



Project Manual

New Fire Station No. 1

RFT# T-FD-22-01

Highlands Boulevard, Millbrook
Township of Cavan Monaghan, Ontario

May 20, 2022

Greenview File: 164.21.005



13 Commerce Court
Bancroft, Ontario
613-332-0057
greenview-environmental.ca



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List of Attachments

Addendum #1 – Geotechnical Investigation, Proposed New Fire Hall Building, 988 County Road 10, Millbrook, Ontario, by GHD, dated April 8, 2022.

Geotechnical Investigation – Proposed New Fire Hall Building, 988 County Road 10, Millbrook, Ontario, by GHD, dated March 17, 2022.

CCDC-2 2020 – Stipulated Price Contract Template.

CCDC 41 CCDC Insurance Requirements (December 14, 2020).

List of Drawings

Building Design Drawings

000	Title Page, OBC Matrix & Construction Assemblies
001	Site Plan
002	Circulation and Fire Protection Site Plan
100	Foundation Plan
101	Main Floor Plan
102	Second Storey and Mezzanine Floor Reflected Ceiling Plan
200	Elevations, Roof Plan and Details
300	Sections
400	Details
401	Details
500	Door and Window Schedules
501	Room and Finish Schedule, Barrier Free and Door Standards

Structural Drawings

S100	Pre-Eng. Requirements, General Notes and Standard Details
S101	Foundation Plan
S102	Foundation Details
S103	Floor Framing and Details
S104	Canopy Framing and Details
S105	Retaining Walls

Mechanical Drawings

M1	Ground Floor Plan - Plumbing & Drainage
M2	Ground Floor Plan - HVAC
M3	Second & Mezzanine Floor Plans - Mechanical
M4	Schedules & Details – Mechanical
M5	Schedules - Mechanical
M6	Specification – Mechanical

Electrical Drawings

E1	Site Power Layout Plan
E2	Site Lighting Details
E3	Main Floor Power Layout Plan
E4	Main Floor Lighting Layout Plan
E5	Mezzanine Power Layout Plan
E6	Mezzanine Lighting Layout Plan
E7	Single Line Diagram and Panel Schedules
E8	Specification

Civil Drawings

C100	Civil Cover Sheet & Notes
C101	Existing Site Conditions, Demolition, Erosion & Sedimentation Control Plan
C102	Civil Site Servicing Plan
C103	Site Grading & Drainage Plan
C104	Schedule & Details
C105	OPSD
C106	Signage

Part 1 General

1.1 Bid Call

- .1 Bids signed under seal, executed, and dated will be received by the Owner:
 - .1 Location: **988 County Road 10, Millbrook, ON.**
 - .2 Date and Time: Before **11:00am** local time on the **22nd** day of **June, 2022.**
 - .3 The time piece at the location for receiving Bids shall be the only measure for the exact time.
- .2 Bids may be returned to the respective Bidder unopened if submitted after the stated time, and/or are incorrectly named.
- .3 The Owner reserves the right to extend the Bid closing time or cancel the Bid call by addendum.
- .4 Bids will be opened publicly.
 - .1 Bids will be opened via virtual on-line meeting at approximately 15 minutes after bid closing time, on the day of the bid closing. Details of the virtual opening will be provided to all registered bidders by the Consultant prior to bid closing.
 - .2 Only the Bidder's name and stipulated sum of the respective bid will be disclosed at the opening.

1.2 Bid Intent

- .1 The intent of this bid call is to obtain an offer to perform Work to complete the Works of the project, located at Highlands Boulevard, Millbrook, ON for a Stipulated Price contract, in accordance with the Contract Documents.
- .2 Perform the Work within the time stated in the Bid Form.

1.3 Bid Modification And Withdrawal

- .1 Modifications to a submitted Bid or withdrawal of a Bid, will be permitted if received in writing in the form of a electronic mail or letter addressed to the Municipal Clerk (**clerk@cavanmonaghan.net**), prior to the date and time of Bid closing and if endorsed by the same party or parties who signed and sealed the initial offer.
- .2 If a Bid is withdrawn, a new Bid may be submitted if received prior to the date and time of Bid closing.
- .3 Change in Bid Price:
 - .1 On stipulated price bids, state only the amount to be added to or deducted from the original bid price.
 - .2 When submitting a second or more modifications, clearly identify if the first Bid price submitted is being modified and any previous modifications are to be discarded, or a previous Bid price modification is being modified.
- .4 State all addendum numbers received, if different from what was indicated on originally submitted Bid Form.

