Leviton.

2.2 RECEPTACLES

.1 Receptacles to be CSA approved, ULC listed, certified and labelled devices.

.2 Hubbell Canada Inc., No. HBL5262 / HBL5362 CSA approved, ULC listed, extra heavy duty, specification grade, back and side wired, flush, nylon face/body construction, duplex U-ground, 15/20 ampere, 125 V, 2-pole, 3-wire grounding receptacles complete with one piece nickel-plated brass mounting strip with integral grounding clips, ground retention clips, nickel-plated brass wiring clamps with nickel-plated brass screws, front circuit identification area and reinforced thermoplastic base.

.3 Hubbell Canada Inc., No. BR15TR series, commercial specification grade, 15 ampere, 125 V, 2-pole, 3-wire grounding, tamper-resistant (safety shutter) duplex receptacles.

.4 Hubbell Canada, No. GFR 5262SG / GFR 5362SG "AUTOGUARD" Series, extra heavy duty grade, 15/20 ampere, 125 V, duplex, ULC Class "A", Group One, tamper resistant, weather resistant ground fault circuit interrupting receptacles complete with automatic self-test diagnostics, green power ON LED, red ground fault LED and 10 kA short circuit current rating.

.5 Hubbell Canada Inc., No. USB 15X2 "Style Line" series, CSA approved, ULC listed, 2-USB ports (3.8 A, 5V DC, type A, class 2.0) and 15 ampere, 125 V rated duplex decorative power receptacles, tamper resistant, back and side wired.

.6 Hubbell Canada Inc., No. BR15C2GRY/BR20C2GRY “Permanently marked” plug load controlled series, industrial grade, permanently marked with two controlled faces symbol identifying controlled receptacle, CSA approved, ULC listed, back and side wired, nylon face/body construction, 15/20 ampere, 125 V, grounding, duplex receptacles; for use with automatic outlet control systems, and with factory broken split circuit tab allowing control of half of receptacle; interconnected to control module relays of lighting control system or other building control systems;

.7 Hubbell Canada Inc., No. 9430, EEMAC type 14-30R, 30 ampere, 125/250 V, 3-pole, 4-wire single electric clothes dryer receptacles with steel faceplates.

.8 Hubbell Canada Inc., No. 9450, EEMAC type 14-50R, 50 ampere, 125/250 V, 3-pole, 4-wire single electric range receptacles with steel faceplates.

.9 Hubbell Canada, No. IG 5262, heavy duty, specification grade, 15 ampere, 125 V, duplex, orange colour, nylon construction, back, and side wired isolated receptacles.

.10 Hubbell Canada, No. BR15TR series, specification grade, 15 ampere, 125 V, 2-pole, 3-wire, tamper resistant, safety shutter receptacles.

.11 Hubbell Canada, No. 4710, specification grade, 15 ampere, 125 V, single, 2-pole, 3-wire grounding twist lock receptacle.

.12 Hubbell Canada, No. 15 ampere and 50 ampere receptacles complete with neutral and ground conductors required for indicated number of phases as shown.

.13 Acceptable manufacturers are:

.1 Hubbell Canada Inc.;

.2 Cooper Wiring Devices (Arrow Hart);

.3 Leviton.

2.3 **FACEPLATES**

.1 Grade 18 8, type 430, 1 mm (0.032") thick stainless steel, satin, brushed or natural finish, complete with a peel off protective plastic film, and stainless steel screws.

.2 Hubbell Canada Inc., No. WP26E/WP26EH, NEMA 3R rated, CSA approved, ULC listed and labelled, single gang, vertical/horizontal mounting, weather-proof in-use, gasketted, cast aluminium faceplates for GFI receptacles in wet locations.

.3 Hubbell Canada Inc., No. HBL1795, ULC listed and labelled, single gang, vertical mounting, weather proof in-use, gasketted, clear bubble plate, silicone rubber faceplates for standard AC toggle switches in wet locations.

.4 Galvanized steel stamped faceplates.

.5 Acceptable manufacturers are as per switches and receptacles.

2.4 **PUSHBUTTONS OPERATORS**

.1 Rockwell Automation (Allen-Bradley) Ltd., 800T Series operators as follows:

.1 emergency off pushbuttons: oversized 60 mm (2-1/2") diameter red plastic mushroom head pushbutton with shroud, thrust washer, and an aluminum faceplate with "EMERGENCY POWER OFF" identification lettering or other nomenclature as required to suit application;

.2 pushbuttons: standard 30 mm (1-1/4") diameter plastic pushbuttons in Red/Green colours as required for application, momentary/maintained/2 position push-pull operations as required, flush/extended/mushroom heads; non-illuminated/illuminated, with aluminum faceplate with identification lettering nomenclature as required to suit application;

.3 key operated switches: standard 30 mm (1-1/4") diameter key cylinder lock operator, 2 or 3 position operations; non-illuminated, with aluminum faceplate with identification lettering nomenclature as required to suit application;

.4 with enamel painted steel or stainless steel faceplate for flush mounting onto recessed wall boxes or in millwork, suitable for mounting of devices;

.5 with NEMA 1 box for surface mounting applications in climate controlled areas, CSA approved for application and of size suitable for mounting of devices;

.2 Exact type and ratings of devices are to suit specific applications.

.3 Acceptable manufacturers:

.1 Rockwell Automation (Allen-Bradley);
.2 Eaton (Cutler-Hammer);
.3 Square D;
.4 GE.

2.5 **RETRACTABLE REELS**

.1 Gleason Reel, ACA Cord Reel, ACA Industrial series, CSA approved, ULC listed and labeled, designed for indoor and outdoor applications. Hazardous location types are to be provided in areas designated as hazardous locations. Requirements for end receptacles and boxes are to be as per drawing notes.

.2 ACA series features include:

.1 maximum operating capacity of 30A, 250V AC;
.2 Durable, corrosion resistant cast aluminum construction;
.3 Yellow or white powder coat finish;
.4 Movable guide arm can be mounted in two positions;
.5 Positive latch mechanism automatically maintains desired cord length;
.6 Ratchet lock can be disengaged in field for constant tension applications;
.7 16-10AWG, 3&4 conductor cord;
.8 10AWG fully rated at 30 amps;
.9 Bare SJO cable, length of 35ft;
.10 Dual Receptacle module complete with two (2) back-to-back, 120V, 15/20A, T-Slot, GFCI receptacles with two (2) USB Charging ports per receptacle

.3 Where applicable, determine classification of hazardous location and provide properly rated reel to suit classification requirements. Ensure that connecting conduits and boxes comply with hazardous location rating requirements.

.4 Acceptable Manufacturers:

.1 Appleton Electric;
.2 Crouse-Hinds;
.3 Thomas & Betts;
.4 Cooper Wiring.

Part 3 - Execution

3.1 **INSTALLATION OF SWITCHES**

.1 Provide switches and install in electrical outlet boxes. Refer to drawings to determine flush or surface mounting requirements. Generally, flush mount devices in finished areas. Size electrical boxes to suit device requirements as per device manufacturer recommendations. Properly ground device to box and ground system as per code requirements and manufacturer instructions.

.2 For pricing only, switches to be ivory for devices connected to normal power circuits, red for devices connected to essential power circuits including isolated power centres.

.3 Illuminated operation of lighted switches to suit specific applications as confirmed with Consultant.

.4 Ensure that switches located adjacent to doors are located at strike side of door. Confirm door swing requirements on architectural drawings, not on electrical drawings.

.5 Coordinate installation of door switches with trades responsible for provision of doors and frames. Confirm exact locations of switches with Consultant to ensure optimum operation of switch to door position.

.6 Additionally, refer to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

3.2 **INSTALLATION OF RECEPTACLES**

.1 Provide receptacles and install in electrical outlet boxes. Refer to drawings to determine flush or surface mounting requirements. Generally, flush mount devices in finished areas. Size electrical boxes to suit device requirements as per device manufacturer recommendations. Properly ground device to box and ground system as per code requirements and manufacturer instructions.

.2 Install USB charger receptacles in extra deep boxes in accordance with manufacturer recommendations.

.3 Provide machine printed clear label with black lettering identifying circuit number and panelboard from where each device is fed, and secure to device faceplates at all outlets. Review exact location for identification with Consultant.

.4 Where receptacles are indicated in counters and benches, box cut-out to be provided in counter and bench. Provide a box, receptacle, plate and branch circuit wiring. Branch circuit wiring within counters and benches to be flexible armoured cable, under requirements of local governing electrical code and standards. Install and connect complete.

.5 Install plug load controlled receptacles of type compatible with and coordinated with connected control system. Confirm compatibility of receptacle with control system vendor. Circuit split controlled receptacles as per local governing electrical code requirements.

.6 Review final device finishes with Consultant. Do not order any devices unless final finishes have been approved by Owner and reviewed with Consultant.

.7 Additionally, refer to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

3.3 **INSTALLATION OF FACEPLATES**

.1 Provide each switch and receptacle with a faceplate with an opening or openings suitable for device it conceals and covers openings around boxes. Secure faceplates to device frames with screws to match faceplates. Provide larger than standard type faceplates for devices that require engraved nomenclature to define special purpose for that device.

.2 Provide galvanized stamped steel faceplates in service areas and equipment rooms where devices are surface mounted.

.3 Provide stainless steel type standard size faceplates for flush mounted devices.

.4 For flush mounted devices, provide oversized faceplates as required to properly cover wall opening around recessed boxes.

.5 Provide faceplates with suitable identification labels. Review exact locations for labelling with Consultant.

.6 In addition to identification requirements specified with devices, provide faceplates with printed self-adhesive clear label with black lettering on outside face identifying circuit number and panel feeding device.

.7 Review exact material, finish, and colour of faceplates for devices in any particular area with Consultant prior to ordering.

3.4 **INSTALLATION OF PUSHBUTTON OPERATORS**

.1 Provide specified and suitable pushbutton operators and pilot lamps to suit various applications.

.2 Where flush mounted, provide faceplate for mounting onto recessed boxes.

.3 Where surface mounted climate controlled areas, provide suitable NEMA 1 box. In non-climate controlled areas, surface mounted devices to be mounted within minimum NEMA 3R rated boxes.

.4 Install devices in accordance with manufacturer instructions to suit application requirements of Owner. Connect complete to respective equipment being controlled. Provide required wiring in conduit.

.5 Test and verify operation of each device. Provide engraved lamacoid nameplate to identify system being operated and any special instructions. Confirm exact nomenclature with Consultant prior to ordering.

3.5 INSTALLATION OF RETRACTABLE REELS

.1 Provide retractable reels and secure to construction in accordance with manufacturer instructions. Ceiling box to be secured to ceiling slab or ceiling structure in manner to provide adequate support to entire assembly.

.2 Install devices in accordance with manufacturer instructions.

.3 Provide receptacles and boxes in required configuration and types.

.4 Ground and bond devices as per local electrical code requirements.

.5 Refer to and provide additional applicable testing requirements of distribution system testing and coordination study article.

.6 Provide engraved lamacoid nameplates for equipment and components. Prior to manufacture of nameplates, confirm exact nomenclature with Consultant in writing. During installation on site, provide temporary labelling until permanent nameplates are installed.

.7 Label outlets with circuit number and source panel.

.8 Test each device and assembly. Verify proper operation. Adjust as required.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

Part 2 - Products

2.1 DISCONNECT SWITCHES

.1 Eaton, heavy duty, CSA approved, disconnect (safety) switches. Features include:

- .1 front operated with a handle suitable for padlocking in "OFF" position and arranged so that enclosure cover cannot be opened while handle is in "ON" position
- .2 operating mechanisms: quick-break, positive acting with visible blades and a line terminal shield;
- .3 fusible units with fuse clips suitable for HRC fuses, unless otherwise noted;
- .4 ampere rating, number of poles and fuse requirements as indicated on drawings;
- .5 factory primed and painted switch enclosures.

.2 Disconnects for variable speed drives to be suitable for use with such drives and include auxiliary switch/contact to de-energize control power circuit, as required and as applicable.

.3 Enclosures for disconnects mounted in interior climate controlled areas and standard non-climate controlled areas to be NEMA 3R. For corrosive environmental applications, enclosures to be minimum NEMA 4X.

.4 Acceptable manufacturers are:

- .1 Eaton;
- .2 Siemens Electric Ltd.;
- .3 Schneider Electric (Square D).

2.2 FUSES

.1 Unless otherwise indicated, fuses to be Form I, Class "J" HRC fuses for constantly running equipment, and Form II, Class "C" HRC fuses for motorized equipment that cycle "ON" and "OFF".

.2 Fuses to be of type suitable for applications as required by local governing electrical codes and in coordination with respective equipment Manufacturer recommendations in which fuses are required. Coordinate also with Mechanical Division Contractor for requirements for Mechanical Division equipment.

.3 Fuses to be of product of one manufacturer.

.4 Acceptable manufacturers are:

- .1 Mersen (Ferraz Shawmut);
- .2 English Electric Ltd.;
- .3 Noram;
- .4 Cooper Bussmann.

Part 3 - Execution

3.1 **INSTALLATION OF DISCONNECT SWITCHES**

.1 Provide disconnects switches and install into locations and connect complete. Ensure adequate clearance is provided as per local code requirements and as required for access for operation and maintenance. Install as follows:

.1 wherever shown on drawings and/or specified herein;

.2 wherever required by MCC/VFD/starter schedule drawings;

.3 for motorized equipment which cannot be seen from motor starter location or is more than 9 m (30') from starter location (in accordance with local governing electrical code requirements);

.4 for "packaged" equipment fed from a motor starter panel.

.2 Ensure enclosure ratings are suitable for intended applications.

.3 Provide engraved Lamacoid nameplate with nomenclature reviewed with Consultant.

3.2 **INSTALLATION OF FUSES**

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Provide a complete set of fuses for each fusible disconnect, motor starter, and similar fusible equipment provided or supplied.

.5 Supply 3 spare fuses of each size and type used on project, mount fuses in cabinet. Secure cabinet in wall location as reviewed with Consultant.

3.3 **ELECTRICAL CONNECTIONS FOR MECHANICAL, OWNER, ETC., EQUIPMENT**

.1 Provide required electrical connections to apparatus provided and/or supplied by Electrical Divisions. Review shop drawings and coordinate with each equipment vendor, requirements for power feeds and control/communication interconnections and provide these requirements to complete installations work.

.2 In addition to providing electrical feeders and connections to equipment provided by Electrical Divisions, provide required electrical connections to apparatus provided and/or supplied by Mechanical Divisions, Owner and as part of other Divisions.

.3 Unless otherwise noted, provide electrical connections including power and control wiring for equipment supplied by Owner or by other Divisions, and except where specified for control wiring of Mechanical Divisions automatic control systems specification Section. Provide complete wired and empty conduit systems with fish cord, junction boxes, pull boxes, outlet boxes, faceplates, sleeves, etc. Provide disconnect switches, receptacles and other required wiring and connection accessories. Coordinate work with respective Consultants and suppliers of equipment to be provided with electrical connections.

.4 Refer to Division 11, and include for coordination and interconnections of Division 11 requirements and equipment schedule.

.5 Coordinate with trades of other Divisions to ensure provision of proper electrical requirements. Unless otherwise noted or reviewed with Consultant, be responsible for provision of interconnect wiring between remote operator devices, controllers, and equipment being controlled by operator devices, whether or not such devices/controllers are supplied by Electrical Divisions. Where equipment is of split unit design and line voltage is required to both units, be responsible for feeders to each unit as coordinated with equipment manufacturer and Division responsible for equipment. Provide disconnect switches, receptacles and other required wiring and connection accessories. Provide system/equipment power feeds with hard wired or receptacle type connections, as required. Coordinate exact requirements prior to start of work, at time of shop drawing submissions and prior to roughing-in of work. Coordinate work with suppliers of equipment to be provided with electrical connections which may include but not be limited to following:

.1 laboratory equipment;

.2 audio visual systems;

.3 telecommunication systems;

.4 mechanical systems and equipment.

.6 Provide coordination of alarm connections of equipment with Mechanical Divisions BAS Contractor. Refer to drawings of both Electrical Divisions and Mechanical Divisions for BAS points to be connected. Include for wiring in conduit, contacts, termination/junction boxes, etc., as required for inter connection.

.7 Mechanical Divisions are responsible for supply of motor starters and variable frequency drives (VFDs) (also known as variable speed drives -VSDs) and harmonic filters for motorized apparatus supplied by them and is to provide Lamacoid identification throughout. Motor starters, VFDs and/or MCCs are generally to be as scheduled. Generally starters are supplied in following manner:

.1 loose starters for mounting adjacent to apparatus or on motor starter panels;

.2 mounted starters in factory assembled and pre-wired motor control centres;

.3 mounted starters on factory assembled and pre-wired packaged equipment.

.8 VFDs (with harmonic filters where required) are to be supplied and set in position by Mechanical Divisions. Coordinate installation and connection requirements with Mechanical Divisions and respective equipment manufacturers. Obtain required wiring diagrams.

.9 Be responsible for following work:

.1 mounting loose starters and providing "line" and "load" power connections;

.2 making "line" side power connections to panelboards and "load" side connections to motors;

.3 making "line" side power connections to starters on "packaged" equipment;

.4 coordinating feeder entries to starters and starter assemblies with Mechanical Divisions;

.5 providing additional disconnect switches (complete with identification) detailed on drawings, or required by Code, or for apparatus which cannot be seen from its starter or is in excess of 9 m (30') from its starter;

.6 connections to thermistors and provision of additional relays as required for connections to starters; generally, Mechanical Divisions are to supply required thermistors and relays necessary for starters; review Mechanical Divisions specifications and/or drawings defining these requirements and include necessary work, wiring, conduit and components not being supplied by Mechanical Divisions;

.7 performing required motor starter interlocking in accordance with requirements specified and as outlined on starter schedules; coordinate interlocking requirements with Mechanical Divisions;

.8 ensure that an identification nameplate is provided on each motor starter or disconnect;

.9 ensure that an identification nameplate is provided on each disconnect switch nameplate is to identify name and voltage;

.10 ensure that an identification nameplate is provided and attached with stainless steel screws to each separately mounted 3-phase motor starter or group of 3-phase motor starters a suitably sized black-white-black Lamacoid nameplate engraved to read:

.11 "MOTOR(S) IS CAPABLE OF MAKING TWO (2) STARTS IN SUCCESSION, COASTING TO REST WITH APPROXIMATELY 15 MINUTES ELAPSED TIME BETWEEN STARTS, WITH MOTOR INITIALLY AT AMBIENT TEMPERATURE, OR OF MAKING ONE (1) START WITH MOTOR INITIALLY AT A TEMPERATURE NOT EXCEEDING ITS RATED LOAD OPERATING TEMPERATURE, IF ΩK^2 OF LOAD, LOAD TORQUE DURING ACCELERATION, APPLIED VOLTAGE AND METHOD OF STARTING ARE THOSE FOR WHICH MOTOR WAS DESIGNED."

.12 Where supplied by Mechanical Divisions and connected by Electrical Divisions, connect VFDs and harmonic filters in strict accordance with manufacturer instructions. Provide manufacturer recommended conductors and connectors to suit respective connected equipment. Provide required upstream fused disconnects or breakers and overload protection. Maintain separation of power and control conductors as per Manufacturer requirements to minimize effects of electromagnetic interference. Properly ground and bond equipment. Coordinate exact installation requirements with Mechanical Division and equipment vendors.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products of this Section, and on Schedule of Luminaires on drawings.

.2 Include photometric data, lamp, and ballast information for each luminaire. Include ballast data identifying maximum circuit loading limitations.

.3 Photometric data to include: total input watts, candlepower summary, candela distribution zonal lumen summary, luminaire efficiency, CIE type, coefficient of utilization, lamp type and lumen rating in accordance with IESNA testing procedures.

.4 Include copy of certification that lenses and louvers comply with local governing building code requirements for flame spread ratings.

1.2 WARRANTY

.1 Warranty requirements are as follows:

.1 unless otherwise noted, LED and LED drivers for a period of five (5) years from date of acceptance of Work by Owner for its intended use;

1.3 SUBSTITUTIONS

.1 Provide luminaires as specified in Schedule of Luminaires and as per documented List of Manufacturers, where applicable. During construction period, no substitutions are permitted unless compelling reasons are given and accepted by Owner and Consultant. A delay caused by Contractor's failure to order luminaires to meet construction schedule is not a valid reason.

.2 Make requests for proposed substitutions as per requirements of Section titled Electrical Work General Instructions and Division 01.

.3 Consideration of any proposed substitutions after Bid Period to be at Consultant's sole discretion.

Part 2 - Products

2.1 LUMINAIRES

.1 Provide luminaires in accordance with Schedule of Luminaires found on drawings. Luminaires are to be CSA approved or have special local electrical authority approval.

.2 Some luminaires as noted or directed by Consultant or identified in other Division documents may be supplied by Owner or under another Division of Work. Include in Bid, Work and materials to accommodate such fixtures, including:

.1 receiving and inspecting fixtures;

.2 complete installation;

.3 providing basic installation hardware not supplied by luminaire manufacturer;

.4 aiming and connecting;

.5 providing power feeders and conduit/boxes;

.6 cleaning, adjusting and testing;

.7 providing lamps where documented or as scheduled, unless otherwise noted or directed by Consultant or supplied with fixture by fixture manufacturer;

.8 provide required power connections and where luminaires are controlled via remote low voltage controller;

.9 include for installation of controller and providing required low voltage wiring in conduit and necessary connections;

.10 coordination of exact requirements with supplier of fixtures and Consultant prior to installation.

.3 Provide thickness of metal as indicated in Schedule of Luminaires and details, or as required so that luminaires are rigid, stable and resists deflection, twisting, warping or bending under normal installation procedures, re-lamping etc., or no less than requirements specified herein the specifications.

.4 Unless otherwise noted, construct fluorescent luminaire bodies from minimum 20 gauge cold rolled prime steel and of rigid construction to permit any suspension method without sag. Unless otherwise noted, provide body finishes of corrosion resistant, chemically treated and electrostatically spray painted baked white enamel. Reflecting surfaces to be white with an average reflectance of not less than 85%. Provide adjustable mounting brackets for troffers mounted in ceilings.