1.4 Bid Document Availability

- .1 Electronic versions of Bid Documents can be downloaded at the Owner's internet tendering application.
- .2 Hard copy versions of Bid Documents can be provided by the Consultant for a non-refundable fee, upon written request.
- .3 Bid Documents are made available only for the purpose of obtaining Bids for this project. Their use does not confer a license or grant for other purposes.

1.5 Bid Document Examination

- .1 Examine Bid documents and promptly notify the person designated to receive enquiries if documents are incomplete, or contain perceived errors, omissions, conflicts or discrepancies.

1.6 Inquiries

- .1 Clarifications requested by Bidders must be in writing, and received by no later than **12:00pm** local time, on **June 15, 2022.**
- .2 Direct questions in writing, via email only to:

- .1 Consultant: Greenview Environmental Management Limited.
- .2 Email address: **solutions@greenview-environmental.ca**.
- .3 Any/all responses to inquiries shall be provided to all registered bidders in the form of Addenda.

1.7 Addenda

- .1 Addenda may be issued during the Bidding period. All addenda become part of the Contract Documents. Include costs in the Bid price.
- .2 Responses to inquiries requiring interpretation, clarification or modification of the Bid Documents will be provided in the form of a written addendum only, issued not less than two (2) days before date and time of Bid closing, a copy of which will be forwarded to all known and registered Bidders.

1.8 Substitutions

- .1 Product Substitution Procedures During the Bidding Stage:
 - .1 Where Bid Documents specify Products by proprietary name, requests for approval of substitutions during the Bid period will not be accepted. Base bids on the named Products only.
 - .2 Bidders wishing to present substitutions or alternative products, materials, or equipment shall do so in accordance with bid documents, and present such in Schedule C of the tender form, accordingly.
- .2 Product Substitution Procedures During Construction Stage:
 - .1 The submission process for substituting Products after Bids have been submitted, is described in Section 01 25 00.

1.9 Alternatives

- .1 Complete and submit tender form, Appendix C - Alternatives, with bid submission.
- .2 The Owner will determine before Contract award which alternatives will be accepted. Each Bidder's alternative prices for all accepted alternatives will be used to adjust that Bidder's base bid price and the lowest compliant Bidder will be determined based on the adjusted base bid price.
- .3 The Owner may select any, all, or none of the specified alternatives, at the Owner's sole discretion.

1.10 List Of Subcontractors

- .1 Complete and submit tender form, Appendix A - Subcontractors with bid submission.
- .2 The List of Bidders will not be used in evaluating the Bids or to determine the lowest compliant bidder.
- .3 The Owner (as further described in the General Conditions) reserves the right to reject a proposed Subcontractor for reasonable cause.
- .4 Refer to CCDC 2 - 2020 as to Owner rights to accept or dismiss Subcontractors.

1.11 Site Examination

- .1 Visit the project site and surrounding area before submitting a Bid.
- .2 A visit to the project site has been arranged in conjunction with a pre-Bid meeting as specified.
 - .1 Bidders visiting that site shall sign in on the meeting register in order to confirm attendance, and provide contact information.
 - .2 Bidders visiting the site shall provide their own personal protective equipment.
 - .3 Bidders visiting the site shall be accompanied at all times by a representative of the Owner.
- .3 Include in Bid price, costs for non-concealed and known conditions that are either visible or can be reasonably inferred from the site examination before Bid submission.

1.12 Pre-bid Meeting

- .1 A pre-bid meeting has been scheduled for **10:00am** on the **31st** day of **May**, 2022, at the location of the project.
- .2 All interested Bidders are invited.
- .3 Attendance by prime contract Bidders is **mandatory**.
 - .1 Bidders will be required to sign an attendance record during the meeting.