.5 Unless otherwise noted, linear and continuous linear architectural LED luminaires bodies to be constructed of extruded aluminum and of rigid construction. Unless otherwise noted, provide body finishes of corrosion resistant, chemically treated and electrostatically applied post powder coat finish. Efficiency not to be less than 69%.

.6 Unless otherwise noted, vandal resistant luminaires to be constructed of heavy duty extruded aluminum rails and die cast end caps, complete with stainless steel Torx with centre reject pin and Allen head set screws. Screw heads to be mounted and concealed under lens. Lens to be extruded UV stabilized polycarbonate lens with internal linear ribbed design.

.7 Provide neoprene or silicone gasketting, barriers and stops where required to prevent light leaks or water/water vapour penetration.

.8 Fabricate housings to allow for easy accessibility and replacement of parts.

.9 Fabricate fixtures with a minimum number of joints. Make unexposed joints by acceptable method such as welding, brazing, screwing or bolting. Soldered joints are unacceptable. Do not use blind metal tapping methods or rivets for fastening parts which must be removed during service, or for fastening electrical components and supports. Cast parts, including die-cast members, to be of uniform quality, close grained, rigid, true to pattern, free from blow holes, pores, discoloration, hard spots, shrinkage defects, and cracks or other imperfections that affect strength and appearance or are indicative of inferior metals or alloys.

.10 Reflectors and reflecting cones or baffles to be free of any tooling marks, spinning lines or marks by other assembly techniques. For fluorescent sources, iridescence to be low. Finishes to be equal to first quality polished, baffled, and anodized "Alzak".

.11 Lenses and louvres to comply with local governing building code and other local governing code flame spread rating requirements.

.12 Unless otherwise noted, construct acrylic lens from 100% virgin acrylic and not less than 3.22 mm (0.125") thick. Glass lenses to be minimum 9.5 mm (0.375") thick.

.13 Luminaires to be factory assembled and tested prior to delivery on site.

.14 Exposed parts and hardware of luminaires located in non-climate controlled areas to be corrosion resistant and weather resistant. Hardware to be tamper-proof. Manufacturer exterior luminaire poles with corrosion resistant finish and construction. Pole suppliers to ensure that poles supplied are suitable for steady wind velocity and gust velocity of area of installation, and suitable for total effective projected area of lighting equipment. Submit verification of this with shop drawings.

.15 When requested, submit luminaire samples.

.16 Dimensions for coves, valances, and strips as shown on drawings are for bidding purposes only. Job measure for exact dimensions of louvres, lenses and strips.

.17 Dimensions for linear and continuous linear LED as shown on drawings are for bidding purposes only. Job measure for exact dimensions requirements to suit installation location.

.18 Confirm exact colours and finishes of luminaires with Consultant after award of contract but prior to ordering. Obtain information in time to meet installation schedule.

.19 Products of same specified type to be of same manufacturer.

2.2 **LEDS & DRIVERS**

.1 General features include:

.1 CSA approved, ULC listed and labelled;

.2 Operating temperature:

.1 Luminaires for applications in non-climate controlled area: operating temperature range through -40°C (-40°F) to 60°C (140°F);

.2 Luminaires for applications in climate controlled area: operating temperature range through -20°C (-4°F) to 50°C (122°F);

.3 With rapid and changing development of LED technology, provide most technically proven and most advanced and successfully tested LED technology at time of installation;

.4 Specification standards to meet requirements of IES LM 79 and LM-80.

.5 Be 100% compatible with connected dimmer controls to provide dimming down to 5%.

.2 Light emitting diodes (LEDs) features to include:

.1 LEDs to be selected from same colour bin size for consistency in chromaticity and meet ANSI C78 377A as a minimum;

.2 generally, colour temperature range to be from 2700 K to 6500 K; specific temperature requirements to be identified on Schedule of Luminaires;

.3 minimum CRI of 80 ;

.4 rated life (based on 70% lumen depreciation level) from 50,000 to 70,000 hours.

.3 Driver (ballast) features to include:

.1 Operate from 60 Hz input source of 120 VAC with sustained variations of ± 10% (voltage and frequency) with no damage to driver;

.2 Output regulated to ±5% across load range;

.3 Power factor greater than 0.90;

.4 Total harmonic distortion less than 20%;

.5 Class A sound rating;

.6 Comply with ANSI C62.41 Category A for transient protection.

.4 Acceptable manufacturers to be as recommended by luminaire manufacturers.

Part 3 - Execution

3.1 **INSTALLATION**

.1 Provide luminaires as required. Obtain required training from manufacturer representative on any special installation procedures. Install products in accordance with manufacturer instructions to suit specific installation requirements.

.2 Before placing luminaire orders:

.1 verify quantity requirements;

.2 thoroughly review ceiling types, finishes and construction details; verify ceiling types with latest Architectural Drawings; order luminaires to suit correct ceiling type;

.3 ensure that required mounting assemblies, frames, rings and similar features are included;

.4 confirm colours and finishes with Consultant.

.3 Include for assembly and mounting of luminaires and lamps, complete with:

.1 wiring and connections;

.2 fittings and hangers;

.3 aligners;

.4 box covers;

.5 other accessories required for a complete, safe and fully operational assembly.

.4 Where outlet boxes locations are shown on drawings, they are diagrammatic only. Position outlet boxes to coincide with suspension hangers and knockouts.

.5 Install ceiling fixtures in centre of tiles unless dimensioned otherwise on Reflected Ceiling Plans. Locate hangers on tile centres or intersections. Mount recessed downlights, troffers, and surface mounted luminaires in or on full tiles. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.

.6 Cut holes for recessed luminaires to exact size so that gaps are not visible or luminaire trims cover gaps.

.7 Mount surface ceiling luminaires perfectly level or plumb, tightly to ceiling without showing a space or light leak between frame and ceiling.

.8 Carefully align linear luminaires shown in continuous lines or rows, so that rows appear as straight lines. Variation in alignment not to exceed 6 mm (1/4") for any 5 m (16') run.

.9 Provide spacers for fixtures mounted on low density ceiling material.

.10 Provide plaster frames for recessed fixtures in plaster or gypsum board ceilings.

.11 Prepare fixtures, trim and poles and standards required to be painted.

.12 Wiring between fluorescent lamp holders and associated operating and starting equipment to be of similar or heavier gauge than leads furnished with approved types of ballasts with equal or better insulating and heat-resistant characteristics.

.13 Protect wiring with tape or tubing at all points where abrasion may occur. Conceal wiring within fixture construction except where design or mounting dictates otherwise.

.14 Splices:

.1 Minimize number of splices.

.2 Make with approved mechanical insulated steel spring type connectors, suitable for temperature and voltage conditions to which splices are to be subjected.

.3 Splices are not to be made unless properly terminated in accessible identified junction boxes.

.15 Support luminaires directly by ceiling slab structure and not to formed steel decking, ceiling hangers, ductwork, piping, cable trays, etc.

.16 Do not tighten wing nuts, bolts, or screws that allow fixture adjustment for recessed adjustable fixtures.

.17 Install spread lenses only where called out on Schedule of Luminaires and Specifications.

.18 Use cloth gloves when handling reflector cones, louvers, halogen lamps, glass, sconces and all exposed surfaces of fixtures.

.19 Co-ordinate luminaire installation with work of other trades to ensure that necessary recessing depths and mounting spaces are provided.

.20 Install luminaires in accordance with applicable architectural drawing reflected ceiling plans and/or wall elevations and/or field instructions issued by Consultant. Confirm luminaire locations prior to roughing-in. In equipment rooms, shafts and similar secondary areas, install luminaires after mechanical and other major work is roughed in and adjust luminaire locations as required.

.21 Align and position all adjustable luminaires, and ensure that luminaires with adjustable lamp holders are properly positioned to correspond to lamps specified.

.22 Comply with requirements of local governing electrical code regarding support of luminaires in suspended ceilings.

.23 Independently suspend luminaires in suspended ceilings from ceiling slab. For each luminaire, provide minimum two (2) cable supports secured to ceiling slab and to luminaire. Confirm with local governing authorities and review with Consultant if a variance to this requirement can be made for specific luminaires of low weight.

.24 Connect luminaires to power circuits and controls as required. Refer to drawings notes and schedules. Include for both normal and emergency power circuits as required.

.25 Locate exit signs in final locations confirmed with Consultant and approved by local building code authority. Connect to power circuits as required. Where applicable for emergency power requirements, connect to emergency battery units. Relocate exit sign and re-direct direction arrows to suit local building code authority requirements and Consultant's directions.

.26 Notify Consultant immediately and relocate if necessary as directed by Consultant, if:

.1 fixture placement is in conflict with a structural beam, mechanical duct, plumbing pipe, etc.;

.2 space above ceiling is not sufficient;

.3 any reason that a fixture cannot be located where it is dimensioned or shown on construction documents.

.27 Provide seismic restraints to suspended luminaires, in accordance with latest local governing building code requirements.

.28 Ground and bond luminaires as per local governing electrical code requirements.

.29 Prior to turn over of Work to Owner, clean luminaires in manner recommended by manufacturer and to satisfaction of Consultant.

.30 Lamps to be new and intact when project is complete and ready for acceptance.

.31 Include a full lamp listing in Operating and Maintenance Instruction Manuals.

.32 Additionally, refer to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

END OF SECTION

Part 1 - General

1.1 **SUBMITTALS**

.1 Submit shop drawings for products specified in this Section.

.2 Include data sheets for cabling, faceplates, terminal cabinets, racks, etc., and proposed cabling testing sheets.

.3 Submit following:

.1 proof that final installation drawings have been reviewed by a Registered Communications Distribution Designer (RCDD);

.2 sample of proposed test sheet;

.3 written confirmation that telecommunication system vendor is Manufacturer valid certified system vendor for at least duration of contract work and is in good standing at time of Bid submission;

.4 written evidence (copies of cerificates) of vendor and technician qualifications;

.5 copy of system Manufacturer warranty.

1.2 **REFERENCE STANDARDS**

.1 Comply with latest editions of following, as applicable for project:

.1 ANSI/TIA-568-C family of Telecommunications Standards, including:

.1 ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises;

.2 ANSI/TIA-568-C.1 - Commercial Building Telecommunications Cabling Standard;

.3 ANSI/TIA-568-C.2 - Balanced Twisted-Pair Telecommunication Cabling and Components Standard;

.4 ANSI/TIA-568-C.3 - Optical Fiber Cabling Components Standard;

.5 Issued addenda.

.2 ANSI/EIA/TIA 606-B (CSA T528) - Administration Standard for Telecommunications Infrastructure of Commercial Buildings;

.3 ANSI/EIA/ TIA-607-B (CSA T527) - Grounding and Bonding Requirements for Telecommunications in Commercial Buildings;

.4 ANSI/EIA/TIA-569-C (CSA T530) - Commercial Building Standards for Telecommunications Pathway and Spaces;

.5 ANSI/TIA-526-14-B - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant;

.6 ANSI/TIA/EIA-526-7 - Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant;

.7 Latest Building Industry Consulting Service International (BICSI) standards;

.8 Applicable local Building Codes.

.2 Work to be installed by system manufacturers certified system installers/vendors who are certified and experienced in implementing selected data cabling system and to perform related testing programs.