- .2 A copy of the attendance record will be issued by Addendum.
- .4 Issues arising from the pre-Bid meeting will be addressed as required in an Addendum to the Bid Documents. Bidders may not rely on information given verbally or otherwise.
- .5 Representatives of the Owner and Consultant will be in attendance.

1.13 Bid Form Supplements

- .1 Submit the following Bid Form Supplements together with the Bid Form:
 - .1 Bid security as specified.
 - .2 Agreement to Bond.
 - .3 Completed and executed CCDC-11 - 2019 - Contractor's Qualification Statement.
 - .4 Undertaking of insurance, in full accordance with CCDC 41 - 2020.
 - .5 Initial/preliminary construction schedule, clearly illustrating key elements and/or milestones for the project as planned by the Bidder, and respective of the prescribed date of Substantial Performance of the Work.

1.14 Subcontractors

- .1 The Owner reserves the right to reject a proposed subcontractor for reasonable cause, in accordance with the General Conditions.

1.15 Bid Irregularities

- .1 Bid Forms or Bid Form Supplements that are unsigned, improperly signed or sealed, conditional, contain arithmetical errors, erasures, contain alterations, added conditions, or other irregularities, may at the discretion of the Owner, be rejected as non-compliant.
- .2 Bids which contain qualifying conditions or otherwise fail to conform to these Instructions to Bidders may be rejected.
- .3 When Bids are by invitation only; Bids from unsolicited Bidders may be returned un-opened.
- .4 The Owner may accept or waive a minor and inconsequential irregularity. The determination of what is a minor and inconsequential irregularity, and whether to accept or waive such an irregularity, will be at the Owner's sole discretion.
- .5 Failure to provide security deposit, bonding or insurance requirements may be declared informal.
- .6 The following irregularities relating to mandatory Bidding requirements will cause the Bid to be rejected as non-compliant:
 - .1 Bid form or Bid form supplement received after the specified Bid closing time.
 - .2 Missing Bid form or Bid form supplement.
 - .3 Bid form or Bid form supplement is not in the form provided or required.
 - .4 Bid bond is improperly completed or executed, if such improper completion or execution may render the Bid bond unenforceable.
 - .5 A Bid price is illegible, ambiguous or unclear.
 - .6 Conditions added to or submitted with the Bid which create a material modification of the Bid Documents.
 - .7 Failure to indicate in the Bid form the Addendum number(s) of all addenda received.
 - .8 Failure to comply with any other Bidding requirement expressly characterized as mandatory in elsewhere in the Bid Documents.

1.16 Bid Submissions

- .1 Bidders shall be solely responsible for the delivery of their Bids to the instructions herein, in the manner and time prescribed.
- .2 Submit one (1) copy of the executed offer on the Bid Form provided, signed and corporate sealed together with the required Bid form supplements in a closed opaque envelope, clearly identified with Bidders name and address, project name and Owners name on the outside cover of the submission.
- .3 An abstract of submitted Bids may be made available to Bidders following Bid opening.

1.17 Bid Security

- .1 Bids shall be accompanied by a Bid security deposit as follows:
 - .1 CCDC 220 - Bid Bond in an amount of not less than 10% of the Bid price, endorsed in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
 - .2 Upon request, Bid bonds will be returned to unsuccessful Bidders after a contract with the Owner has been awarded and the successful Bidder has provided the specified contract security.
 - .3 In lieu of a Bid bond, Bidders may submit a certified cheque or bank draft in the amount of not less than 10% of the Bid price.
 - .4 Certified cheques and bank drafts will be returned to Bidders after a contract with the Owner has been awarded and the successful Bidder has provided the specified contract security.
- .2 If no contract is awarded, all security deposits will be returned.

1.18 Agreement To Bond

- .1 Submit with the Bid form, a Agreement to Bond, stating that the surety providing the Bid bond is willing to supply the Performance Bond and Labour and Materials Payment Bond required.
- .2 Include the cost of bonds in the Bid Price.

1.19 Contract Security

- .1 The accepted Bidder shall provide a Performance Bond in accordance with CCDC 221 - 2002, of not less than 100% of the Bid Price.
- .2 The accepted Bidder shall provide a Labour and Material Payment Bond in accordance with CCDC 222 - 2002, of not less than 100% of the Bid Price.

1.20 Insurance

- .1 The Contract's insurance requirements shall be in accordance with the most recent version of CCDC 41, at a minimum.
- .2 Provide a signed "Undertaking of Insurance" on a standard form provided by the insurance company stating the Bidder's intention to provide insurance to the Owner in accordance with the insurance requirements of the Contract Documents.
- .3 Confirm that the Owner and Consultant are to be added as Additional Insured parties upon execution of the formal certificate, if awarded.

1.21 Taxes

- .1 Include in Bid price all taxes and customs duties in effect at the time of the bid closing, except for Value Added Taxes as defined in the CCDC standard form of contract.

1.22 Bid Form Signing

- .1 The Bid Form shall be signed under seal by the Bidder.
- .2 Incorporated Company: Provide company name and name and signature of the duly authorized signing representative(s) in their normal signatures. Insert under each signature, the representative's capacity to act on behalf of the company. Affix the corporate seal.
- .3 Joint Venture: Each party of the joint venture shall execute the Bid under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.
- .4 Partnership: Provide name of partnership and name and signature of duly authorized representatives of the partnership. Affix a seal to each signature.
- .5 Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.

1.23 Bid Acceptance Period

- .1 Bids shall remain open to acceptance by the Owner and be irrevocable until another Bidder enters into a contract with the 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, the 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.

1.24 Bid Acceptance

- .1 The Owner reserves the right in its absolute discretion to accept any Bid which it deems most advantageous to itself.
- .2 The lowest or any Bid will not necessarily be accepted and the Owner may reject any and all Bids.
- .3 The Owner will evaluate the bids received and identify the offer which represents best value, considering: bidder experience and qualifications, expected quality and service, bidders assigned team to the project, project schedule (and any alternate price for accelerated schedule), in addition to price, as interpreted by the Owner, in its own best interest and in its sole and absolute discretion; this may not be the lowest-priced tender.
- .4 In making a determination, the Owner reserves the right to objectively and reasonably consider any criterion which it considers to be relevant to its own best interest; which may include, among other criteria, consideration of past performance of the bidders, based on the Owner's experience and/or experience reported by individuals which have knowledge of the Bidder's past performance.
- .5 If requested by the Owner, bidders will meet with the Owner to discuss the offer submitted, at no cost to the Owner.
- .6 After acceptance by the Owner, the Owner, or Consultant on behalf of the Owner will issue to the successful Bidder, a written notification of intent to award.
- .7 Once a formal agreement with the awarded Bidder is fully executed, written notice will be provided to all other Bidders with respect to bid securities.

End of Section

Part 1 General

1.1 Reliance On Available Project Information

- .1 Bidders shall interpret and draw their own conclusions about available information.
- .2 The available information shall not be considered a requirement of this contract unless contained in the Contract Documents. In the case of conflict, the Drawings and/or Specifications shall govern.
- .3 Bidders may rely on the available information unless noted otherwise in this document.

1.2 Available Project Information

- .1 Geotechnical Investigation Report:
 - .1 An investigation report with respect to the applicable building site and important immediate affected surroundings, is titled as follows:
 - .1 Title: Geotechnical Investigation, Proposed New Fire Hall Building - 988 County Road 10, Millbrook, Ontario.
 - .2 Dated: March 17, 2022.
 - .3 Prepared by: GHD.
 - .2 An Addendum to the above-noted report was issued and is titled as follows:
 - .1 Title: Addendum #1 - Geotechnical Investigation, Proposed New Fire Hall Building, 988 County Road 10, Millbrook, Ontario.
 - .2 Dated: April 8, 2022.
 - .3 Prepared by: GHD.
 - .3 A copy of the above noted report(s) are included as attachments to the Project Manual.
 - .4 The report(s), by its nature, cannot reveal all conditions that exist or can or might occur on the subject site. Should subsurface conditions be found or be a concern thereto, or to vary substantially from the investigation report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.