.3 System final installation layout to be designed and/or reviewed by a RCDD. Submit shop drawings verifying this requirement.

1.3 **WARRANTY**

.1 System manufacturers to provide a minimum twenty (20) year full parts, labour, and performance warranty on all passive components including structural cabling system. These warranties to be provided in written certificate form and that guarantee following:

.1 passive system components, e.g. patch panels, UTP cable and outlet jacks, are free from manufacturing defects in material or workmanship;

.2 approved cabling systems exceed specifications of TIA-EIA 568B.2.1 standards for specified category, in particular for attenuation and near-end cross-talk, loss and bandwidth requirements;

.3 installation supports applications for which it was originally designed as well as future versions of system performance specifications and any future applications using TIA/EIA 586B.2.1 component and cabling standards;

.4 replacement or repair of any originally installed registered system component to be completed at no cost for parts and labour to Owner during warranty period. Any components repaired or replaced to be warranted for remainder of warranty.

.2 System manufacturers to provide in writing to Owner that in event of demise or failure or change in approved status of installing certified system installer/vendor, manufacturer to be responsible for providing another certified system installer/vendor to fulfil remainder of warranty conditions.

.3 Claim for repair procedure to comprise of contractor being notified of a problem and who will conduct necessary tests and repairs to correct problem. Should contractor be unable to resolve problem, contractor to contact system supplier who will take necessary action and provide any technical support to correct problem.

.4 Initial response time to a repair claim for a registered system to be within four (4) hours from time Contractor was notified of system fault.

.5 Ensure that selected network cabling component manufacturer includes a system warranty that is a true "end-to-end" structured cabling system warranty from a single manufacturer, which includes data/voice communications outlet and patch cord at workstation, horizontal copper cabling, and patch panel and patch cords at LAN room.

1.4 **SCOPE OF WORK**

.1 This Section provides minimum standards for provision of a structured cabling system to network computer systems for complex. Requirements for network electronics are responsibility of Owner Network Integrator. Work includes but is not to be limited to following:

.1 provision of category grade rating Category 6A cabling system for wireless access points within complex which can support use of intelligent network switches with Network Management capabilities;

.2 provision of category grade rating Category 6 cabling system for wall devices within complex which can support use of intelligent network switches with Network Management capabilities;

.3 organized wiring in a structured cabling system using point to point distribution system incorporating modular terminations;

.4 provision of data and voice cabling, data and voice communications outlets, patch panels and associated equipment;

.5 system testing and verification;

.6 coordination of system requirements and integration requirements with integrated systems.

.2 The local area network system must be "protocol neutral" and provide users access into a variety of resources from any location within the Complex. An Ethernet backbone shall be utilized for the system with intelligent network switches coordinating and managing data flow. The wiring configuration is based on a "physical star" topology in which cabling runs emanate in a radial pattern from the main data communications room in which the intelligent switches are located.

.3 Technical features of the structural cabling plan include:

.1 use of Category 6A cabling to each data outlet serving wireless access points.

.2 use of Category 6 cabling to all other data/voice outlets;

.3 use of modular Category 6A jacks at wireless access points ends of data cabling run;

.4 use of modular Category 6 jacks at workstation ends of data/voice cabling run;

.5 backward compatibility to categories 5e, 5 and 3.

.4 The network cabling system vendor shall coordinate with Electrical Contractor to ensure that properly sized conduits, back boxes outlet boxes, junction boxes and floor boxes are provided of sufficient size as per EIA/TIA Standards to accommodate Category system wiring and devices, with particular emphasis on bending radii of cabling. Replace to suit, Conduit and boxes not meetings required Category rating requirements.

.5 Design system to support minimum 802.11a/b/g/n/ac standards.

1.5 **SYSTEM SUPPLIER QUALIFICATIONS**

.1 Vendor responsibility for provision of system to have following qualifications:

.1 being an established communications and electronics contractor that has and currently maintains a locally run and operated business for at least five years and holds applicable provincial and local licenses;

.2 be an Authorized Distributor or established franchisee for manufacturer of product/system proposed with full Manufacturer warranty privileges and be capable of providing post warranty service;

.3 employ technicians who have attended and successfully completed Manufacturer technical certification classes for proposed system;

.4 show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to system on a 24-hour/7-day basis;

.5 maintain at their facility necessary spare parts in proper proportion as recommended by manufacturer to maintain and service equipment being supplied.

.2 Submit written evidence of qualifications with shop drawings submission.

.3 Vendors not meeting any of the above qualifications may be disqualified at Owner’s discretion and replaced with qualified vendor acceptable to Owner.

Part 2 - Products

2.1 **HORIZONTAL CABLING**

.1 Colour coded Data (White) cables shall be 4 conductors, solid copper #24 AWG, 100 ohms balanced, Cat 6A/CAT 6 UTP (enhanced unshielded twisted pair) cable.

.2 Category 6 system to exceed ANSI/TIA/EIA 568-C.2-1 standard for a Category 6 cable. Demonstrate that proposed Manufacturer solution is guaranteed to exceed Category 6 requirements across entire swept frequency range of 1 - 250 MHz, by margin as per base specified product. Submit with shop drawings, ETL test reports to verify full channel performance of cable.

.3 Plenum rated UTP CMP cable (NFPA 262 Flame rating) is to be used exclusively in all ceiling spaces above tile. Whether or not those areas are designed as plenum areas or not.

.4 For installations in all ceiling spaces, Cat 6A pleanum rated cables shall be Panduit #PUP6AM04WH-UG, UTP, CMP, NFPA 262, CMP, cable.

.5 For non-plenum use, Cat 6 cables shall be Panduit #PUR6C04WH-U (white), Cat 6, UTP, CMR, riser cable.

.6 For installations in air plenums, Cat 6 cables shall be Panduit #PUP6C044WH (white), Cat 6, UTP, CMP, NFPA 262, CMP, plenum cable.

.7 Incoming copper cabling to be provided with suitable lightning protection devices. Refer to additional requirements later in this Section.

2.2 WALL DEVICE BOXES

.1 Recessed/flush mount device boxes to be based on the following specifications:

.1 Single gang cover plate mounting bracket (where applicable) - Cooper B-Line #BB15.

.2 Single gang cover plate mounting bracket (where applicable) - Cooper B-Line #BB10.

.2 Surface device boxes to be based on the following specifications:

.1 Single gang deep cast box, grey, with 3/4" threaded hubs (conduit fill rate 4 cables=44.6%, 3 cables=33.5%) - T&B #TD14-2

.2 Two gang deep cast box, grey, with 1" threaded hubs (conduit fill rate 6 cables=41.1%, 5 cables=34.5%) - T&B #T&B 2IHD5-3 (1” box); Note: requires single gang reducing plate Panduit #MIWBAIW.

2.3 OUTLETS

.1 Data/voice outlets to be based on the following specifications:

.1 Provide RJ-45 jacks Panduit #CJ688TGOR (CAT6, orange) and Panduit #CJ6X88TGWH (CAT 6A, white) data outlets.

.2 Where 1 jack is shown provide a 2-position faceplate, Panduit #CFPL2IGY

.3 Where 2 jacks are shown provide a 4-position faceplate, Panduit #CFPL4IGY

.4 Where 4 jacks are shown provide a 6-position faceplate, Panduit #CFPL6IGY, and an appropriately sized box.

.5 Provide snap-in plastic dust covers on blank outlets and unused outlets.

2.4 PATCH PANELS

.1 Terminate all computer data and voice cables on 24 port modular patch panel(s) Panduit Mini-com #CP24BLY mounted in standard floor mounted 19 inch-wide equipment rack (Minimum depth 19 inches).

.2 Panels to be loaded with jacks. Each jack connector module to have a T568 (ISDN) eight pin RJ 45 jack on front and IDC type connectors on back. Confirm pin orientation with Owner and review with Consultant. Panels to mount onto standard EIA 19 inch racks or cabinets and have capability to be stacked in larger systems. Horizontal data and voice cabling for various server/hub rooms to terminate onto patch panels provided into floor standing equipment enclosures, as detailed and as required. Consult with Supervisor of Network Services, Information Technology Services Dept. for approval of wall mounting equipment enclosures.

.3 Patchpanel system to include required accessories such as bezels, harnesses, pigtails, connectors, jumpers, and retaining rings, interlay racking panels, horizontal wire managers etc., to provide for patch cord management.

2.5 **PATCH CORDS & CABLES**

.1 Copper data patchcords to be Panduit #UTP6ASD7 (Off white) Panduit Advanced MaTriX Cat6A (SD-small diameter) UTP, CM, 7ft patch cord. Note: Consult with Supervisor of Network Services, Information Technology Services Dept. for additional patch cord colour requirements.

.2 Copper patchcords to be factory terminated and tested, and be provided in lengths to meet manufacturer's requirements to comply with required category grade performance standards. Provide patchcords in quantities to accommodate requirement that each port is active. Unless otherwise noted, patchcords at workstation ends are responsibility of others.

.3 Include for provision of suitable patchcord extending to Owner's switch/server in room/rack. Confirm exact requirements with Owner and review with Consultant.

.4 Where voice terminations are terminated onto wall mounted blocks, include for required patch cord to extend to rack voice patch panels and patchcords to further extend to Owner switch/server in room/rack. Confirm exact requirements with Owner and review with Consultant.

2.6 **PUNCHDOWN BLOCK TERMINATIONS**

.1 Capacity of connectors to be to suit number of conductors. Confirm and coordinate exact type of termination means with local carrier/provider and review with Consultant. Mounts to be suitable for wall mounting.

.2 Category 6 punchdown block bases for termination of UTP cabling and connecting blocks; finished in white; can be interlocked and stacked to accommodate system capacity; of types to be either rack mounted or panel mounted to suit application and room requirements.

.3 Cross connect jumper wire, patch cords, cable HUB harness or pigtails as required.to extend connections from blocks to patchpanels and to Owner's switches/servers.

.4 Connecting tool, termination kits, designation strips, labels, and wiring distribution rings.

2.7 **OPEN EQUIPMENT RACKS**

.1 Each data hub to have equipment mounted on a 19" standard rack, 44U-83" tall floor standing rack R.F. Mote #RFM-1944-RB.

.2 Vertical rack cable managers, 44U size, both sides with doors R.F. Mote RFM-RVCM-B.

.3 Vertical power bar - 15A, 12 plug minimum, black, with breaker, UL, cUL approved and must be vertically mounted. #RFM-VRTBC200-10.

.4 Note: If space is limited, consult with the Supervisor of Network Services, Information Technology Services Dept. for alternative wall-mount solutions.

.5 Each rack to include grounding provisions to meet previously listed standards, which include but are not limited to following provisions:

.1 copper ground strip mounted on side rail extending full height of rack;

.2 equipment jumper kits, to bond network equipment to rack ground strip;

.3 common bonding network to rack jumper kit, to bond rack to room common bonding network;

.4 hardware including, copper compression HTAPS, paint piercing washer kits, bonding screws and electrostatic discharge port kits.

.6 Racks to be of size and quantity to accommodate respective number of patch panel ports to suit number of required drops, quantity of network electronic components as directed by Owner network integrator, uninterruptible power supply unit and an additional 20% spare capacity for future expansion.