End of Section

Part 1 General

1.1 Project Information

- .1 Bidder Information:
 - .1 Date: _____
 - .2 Company Name: _____
 - .3 Authorized Signature: _____
 - .4 Address: _____
 - .5 Telephone: _____
 - .6 Email: _____
- .2 To:
 - .1 **Clerk, The Corporation of the Township of Cavan Monaghan.**
- .3 Project:
 - .1 Project Name: **New Fire Station No. 1.**
 - .2 RFT#: **T-FD-22-01.**

1.2 Offer

- .1 Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared for the above noted project, we, the undersigned, hereby offer to enter into a contract using a CCDC 2 - 2020 Contract form, to perform the Work for the price of:
 - .1 \$ [_____]
dollars, in lawful money of Canada.
 - .2 We have included herewith, the required proof of insurance and security as required by the tender documents.
- .2 Taxes:
 - .1 Applicable federal taxes in the form of the Harmonized Sales Tax (HST) at 13% are excluded from the Bid Price.
 - .2 Applicable provincial taxes are excluded from the Bid Price.

1.3 Acceptance

- .1 Refer to Section 00 21 13 - Instructions to Bidders for Conditions of acceptance.
- .2 This offer shall be open to acceptance and is irrevocable for sixty (60) calendar days from the Bid closing date and time.
- .3 If this Bid is accepted by the Owner within the time period stated above, the bidder will:
 - .1 Execute the 'Agreement' within seven (7) days of receipt of the form of execution.
 - .2 Furnish the required bonds prior to receipt of the Agreement for execution.
 - .3 Commence Work in the as soon as practicable and carry out the Work on a continuous basis until completion, after execution of the Agreement.
 - .4 Achieve Substantial Performance of the Work by no later than **September 30, 2023.**
- .4 If this Bid is accepted within the time stated herein, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited immediately as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the deposit, or the difference between this Bid and the Bid which the Contract is signed.
- .5 In the event our Bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions in the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.4 Appendices

- .1 A list of Subcontractors/Suppliers is appended hereto and is identified as 'Appendix A'.

- .2 A schedule of Unit Rates for labour, equipment, and specialized tools, exclusive of overhead and profit adjustments, is appended hereto and is identified as 'Appendix B'.
- .3 A schedule of alternatives is appended hereto and is identified as 'Appendix C'.

1.5 Addenda

- .1 The following Addenda have been received. The modifications to the Contract Documents noted therein have been considered and all costs thereto are included in the Bid Price.
 - .1 Addendum # ____ Dated _____.
 - .2 Addendum # ____ Dated _____.
 - .3 Addendum # ____ Dated _____.
 - .4 Addendum # ____ Dated _____.
 - .5 Addendum # ____ Dated _____.
 - .6 Addendum # ____ Dated _____.
 - .7 Addendum # ____ Dated _____.
 - .8 Addendum # ____ Dated _____.

1.6 Bid Form Signatures

The Corporate
Seal of:

_____ (Bidder Company Name – please print or type)

Was hereunto affixed in the presence of:

Authorized Signing Officer(s) Name & Signature: _____

Title: _____

Authorized Signing Officer(s) Name & Signature: _____

Title: _____

If this Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture on the appropriate form or forms, as above.

Appendix A – Subcontractors/Suppliers:

The following is the list of Subcontractors referred to in the Bid Form submitted by:

(Bidder): _____

(Owner): The Corporation of the Township of Cavan Monaghan

to which this Appendix is an integral part of the Bid Forms.

The following work will be performed (or provided) by Suppliers and/or Subcontractors and coordinated by the Bidder:

Portion of the Work	Subcontractor / Supplier
Demolition	
Earthworks / Excavation / Grading	
Site Servicing	
Soils & Aggregates	
Building Foundation Forming	
Site Retaining Wall	
Building/Site Cast-in-Place Concrete	
Pre-Engineered Building Supplier	
Pre-Engineered Building Erector	
Rough Carpentry	
Roofing	
Masonry	
Electrical	
Mechanical – Plumbing	
Mechanical – HVAC	
Sectional (Overhead) Doors & Operators	
Person Doors & Hardware	
Gypsum Board	
Windows	
Painting & Sealing	
Flooring	
Site Restoration/Landscaping	
Asphalt Paving & Line Painting	
Other -	
Other -	
Other -	
Other -	

Appendix B – Unit Rates:

The following is the list of Unit Rates referred to in the Bid Form submitted by:

(Bidder): _____

(Owner): The Corporation of the Township of Cavan Monaghan

to which this Appendix is an integral part of the Bid Forms.