.7 Within LAN rooms, provide flexible steel type wire basket tray to manage cabling to and from racks. Refer to cable tray section for tray requirements.

2.8 **WIRELESS LAN INFRASTRUCTURE**

.1 Provisions for a wireless LAN infrastructure to be provided with 100% coverage of entire complex, utilizing structured network cabling system as a rough-in for future wireless access points (WAP) located in ceiling spaces. Generally, quantity of outlets to be identified on drawings, but Electrical Divisions contractor to coordinate device locations with Supervisor of Network Services, Information Technology Services Dept.

.2 Locations may generally be shown on drawings, however, following criteria to be followed:

.1 above accessible ceiling tile or high up in open ceiling areas as confirmed with Consultant;

.2 classroom priority:

.3 in service areas and public areas as identified on plans;

.4 in light cove if WAP is hidden;

.5 with access panel (location identified).

2.9 **ACCEPTABLE NETWORK CABLING SYSTEM MANUFACTURERS**

.1 Horizontal copper structured cabling infrastructure is to be end-to-end solution from a single manufacturer, which includes data communication outlets and patch cords at workstations, and patch panels and patch cords at LAN/Telecommunication rooms.

.2 Acceptable network cabling system manufactures for provision of horizontal network copper cabling infrastructure are:

.1 Panduit

.2 Belden/CDT;

.3 Commscope Systimax/Uniprise;

.4 TE (Tyco AMP);

2.10 **ACCEPTABLE CONTRACTORS**

.1 Contractor selected for installation of structured cabling system to provide confirmation of following:

.1 detailed knowledge and experience in fibre optic cabling and category grade rating copper UTP wiring installations;

.2 detailed knowledge and experience in installation of Intelligent HUB equipment;

.3 experience in troubleshooting and problem solving in data communication networks.

.4 ability to provide system Manufacturer certified warranties;

.5 certified and valid proof of being system Manufacturer authorized vendor.

.2 Refer also to supplier requirements specified in Part 1.

Part 3 - Execution

3.1 **INSTALLATION OF NETWORK CABLING - GENERAL**

.1 Properly handle and install structured network cabling in accordance with Manufacturer specifications. Avoid undue pulling tension, abrasion, or rough handling to ensure that cables will permit transmission up to required category rating design speed for cables. Install cables without splices or cuts to ensure elimination of reflections, discontinuities, impedance mismatches, etc. maximum horizontal length of copper cabling from workstation to network switch is not to exceed 90 m (295') or less if recommended by system manufacturer to meet required category grade rating performance standards. Maximum length of patch cables (either cross connects or interconnecting with electronic equipment to connect devices at work area outlet), to be a total of 10 m (30'). Maintain system Manufacturer minimum channel lengths as confirmed with system manufacturer. Provide cable loops in accordance with Manufacturer instructions.

.2 Unless otherwise noted or where cable tray is shown for such use, run cabling in conduit. Install pull cords for future use, in conduits extending between floors.

.3 Generally, no more than two (2) 90-degree changes in direction are recommended for cable installed in conduit without pull boxes and not more than 40% fill ratio. Confirm exact conduit bending radii restrictions and fill ratios with system manufacturer and comply with those standards.

.4 With consideration in minimizing alien crosstalk to levels as per BICSI standards and Manufacturer standards, dress cables in a neat and orderly fashion from entrance of communications closet to relay racks using vertical and horizontal cable management trays and paths. Do not exceed Manufacturer distance limitations to maintain required category rating performance standards.

.5 Care to be taken to ensure that during installation, nicks, abrasions, burning and scuffing of cable is prevented. Replace cables found to be damaged regardless of whether cable passes category grade rating or fibre performance testing standards.

.6 Secure bundled cables transitioning between floors via ladder cable tray, to vertical ladder sections with Velcro wraps. Use waterfall (rounded transition) fittings for cable changing from a horizontal path to a vertical one. This is to maintain minimum bend radius for cabling system. Support cables running through risers between floors such that they are properly supported for their weight, especially in situations with high pair count cables and large bundles.

.7 Electrical Contractor and telecommunication system vendor to provide coordination of structured cabling system with other systems as required. Review data outlet and connection requirements with various system vendors and provide data drops to equipment as required. Size head end equipment to accommodate these additional outlets.

.8 Required necessary drilling and anchoring components to be installed before any horizontal cable is installed.

.9 Route horizontal cable into equipment racks/enclosures and neatly bundle with Velcro cable ties. Maximum number of cables per bundle to be 25.

.10 Securely mount fire retardant plywood on wall in each telecommunications room or closet.

.11 Cables wraps are to be Velcro type and are not to be over tightened.

.12 Provide grounding and bonding requirements as specified in Section titled Grounding and Bonding.

3.2 **INSTALLATION OF PATCH PANELS & ACCESSORIES**

.1 Provide patch panels onto racks in locations. Provide terminating hardware and connectors to suit incoming and outgoing cabling. Clearly identify each port. Provide patch cords as required. Install devices in accordance with system Manufacturer requirements.

.2 Terminate both data and voice horizontal cabling onto patch panel punch down using Manufacturer recommended tools. Bundle cabling in neat configuration and secure to patch panels and rack assemblies. Typically dedicated separate patch panels are required for data and voice.

.3 Install rack enclosures on walls. Neatly bundle wiring within wiring management channels. Do not over tighten Velcro straps. Ground racks as required.

3.3 **INSTALLATION OF TERMINATION HARDWARE**

.1 For main telephone service incoming conductors to main communication closets and other conductors as detailed, provide required punchdown connectors and mounts on hardwood backboards on walls or on racks. Refer to drawing details. Design system layout to best suit incoming and outgoing cables. Properly punchdown cabling with manufacturer’s required tool and label each connector as required.

.2 Run interconnect cables neatly secured and bundled across connectors and between banks of mounts. Use D-rings to their full advantage. Neatly bundle pigtails and secure to IDC connectors.

.3 Where wall mounted, align mounts in straight formations to provide a neat installation and to minimize interconnect wiring lengths.

.4 Where horizontal cables are terminated to patchpanels, provide appropriate patch cords/ jumper cables to interconnect patch panels to respective wall mounted punchdown blocks.

.5 Clearly and properly identify each cable and block terminations.

.6 Co-ordinate with Owner’s network integrator to determine exact requirements for telephone service interconnections.

3.4 **COPPER CABLE INSTALLATION**

.1 Run horizontal, UTP cables continuous from end to end with no splices. Install horizontal cables in Star topology, emanating from rack mounted patch panel(s) and terminating on data outlet faceplates in rooms or other workstation locations. maximum length for horizontal cables to not exceed 90m (295'). Maximum length for patch cords at patch panel to not exceed 3m (10').

.2 Install conductors in cable tray and conduit runs designated for data and voice conductors. Do not fasten conductors and conduit to suspended ceiling support systems. Support conduit to building structure slab independent of other support.

.3 Terminations to involve as little outer jacket removal as possible and cable pairs "untwisting" is to not exceed 6 mm (1/4").

.4 Provide slack cable to allow for minor workstation relocations. Provide a coil of slack cable of an approximate 2 m (6') length for each workstation outlet run.

.5 Where conduits and/or cable tray is not being provided, conductors within accessible ceiling spaces to be properly bundled using "Velcro" type wraps and supported with "J" hooks. Secure "J" hooks to ceiling slab structure. Install conductors following building lines. Do not fastened conductors to suspended ceiling support systems. Obtain Consultant's approval in use of "J" hooks. Unless otherwise noted, drops down from ceiling spaces to consist of cabling installed in vertical conduits running down within walls to outlet boxes and terminating onto jacks.

.6 For main voice backbone cabling from main telecom room, provide 110 connectors and mounts on hardwood backboards on walls, as required. Design system layout to best suit incoming and outgoing cables. Properly punch down cabling with Manufacturer required tool and label each connector as required.

.7 Run interconnect cables neatly secured and bundled across connectors and between banks of mounts. Use D-rings to their full advantage. Neatly bundle pigtails and secure to BIX/110 connectors.

.8 Align mounts in straight formations to provide a neat installation and to minimize interconnect wiring lengths.

.9 Coordinate with Owner network integrator to determine exact requirements for telephone service interconnections.

.10 Provide jumpers/pigtails to interconnect backbone wiring to rack mounted voice patch panels where horizontal voice cabling is terminated.

.11 For horizontal copper backbone cabling, multi- pair conductor cabling is preferred. If available only in limited number of pair cabling, provide multiple runs to provide quantity as identified on drawings, and increase conduit diameters to suit exact number requirements, in accordance with of standards and codes.

3.5 PENETRATION THROUGH FIREWALLS

.1 Provide a conduit sleeve where horizontal cables penetrate firewalls. Size conduit sleeve at 40% fill ratio with a plastic bushing at both ends.

.2 After conduit sleeve is installed, fill opening around conduit with firestop and smoke seal materials.

3.6 INSTALLATION OF OUTLETS

.1 Connect each data/voice outlet with a 4-pair, UTP cable. Test and identify each outlet and faceplate. Wire and connect data/voice jacks back to respective dedicated racks in LAN/TEL rooms. As detailed, extend voice cabling from voice patch panels to wall mounted 110 connectors, using patch cords, cross connects/jumpers, etc. as required.

.2 Provide outlet jack/faceplate configuration as detailed on drawings.

.3 Drawings identify data jacks for wireless access point receivers (antennae). These locations are approximate. Confirm exact locations during onsite radio frequency studies. Allow for jacks to be repositioned up to 4m (15') to suit results of studies. Perform studies after completion of construction of interior structures. If studies are not performed at discretion of Owner, leave slack coiled length of cable on each run, allowing for repositioning and review with Consultant.

3.7 SEPARATION OF DATA COMMUNICATION CABLES FROM SOURCES OF ELECTROMAGNETIC INTERFERENCE

.1 Separate data communication cables from sources of electromagnetic radiation in accordance with standard ANSI/TIA/EIA-269 and following:

.1 FT-6 rated data cabling raceway and power conductors (2 KVA power circuits) raceway require 125 mm (5") clearance;

.2 for fluorescent luminaires, required clearance is 300 mm (12");

.3 clearance increases up to 600 mm (24") for power circuits over 5 KVA.

.4 for large motor, transformers, power panels, etc., required clearance is 1m (39");

.5 route cables to avoid direct contact with steam piping, hot water piping or other heat sources to avoid thermal degradation.

3.8 INSTALLATION OF RACKS

.1 Provide racks and secure to floor with bolts and concrete anchors.

.2 In locations where more than one rack is required, butt multiple racks together. Provide wiring channel interconnection such that wiring from rack to another is not exposed.

.3 For open racks, provide metal raceway chimney channel for conductors extending down from ceiling, such that wiring is not exposed. Secure channel to rack and ceiling.

.4 Run wiring neatly bundled within wiring management channels. Do not over tighten Velcro tie wraps such that they deform cable jacket. Velcro straps to easily slide along length of cable. Velcro tie wraps used in plenum spaces to be CMP/FT-6 rated.

.5 Protect cable from any obstructions using appropriate grommets in roof of rack.

.6 Properly ground and bond rack and equipment to room ground bus as per specifications and to standards of TIA/EIA 607.

3.9 INSTALLATION OF EQUIPMENT ENCLOSURES

.1 Provide equipment enclosures and secure to wall/floor/ceiling as required with suitable anchors.

.2 In locations where more than one enclosure is required, butt multiple enclosures together. Provide wiring channel interconnection such that wiring from enclosure to another is not exposed.

.3 Provide metal raceway chimney channel for conductors extending down from ceiling, such that wiring is not exposed. Secure channel to enclosure and ceiling.

.4 Provide suitable power supply to cabinets having fans and other active components or designated as such.

.5 Run wiring neatly bundled within wiring management channels. Do not over tighten Velcro tie wraps such that they deform cable jacket. Velcro straps to easily slide along length of cable. Velcro tie wraps used in plenum spaces to be CMP/FT-6 rated.

.6 Protect cable from any obstructions using appropriate grommeting in roof of enclosure.

.7 Properly ground and bond enclosure and equipment to room ground bus as per specifications and to standards of TIA/EIA 607.

3.10 SYSTEM IDENTIFICATION

.1 Provide a complete identification system that clearly designates following:

.1 horizontal cable;
.2 workstation (or faceplate);
.3 horizontal/passive patch panel port;
.4 switch/active patch panel port;
.5 patch cords;
.6 switch rack.

.2 Obtain Owner approval of identification format, prior to start of work. Format to comply with Owner standards. Submit proposed identification system and nomenclature with shop drawing submission.

.3 Labels:

.1 Labels for outlet and patch panel identification to be typewritten/computer printed self-adhesive type with white printing area at outlet location and on face of patch panel; legible permanent marker on inside of outlet box cover; use minimum font size Arial 10 point.

.2 Number and identify each computer hub rack with a 20 mm x 50 mm (3/4" x 2") engraved lamacoid plate, with white letters on black background. For letters and numbers use Arial 24 font size. Fasten nameplates with minimum two metal screws.

.3 Cable Identification:

.1 Permanently identify horizontal UTP cables at both ends of cable, placed within 13 mm (1/2") at outlet location and 50 mm (2") at rack location and inside of outlet cover in following manner:

.2 "CABLE # / RACK # / PATCH PANEL PORT # / OUTLET #"

.4 Faceplate:

.1 Label data ports: "Closet / Patch Panel/Port Number", where closets to be numerically assigned, patch panels to be sequentially alphabetically assigned beginning at top of rack and ports sequentially numerically assigned related to number of ports per patch panel.

.2 Label voice ports: "Port Number/Level/Closet", where ports are sequentially numerically assigned, level refers to floor level on which communication closet is located and closets to be numerically assigned as per data ports.

.5 Patch panel And Patch Cord Identification:

.1 Identify patch panel ports in simple numeric form approved by Consultant/Owner.

.2 Identify patch cords at both ends in simple numeric form, not necessarily corresponding to port numbers and be approved by Consultant/ Owner.

.4 Identification Log:

.1 Record cable and workstation identification in a hard copy "CABLE IDENTIFICATION LOG" which is to be handed over to Owner after cable testing and certification is complete. Forward duplicate copy to Consultant.

3.11 **CABLE TESTING & SYSTEM CERTIFICATION**

.1 Structured cabling system certification to include 100% cable testing and verification for an EIA/TIA required category grade rating solution.

.2 Perform verification of each cable and document on a cable testing sheet forming part of hard and soft copy documentation supplied at end of installation. Testing sheets to list detailed performance test measurements as requested and as required to prove compliance with referenced standards. Also include summary sheet of passes, failures and rectified failures. Submit sample of test sheet with shop drawings.

.3 Comply with system Manufacturer testing and certification procedures.

.4 Testing Procedures:

.1 Perform testing using Category 6 testers such as Fluke Networks Versiv family, or equivalent Microtest or Scope Communications. Tester to meet TIA/ISO certification standards for Levels IIe, III, IIIe, IV and V. Submit with shop drawings copy of calibration certificate issued by tester Manufacturer authorized technician identifying calibration within one year of use for testing on this project. Testing to include, but not be limited to following:

.1 wire map;

.2 cable length;

.3 attenuation;

.4 near end crosstalk (next);

.5 power sum near end crosstalk (PSNEXT);

.6 equal level far end crosstalk (ELFEXT);

.7 power sum equal level far end crosstalk (PSELFEXT);

.8 return loss;

.9 ACR;

.10 power sum ACR;

.11 end to end continuity;

.12 opens or shorts;

.13 pair polarity.

.2 Field testing units for multimode fibre optic cabling to comply with ANSI/TIA-526-14-B. Field testing units for singlemode fibre optic cabling to comply with ANSI/TIA/EIA-526-7.

.3 Conduct test set-up and performance in accordance with ANSI/TIA/EIA-526-7 and/or ANSI/TIA/EIA-526-14 Standards, and to Manufacturer application guides.

.4 Perform attenuation testing with a stable launch condition using two-meter jumpers to attach test equipment to cable plant. Light source to be left in place after calibration and power meter moved to far end to take measurements.

.5 Acceptable loss measurements for 50 micron laser optimized solution at 850 nm wavelength is not to exceed 2.5 db.

.6 Since optical signal attenuation at one wavelength is independent of attenuation at a second wavelength, measure attenuation of channel at both standard wavelengths (850 mm and 1300 mm) for backbone links.

.7 Replace cable not passing testing procedure, in its entirety. No splicing is permitted.

.5 Reports:

.1 Submit test results to system manufacturer and obtain Manufacturer certificate of approval of system. Submit detailed indexed test report in a 3-ring binder with Manufacturer certificate of approval and covering letter from company responsible for installation and testing of system stating accuracy of report. Letter to be signed by company authorized testing technician. Document testing and reports with date and time of testing, testing technician's name and signature and specification Section number that test fulfilled.

.2 Submit copy of report including test reports in digital format loaded on USB type memory flash drive.

3.12 **SYSTEM TRAINING & INSTRUCTIONS**

.1 Provide training of Owner designated staff on principles of connections and operations to system. Clearly instruct on procedures of disconnections and reconnections to accommodate changes and relocations of connected equipment.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

1.2 SOFTWARE NOMENCLATURE REPROGRAMMING

.1 Include additional costs for system Manufacturer to make necessary on site final changes to applicable system/equipment software. Make such changes after successful testing and verification of the systems, but prior to turn over to Owner. After successful final verification of the work, confirm and obtain approval of final nomenclature in writing from Owner and Consultant. Software revisions to incorporate final room names/area names/building names and equipment identification.

1.3 SYSTEM SUPPLIER/INSTALLER QUALIFICATIONS

.1 System supplier/installer to be an established communications and electronics contractor that currently maintains locally run and operated business for at least 5 years and holds applicable provincial and local licenses.

.2 Supplier/installer to be valid authorized distributor for product/system proposed with full Manufacturer warranty privileges.

.3 Supplier/installer to employ technicians who have attended and successfully completed Manufacturer technical certification training for proposed system.

.4 Supplier/installer to show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to system. Supplier/installer to maintain at their facility, necessary spare parts in proper proportion as recommended by system manufacturer to maintain and service equipment being supplied.

Part 2 - Products

2.1 WASHROOM EMERGENCY CALL SYSTEMS

.1 Provide an emergency call system consisting of CSA approved and/or ULC listed components to provide system in compliance with local governing codes and standards, with following operations:

.1 activated emergency call station in ADA designated washroom sends signal to audible and visual devices that indicate that someone in washroom needs assistance;

.2 audible devices and visual devices located over washroom door illuminate and sound tone when remote call stations are activated; visual and audible signals to be distinct and of different types of signals from other building systems;

.3 call stations, audible devices and visual devices to only be reset when call has been responded to and activated station locally reset.

.2 Remote stations to be tamper-proof, vandal-proof and with call pushbutton of minimum 32 mm (1-1/2") dia., but of greater size if required by local governing codes. Stations include reset button, call tone and call assurance LED light. Stations to include user able reset feature. Call tone to have adjustable sound level.

.3 Remote stations to be tamper-proof, vandal-proof and with 1.8 m (6') long PVC call cord. Stations include reset button, call tone and call assurance LED light. Stations to include user able reset feature. Call tone to have adjustable sound level.

.4 Signage: engraved lamacoid emergency sign that contains wording - "IN EVENT OF EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE" in letters at least 25 mm (1") high with 5 mm (3/16") stroke and that is posted above call station. Exact sizing and nomenclature to be as per local governing code requirements and reviewed with Consultant prior to ordering.

.5 Visual devices to be flashing LED type with Lexan lens and audible signal tone, mounted onto single gang stainless steel faceplate, and suitable for mounting onto recessed electrical box. Signals to be distinct from other building systems. Confirm LED colour with Consultant prior to ordering.

.6 Subject to approval of local governing inspection authority, interior audible and visual signals may be devices remote from call station but still within room and also must meet performance requirements specified herein. Flush mount in recessed boxes.

.7 Provide power supplies, wiring and mounting hardware as required and as recommended by system manufacturer.

.8 Wiring to be of type in accordance with applicable local governing codes and standards, and as recommended by system vendor.

.9 Provide system to suit application as shown and as required. Ensure that stations meet requirements of each application as recommended by manufacturer. Include required accessories to suit. Provide weatherproof and corrosion resistant devices for devices located in non-climate controlled areas.

.10 Verify system sequence of operation with local governing authority inspector and coordinated with Consultant.

.11 Manufacturer authorized vendor to supply, install, test, start-up and certify complete systems as required.

.12 Acceptable manufacturers are:

.1 GE (Chubb Edwards);
.2 Aiphone;
.3 TOA;
.4 Telecor;
.5 Rauland;
.6 Mircom;
.7 Jeron.

Part 3 - Execution

3.1 **INSTALLATION OF WASHROOM EMERGENCY CALL SYSTEM**

.1 Provide specified emergency call systems components and connect complete. Program sequence of operation as required and confirmed with Owner and Consultant. Exact programming requirements to be verified with local governing authority and coordinated with Consultant and/or Owner.

.2 Obtain required training from Manufacturer representative on any special installation procedures.

.3 Install devices in locations as coordinated with Consultant prior to roughing-in. Install components at mounting heights as noted on drawings and confirmed with Consultant. Generally, mount devices on recessed back boxes. Typically locate audible/visual devices above doorframe. Locate power supplies in service room accessible location confirmed with Consultant.

.4 Set sound level of interior audible devices at level acceptable to Owner and coordinated with Consultant. Adjust as required.

.5 Provide required system wiring. Wiring to be copper conductor, colour coded, and in accordance with system Manufacturer recommendations and instructions. Connect equipment in accordance with system Manufacturer certified wiring diagrams and instructions and under direct supervision of manufacturer. Run conductors in conduit.

.6 Install devices and perform work in accordance with Manufacturer instructions and requirements and in accordance to applicable codes of local governing bodies having jurisdiction.

.7 Confirm locations of devices prior to roughing-in.

.8 Provide a lamacoid identification nameplate for each enclosure. Confirm wording of identification nameplates and colour finishes of devices with Owner prior to ordering.

.9 Install signage as required. Locate in position and secure to wall with proper mechanical fasteners. Confirm exact nomenclature, sizing and locations with Consultant with shop drawing submissions.