The following unit rates shall apply to work to be performed (or provided) by Suppliers and/or Subcontractors carried by the Bidder on this project:

Labour / Equipment Item Description	Unit Rate
Demolition	\$ per hour
Earthworks – Topsoil Stripping & Stockpiling	\$ per hour
Earthworks – Excavation, Load, Haul, Dump	\$ per hour
Aggregates	\$ per hour
Building Foundation Forming	\$ per hour
Building/Site Cast-in-Place Concrete	\$ per hour
Pre-Engineered Building Erection	\$ per hour
Rough Carpentry	\$ per hour
Roofing	\$ per hour
Masonry	\$ per hour
Electrical	\$ per hour
Mechanical – Plumbing	\$ per hour
Mechanical – HVAC	\$ per hour
Overhead Doors	\$ per hour
Person Doors & Hardware	\$ per hour
Windows	\$ per hour
Gypsum Board	\$ per hour
Painting	\$ per hour
Flooring	\$ per hour
Site Restoration/Landscaping	\$ per hour
Other -	\$ per hour
Other -	\$ per hour
Other -	\$ per hour

Appendix C – Alternatives:

The following is a summary of offered alternatives to the work and associated potential price adjustments, including any presented by the Owner:

(Bidder): _____

(Owner): The Corporation of the Township of Cavan Monaghan

to which this Appendix is an integral part of the Bid Forms.

Alternative	Description	Price Adjustment
1	Owner completes initial site preparation and demolition works, and removals, including: tree and vegetation clearing and grubbing, topsoil stripping and stockpiling, mass soil excavation, haulage, disposal within the limits of construction of the project to a topographic elevation of 254.70m EL (300mm [1 foot]) above building FFE. Refer to Drawings. Contractor would complete finishing earthworks and related tasks to meet contract design. Owner would complete alternative works prior to Contractor mobilization.	\$

End of Section

Part 1 General

1.1 General

- .1 The Standard Construction Document for Stipulated Price *Contract*, CCDC-2 2020, English version, consisting of the Agreement Between *Owner* and *Contractor*, Definitions, and General Conditions of the Stipulated Price *Contract*, is part of these *Contract Documents* with the following amendments, additions and modifications:

1.2 Agreement Between Owner And Contractor

.1 Article A-3 - Contract Documents

- .1 Amend paragraph 3.1 by adding the following after the words, "The General Conditions of the Stipulated Price Contract":
 - .1 "These Supplementary Conditions
 - .2 The Special Conditions, if any
 - .3 Drawings
 - .4 Specifications"

.2 Article A-5 - Payment

- .1 Delete paragraph 5.2 in its entirety and replace with the following:
- .2 "Interest
- .3 Interest will be paid by the Owner on any amount that is not paid when it is due to be paid under Part I.1 of the *Construction Act*, commencing the date that the payment was due, at the prejudgment interest rate determined under subsection 127 (2) of the *Courts of Justice Act*. In no other circumstances, will interest accrue on any amount due by the City to the Contractor."

.3 Definitions

- .1 Add a new Definition, "Act", as follows:
 - .1 "Act means the *Construction Act* (Ontario), as amended."
- .2 Add a new Definition, "OHS", as follows:
 - .1 "OHS means the *Occupational Health and Safety Act* (Ontario)."
- .3 Add a new Definition, "WSIB", as follows:
 - .1 "WSIB means the Workplace Safety and Insurance Board."

.4 General Conditions of the Stipulated Price Contract

- .1 Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the number of the deleted items will be retained, unused.