.10 After installation is complete, test, adjust and verify operation of system. Demonstrate system operation and maintenance with Owner staff.

.11 Obtain approvals from local governing inspection authorities.

3.2 **TESTING & VERIFICATION OF SYSTEM**

.1 After completion of installation work, make arrangement with Consultant and Owner and manufacturer of equipment to have a final functional witness acceptance test, giving minimum 7 working days' notice to each party concerned to be present. Exact schedule of testing work to be approved in writing by Consultant.

.2 Include minimally the following:

.1 check of devices to ensure proper connections and supervision;

.2 operation of an initiating device on each circuit to verify required operation of alarm devices, annunciator and other installations;

.3 testing of signal devices for correct operation and function;

.4 testing of each secured door access control components and review of events reported at head end;

.5 testing of sequence of operation of system with integrated systems and equipment;

.6 start-up procedures;

.7 submission of detailed test report of system performance, signed by authorized testing technician.

.3 Include for system Manufacturer authorized technician to test this work and provide minimum one hard copy and electronic copy of signed report of the documented test results.

.4 Additionally, refer to testing, coordination and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

3.3 **TRAINING**

.1 Manufacturer trained technician to perform onsite training of each user (including the provision of user guides) prior to project completion to ensure that users are properly trained in the operation and maintenances of system.

.2 Refer to Instructions to Owner specified in Section titled Electrical Work General Instructions.

END OF SECTION

Part 1 - General

1.1 **SUBMITTALS**

.1 Submit shop drawings for products specified in this Section. Include annunciator schedules, revised system programming and sample of revised graphic annunciator layout and nomenclature.

.2 Submit copies of final system testing and verification reports and certificates of approval from local governing inspection authority.

Part 2 - Products

2.1 **EXISTING FIRE ALARM SYSTEM**

.1 Existing fire alarm system serving complex is EST, MODEL 3X-SFS1. Provide additional devices and work to extend system to serve additional and renovated areas. Additional devices to be 100% compatible with and of same manufacture as per existing system. Include provision of necessary control panel and annunciator work of existing system to accommodate integration of additional devices.

.2 Include for and engage Owner existing system manufacturer authorized technicians to provide and perform required system products and work.

.3 Verify with existing fire alarm system manufacturer during Bid period, exact requirements needed to provide renovation work. If necessary, visit site with manufacturer to review existing conditions. Confirm and coordinate exact work responsibilities with system vendor. Items of clarification or proposed revisions to Bid Documents must be reviewed with Consultant during Bid Period.

2.2 **ADDITIONAL FIRE ALARM SYSTEM WORK**

.1 System work to include but not be limited to provision of following:

.1 modifications to existing head end equipment including provision of additional device connection modules, zone modules, amplifiers and system re-programming;

.2 additional transponders/data gathering panels (DGP);

.3 additional initiating devices (pull stations, heat/smoke/flame detectors);

.4 additional alarm indicating devices (speakers, horns, strobes);

.1 All new horns sound pattern shall match sound pattern of existing-to-remain horns throughout the existing school.

.5 additional interfaces and interconnections to auxiliary building systems;

.6 review of existing battery backup capacity and amplifiers (as applicable) and increasing capacities to accommodate additional device loading and to meet applicable governing local code requirements;

.7 additional wiring in conduit and/or fire rated cables.

.2 Additional system components to be listed as products of a single manufacturer under appropriate category, by Underwriters Laboratories of Canada and bear ULC label. System components and work in conjunction with system installation to meet specific application requirements of local governing authorities, codes, standards, regulations and requirements of following:

.1 CAN/ULC-S524, Standard For Installation Of Fire Alarm Systems;

.2 CAN/ULC-S527, Control Units For Fire Alarm Systems;

.3 CAN/ULC-S537, Standard For Verification Of Fire Alarm Systems ;

.4 local governing building code;

.5 local governing building permit applications for approvals;

.6 other requirements of local governing authorities.

2.3 **MODIFICATIONS & DEVICES**

.1 Modify control panels and annunciators to supervise and annunciate additional and relocated devices. Additional initiating devices shall be devices that are 100% compatible with existing controls and be ULC listed and labelled for connecting to respective control units. Include costs for manufacturer authorized representative to perform control panel/transponder work and to reprogram system software to accommodate renovation work. Provide additional zone modules as required and additional batteries as required to supply back-up battery capacity to the additional components.

.2 Additional devices to be ULC listed and labelled devices suitable for fire alarm applications. Power supplies and other components to be CSA approved where required by local governing authorities and codes.

.3 Exact type of device to be used in each area of installation to be as recommended by system manufacturer to suit specific applications and to be approved for such use as per ULC standards. Devices in non-climatic controlled areas to be weatherproof, corrosion resistant and ULC listed for use in below freezing temperatures. System manufacturer to be responsible for ensuring compliance with these requirements.

.4 Devices:

.1 Additional smoke detectors and heat detectors: to be of type and rating to suit specific application as per existing system Manufacturer recommendations.

.2 Audible devices: of type to match existing system standards.

.3 Strobes and combinations strobes/audible devices: of type to match existing system standards; include additional strobes to meet latest governing building code requirements.

.4 Addressable modules as required for connection of additional devices.

.5 Ancillary devices as required to complete system.

.6 Refer to drawings for additional device requirements.

.5 End-Of-Line Resistors and Isolators:

.1 End-of-line resistors for standard alarm and signalling circuits to be sized to ensure correct supervisory current flows in each circuit.

.2 End-of-line resistors to be mounted on a stainless steel plate for mounting on a standard single gang box and bear ULC label.

.3 Isolators to be provided in accordance with code requirements and installed as per system Manufacturer requirements to isolate/monitor zones, loops, group of devices within building and between buildings.

.6 Wiring:

.1 CSA approved and ULC listed wire and cable, approved for fire alarm circuits; with colour coded, insulated solid copper conductors; of type as per local governing electrical code and local governing fire authority requirements.

.2 Sized and installed in accordance with system Manufacturer instructions and local governing electrical code.

.3 Fire rated MI for wiring as required by local governing building code, local governing authorities and as noted on drawings, for connections and interconnections to equipment for life safety applications.

.4 To be mechanically protected to satisfaction of local fire authority.

.5 Pentair "Pyrotenax" type "MI" ULC listed and labelled, 2 hour fire rated, mineral insulated, copper sheathed, copper conductors for power, control and signal wiring to and between each transponder/control panel, and for other local code required or local governing authority required applications with regards to life safety equipment.

2.4 **TESTING & VERIFICATION WORK**

.1 Refer to Part 3 for system testing, verification and certification Work.

Part 3 - Execution

3.1 **INSTALLATION - GENERAL**

.1 Prior to start of Work as part of shop drawing submission process, review with system manufacturer following:

.1 device types to ensure that selected type is suitable for intended application on project;

.2 locations of devices to ensure proper operation and coverage are in compliance with requirements of local fire authorities;

.3 device mounting heights to ensure proper operation and coverage are in compliance with requirements of local fire authorities;

.4 device back box requirements to ensure size and depth suit system Manufacturer recommendations for specific devices;

.5 types of system wiring and required sizing taking into consideration applications and voltage drop;

.6 system circuiting and device quantities per circuit while maintaining limitations in Specifications;

.7 proposed revisions required to existing system sequence of operation.

.2 Immediately advise Consultant of any requirements of above that may necessitate revisions to design documents.

.3 Install fire alarm system components and connect complete.

.4 Perform Work in conjunction with this installation to meet requirements of latest editions of local governing building code, local governing electrical code, ULC Standards including Installation Standard CAN/ULC-S524, and any applicable local governing codes. If any requirements of these specifications are different, omitted or contrary to ULC-S524 Standard, then ULC Standard governs and overrides these specifications, but in no instance will standards established by drawings and specifications be reduced by any of Codes referred to previously. Control units and annunciators to be in accordance to latest requirements of ULC Standard CAN/ULC-S527 "Control Units for Fire Alarm Systems.

.5 In addition, work to meet Owner's standards, and recommendations and instructions from system manufacturer.

.6 During work to existing fire alarm system, proposed time and duration of interruption to be approved by Consultant. At any time due to emergency situations, Owner may request by-passed zone(s) to be re-instated immediately. In all areas where renovation work requires shutdown of any part of fire alarm protection system, provide manual fire alarm protection (Fire Warden) by means of supervising area as approved by local governing authorities. At no time allow fire alarm system or any one (1) zone to be left inoperative overnight. Provide required bypass wiring and temporary wiring to maintain all parts of fire alarm system operative during construction and alterations.

.7 Fire alarm system Manufacturer authorized technician to supervise control panel, transponder, and annunciator work.

.8 Provide sequence of operation for fire alarm system as approved by local fire authority and reviewed by Consultant. Refer to additional requirements on drawings.

.9 Demonstrate system to local Fire Department and obtain their approval for complete system.

3.2 **INSTALLATION OF CONTROL UNITS**

.1 Install required additional transponders, and make modifications to existing controls, panels, and annunciator.

.2 Re-programme system to accommodate system modifications and to accommodate additional devices and zones, as required. Submit proposed software programming revisions to Consultant and local fire authority for review and approval prior to start of work.

.3 Install units in accordance with Manufacturer instructions.

.4 Connect transponders to dedicated 15A breakers in nearest emergency panel as shown or as scheduled. Ensure that room housing panels have fire rating to local governing code requirements. Provide fire rated conductors as required.

.5 Properly ground and bond transponders to building ground. Conduit ground will not be acceptable. Provide green coloured grounding loop, a minimum #10 AWG insulated copper conductor run in conduit. Connect ground loop to main building ground system source. Do not run ground wire in same conduit as fire alarm and communication wiring.

3.3 **INSTALLATION OF DEVICES**

.1 Install required devices. Do not install devices in locations that may hamper proper operation of devices including adjacent devices.

.2 Obtain required training from manufacturer representative on any special installation procedures. Install devices and perform work in accordance with Manufacturer instructions and requirements and in accordance to applicable codes of local governing authorities having jurisdiction.

.3 Review device finishes with Consultant prior to ordering.

.4 Install manual pull stations in boxes as required, recessed outlet boxes with plaster rings, except in unfinished areas where pull stations are surface mounted, in which case, install stations in surface mounted boxes. Comply with mounting height requirements for local governing building code barrier free access.

.5 Install mounting plate of thermal detectors to ceiling mounted boxes as required. Secure detectors to plates. Refer to floor plans and drawing symbol list to determine rating of detectors in any given area. Generally, do not install rate-of-rise type detectors in areas subject to sudden changes in temperatures, such as entrance vestibules. Confirm application requirements with system manufacturer and ensure that devices are ULC listed for such applications and are approved by local fire authority for such use.

.6 Secure base of each ceiling mounted products of combustion detectors to boxes as required, either flush or surface mounted as required. Secure detector heads to bases.

.7 Install cross zoned connection of detectors and remote indicating devices for areas of raised floors or within accessible ceiling spaces or for applications detailed on drawings.

.8 In application with hold open devices on doors, ensure compliance with NFPA regarding smoke detectors tied to hold open devices such that a signal received directly from smoke detector to cause release of door. Where electromagnetic locks are used on doors of egress, provide required automatic release of locks upon activation of fire alarm (i.e. via connection to auxiliary contact of adjacent pull station). Provide required conductors and connections to fire alarm system and to electromagnetic locks.

.9 Wire speakers in Class B, 2 wire circuit configuration, terminating in end of line devices. Wire alternate speakers in same circuits with a minimum of 2 circuits per floor.

.10 Generally, audible device locations are indicated on drawings, however, exact audible device quantities and locations to be in accordance with results of audibility device coverage site tests. Provide suitable sound detection metering and personnel to make necessary tests. Relocate audible devices and/or provide additional audible devices as required.

.11 Install amplifiers sized as required to power additional speakers and include spare capacity as specified.

.12 Typically, Install visual notification appliances 2400 mm (8') above floor or 300 mm (12") below finished ceiling line. Provide visual notification devices in areas subject to high ambient noise levels, such as mechanical equipment rooms, computer equipment rooms, parking garage, etc., and areas designated for hearing impaired as per local building code requirements. Provide minimum 2 circuits per floor and connect devices in alternating scheme.

.13 Provide required additional devices and install existing devices as required. Circuit devices to existing standards and in compliance with local governing codes and authorities. Determine exact quantities of circuits based on requirements of governing codes and standards, and recommendations of system manufacturer.

.14 Unless otherwise noted in Contract Documents, do not load device circuits more than 80% capacity.

.15 Devices in non-climate controlled areas to be weatherproof, corrosion resistant, ULC listed for operation in below freezing temperatures, and as recommended by system manufacturer for use for each specific application. Where electronics are not recommended for cold temperature applications, include for Manufacturer recommendations and directions in remotely locating addressable modules in closest heated areas and connecting to respective device in non-climate controlled areas.

3.4 REQUIREMENTS FOR INTEGRATED SYSTEMS & EQUIPMENT

.1 Perform required fire alarm system wiring connections to mechanical equipment and other building systems to perform required interrelated functions. Provide required wiring, relays and/or contactors between fire alarm system and various equipment to achieve automatic or manual control of equipment, to perform required integrated to fire alarm system functions. Provide shunt trip breakers as required. Provide fire rated conductors where required by local codes and local authorities.

.2 Provision of fire alarm supervisory wiring connections to include but not be limited to following (where applicable):

.1 fan equipment starters;

.2 pumps;

.3 door holders/releases and electromagnetic locks;

.4 devices as shown on drawings.

3.5 ADDITIONAL REQUIREMENTS

.1 Provide required system wiring in accordance to requirements of applicable governing electrical code, other local governing code and standards requirements, system manufacturer’s recommendations and based on specific applications and consideration of voltage drop.

.2 Install wiring in conduit unless otherwise directed by Consultant. Perform wiring connections associated with fire alarm system on terminal strips in junction boxes and colour coded. Provide wiring colour coding consistent for entire length of each run. When pulling wires into conduit, use lubricant and run wires straight and not twisted or abraded. Neatly secure exposed wires in apparatus enclosures with approved supports or ties. Clearly identify wiring at each termination point. In addition, number wiring with Brady Ltd. or Electrovert Ltd. Z-type markers. Colour conductors for each part of system in accordance with system equipment Manufacturer recommendations. Paint conduit couplings red of paint type suitable for application to standards of Division 09.

.3 Where existing devices are relocated and existing wiring is of insufficient length to connect to relocated position, provide replacement wiring and conduit of sufficient length.

.4 Where required by local governing codes and/or local governing authorities, provide ULC listed, fire rated conductors (MI) for connections to and interconnections between equipment for life safety applications requiring fire rating. Install MI type conductors in accordance with manufacturer's instructions and requirements in Specification.

.5 Run alarm indicating circuits (speakers) and alarm receiving circuits (pull stations, detectors) in separate conduits from each other.

.6 Provide engraved Lamacoid identification nameplates for each equipment or wiring housing and secure to front of housing. Confirm exact wording designations and sizes to with Consultant prior to manufacture.

.7 Review nomenclature of annunciator identification with Consultant prior to ordering.

.8 Install end-of-line resistors to electrically supervise wiring. Generally, locate end-of-line resistors at ceiling lines above a pull station location. Provide isolators and install in accordance with ULC standards. Properly label and identify. Do not locate end-of-line resistors and isolators in concealed locations. Generally install in equipment rooms.

.9 Refer to drawing riser diagram. Riser drawings are diagrammatic and are not to be used for determining quantities or lengths. Quantities of components to be as per floor plans. Determine exact quantities of circuits based on drawings information, connected devices, requirements of governing codes and standards, and recommendations of system manufacturer.

.10 Review exact location of components prior to roughing-in.

.11 Ground and bond system as required by local governing electrical code and authority and system manufacturer.

3.6 SYSTEM TESTING, VERIFICATION & CERTIFICATION

.1 Submit to Consultant for approval, proposed schedule for testing and verification of system. Obtain such approvals prior to start of testing. Consultant and/or other Owner representatives to have option to witness all or part of testing and verification work. Notify Consultant and Owner minimum 7 working days in advance of testing.

.2 Include for fire alarm system manufacturer to inspect, test, verify and certify system components and wiring, individually and as a complete system, in accordance with requirements of CAN/ULC S537. Work to include but not be limited to provision of following:

.1 to ensure that type of equipment installed is that designated by Contract Documents;

.2 to ensure that wiring connections to equipment components show that installer observed ULC and CSA requirements;

.3 to ensure that equipment was installed in accordance manufacturer recommendations, and that signalling devices of whatever manufacture were operated or tested to verify their operation;

.4 to ensure that supervisory wiring of those items of equipment connected to a supervised circuit is operating and that governmental regulations, if any, concerning such supervisory wiring, have been met to satisfaction of inspecting officials;

.5 to ensure that sequence of operation is in accordance with existing sequence of operation and any modifications identified on documents and are approved by local fire authority;

.6 to ensure that devices are commissioned and operable.

.3 System manufacturer to also be responsible for, but not be limited to, provision of following additional work to existing systems:

.1 coordinate with local fire authority inspector and Electrical Division Contractor, required testing and verification work in order to obtain certification and meet local fire code and local fire authority requirements;

.2 test system battery power supplies and demonstrate compliance with local governing building code and local fire authority requirements that battery supplies are capable of providing required 24 hours of supervisory power followed by local governing building code required time (or time directed by local fire authority) of full load power; exact method of testing to be approved by local fire authority, Consultant and Owner; confirm exact procedures with previously named parties prior to testing; include for sufficient sound measurement devices and personnel in order to successfully comply with this requirement;

.3 full review, testing, and verification of operation of building ventilation and smoke exhaust system and its integrated operation with fire alarm system and various pieces of air handling equipment;

.4 full review, testing and verification of operation of integrated systems such as elevators and their emergency sequence of operation, supervisory annunciation of sprinkler/standpipe monitor switches, pressure switches and flow switches, diesel genset alarms, security alarms, BAS alarms, release of door holders and electromagnetic locks, and any other integrated components; coordinate requirements with trades responsible for integrated components and systems who will be present at time of testing and verification work;

.5 test that system audible devices provide alarm sound levels in areas as per local governing building code and local fire authority requirements; site adjust tap settings of audible devices as required to achieve required audibility levels; also test that emergency voice communication system meets or exceed intelligibility requirements of local governing building code and is approved by local fire authority;

.6 assist in testing and verification of electromagnetic door locks to meet requirements of authorities having jurisdiction and to obtain overall approval of installation;

.7 coordination with Electrical Divisions and local fire authority to provide requirements to obtain certificates of approvals from local fire authority;

.8 provide full detailed test sheets of tested components and provide certification that system work has been fully tested, that devices have passed testing and that system is in proper work order in compliance to local governing code requirements and project documents; testing report documents to be additionally provided in electronic format as confirmed with Owner and Consultant.

.4 Where project work is phased and Owner requires occupancy at various stages, include for providing system testing, verification and certification after completion of each phase of work, to approval of local governing authorities. Upon Substantial Performance of the Work, include for providing system testing, verification and certification of entire system work.

.5 Contact local fire authority inspector and coordinate and arrange for Fire Inspector to perform required inspections. Integrate local fire authority inspection requirements with testing and verification work to extent as per Fire Inspector's directions. Obtain full approval and certification by local fire authority.

.6 Local fire authority inspector, Consultant and Commissioning Agent to at their discretion test system or parts of system in their review of test reports. Correct/repair any failures or deficiencies found in system, whether or not identified in test reports of manufacturer. Re-test and re-verify until successfully passed, at no extra cost to Owner.

.7 Obtain from local fire authority required certificate of approval of system and forward to Consultant.

.8 Arrange for manufacturers to supply reasonable amounts of technical assistance with respect to any changes required to conform to paragraphs above. During period of inspection, testing and verification, make Electricians available to do any required correction work and to assist during this Work. Include for trades responsible for integrated components (i.e. exhaust fans, sprinklers, elevators, gensets, etc.) and systems to be present at time of testing and verification work.

.9 On completion of verification, inspection and testing of system, obtain from manufacturer and forward to Consultant, a verification certificate together with detailed inspection reports listing each and every system component, its location in building and its acceptability. Verification certificate and inspection reports to be prepared and signed by certified testing technicians of manufacturer. Signed test reports to confirm that systems are installed and perform in accordance with requirements specified above.

.10 Obtain from system manufacturer and testing agency and forward to Consultant a certificate of liability insurance of minimum amount of Two Million Dollars ($2,000,000.00) that is to be registered for this project to show satisfactory proof of manufacturer liability coverage for both their product and personnel.

.11 Include for re-verification of any failed device repaired or replaced, until successful testing and verification.

.12 Unless approved in writing by Consultant and Owner, do not use open flame and/or smoke for testing.

.13 Testing technician to be certified and approved for fire alarm system testing by Canadian Fire Alarm Association (CFAA) and or be a Certified Fire Alarm Electrician (CFAE) with Electrical Contractors Association of Ontario (ECAO) as deemed acceptable to Ontario Fire Marshall.

.14 Additionally, refer to testing, coordination and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

.15 The Electrical Contractor shall warrant that the components of the fire alarm system installed as part of this work shall remain in good working order for a period of one year from the date of verification. Should components of the system fail to perform as intended under normal operating conditions at any time during this one year period, the Client shall notify the Electrical Contractor in writing. The Electrical Contractor shall repair or replace the failed equipment/devices to maintain a fully operational fire alarm system.

3.7 **MONITORING OF SYSTEMS**

.1 In areas that remain occupied and used by Owner during Work, daily monitor and supervise existing fire alarm system serving renovation/working areas. Ensure that system is left in proper operating condition at end of each working day. Include for but not be limited to performing following:

- .1 under presence of Owner representative, check each morning and evening (start and end of work) of each day, system to ensure that it is in proper working condition;
- .2 if portions of system are not in proper working order, provide temporary bypass wiring (if fire alarm system, must be subject to approval of local fire authority), and/or provide supervisory personnel to monitor systems for area affected;
- .3 document and sign off with Owner representative signing off also, each respective daily check condition;
- .4 ensure that work to system does not affect portion of system serving areas outside of renovation/working areas.

.2 Maintain fire protection of areas which may include fire watch during temporary shutdowns of existing systems, in accordance with requirements of local governing code and local governing authorities.

END OF SECTION