.5 GC 1.1 - Contract Documents

- .1 Amend paragraph 1.1.4 by adding the following at the end thereof:
 - .1 "If the *Contractor* finds discrepancies in or omissions from the *Contract Documents* or has any doubt as to the meaning or intent of any part thereof, the *Contractor* shall immediately notify the *Consultant*, who will provide written instructions or explanations. Neither the *Owner* nor the *Consultant* will be responsible for oral instructions."
- .2 Delete paragraph 1.1.7.1 in its entirety and replace it with new paragraph 1.1.7.1:
 - .1 "1.1.7.1 If there is a conflict within the *Contract Documents*, the order of priority of the documents, from highest to lowest, shall be:
 - .1 Any amendments to the *Agreement* between the *Owner* and the *Contractor*,
 - .2 The *Agreement* between the *Owner* and the *Contractor*, as amended by these Supplementary Conditions,
 - .3 The Definitions,
 - .4 Special Conditions,
 - .5 Supplementary Conditions,

- .6 The General Conditions,
- .7 Division 01 of the *Specifications*,
- .8 Technical *Specifications*,
- .9 The *Drawings*”
- .6 **GC 1.4 - Assignment**
 - .1 Delete paragraph 1.4.1 in its entirety and replace it with the following:
 - .1 “1.4.1 The *Contractor* shall not assign the *Contract*, either in whole or in part, without the written consent of the *Owner*.”
- .7 **GC 2.2 - Role of the Consultant**
 - .1 Amend paragraph 2.2.6 by deleting the words “except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER.”
 - .2 Add the word “schedules” after the word “techniques” in paragraph 2.2.5.
 - .3 Add to the end of the second sentence of paragraph 2.2.5, “or to adhere to the construction schedule.”
 - .4 Add at the end of paragraph 2.2.8, “The Owner and the Contractor shall waive any claims against the Consultant arising out of the making of such interpretations and findings in accordance with paragraphs 2.2.7., 2.2.8., and 2.2.9”.
 - .5 Add new sentence to end of paragraph 2.2.10, “The Consultant’s obligation to make findings on a large claim or large number of claims is subject to the terms and conditions of the Owner/Consultant agreement.”
- .8 **GC 2.4 - Defective Work**
 - .1 Add new subparagraphs 2.4.1.1 and 2.4.1.2:
 - .1 “2.4.1.1 The *Contractor* shall rectify, in a manner acceptable to the *Owner* and the *Consultant*, all defective *Work* and deficiencies throughout the *Work*, whether or not they are specifically identified by the *Consultant*.
 - .2 2.4.1.2 The *Contractor* shall prioritize the correction of any defective *Work* which, in the sole discretion of the *Owner*, adversely affects the day to day operations of the *Owner*.”
- .9 **GC 3.2 - Construction by Owner or Other Contractors**
 - .1 Delete subparagraph 3.2.2.3 and 3.2.2.4 in their entirety.
- .10 **GC 3.5 - Supervision**
 - .1 Amend paragraph 3.5.1 by adding the following after the words, “competent representative”, “who shall be a Competent Person, as the term is defined in the *OHSA*”, and by deleting the last sentence, and replacing it with the following, “The *Contractor* shall not be entitled to change the Competent Person without the prior written authorization of the *Owner*, which shall not be unreasonably withheld.”
- .11 **GC 3.7 - Labour and Products**
 - .1 Paragraph 3.7.2 is amended by adding the following sentence to the end:
 - .1 “The *Contractor* shall not change the source of supply of any *Product* without the written authorization of the *Consultant*.”
- .12 **GC 3.8 - Shop Drawings**
 - .1 Add the words “AND OTHER SUBMITTALS” to the Title after SHOP DRAWINGS.
 - .2 Add “and Submittals” after the words “Shop Drawings” in paragraphs 3.8.1, 3.8.2, 3.8.3, 3.8.5, 3.8.6, and 3.8.7.
 - .3 Delete the last sentence in paragraph 3.8.5.
 - .4 Delete the words “so as to cause no delay in the performance of the Work” in paragraph 3.8.7.
- .13 **GC 3.9 - Cleanup**
 - .1 Add new General Condition 3.9 as follows:
 - .1 “3.9.1 The *Contractor* shall maintain the *Work* in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the *Owner*, other contractors or their employees.

- .2 3.9.2 The *Owner* shall have the right to back charge cleaning to the *Contractor* if the cleaning is not completed within 24 hours of written notice to clean and the *Owner* shall have the right to back charge the cost of damage to the *Place of the Work* caused by the *Contractor's*, *Subcontractor's* or *Supplier's* transportation in and out of the *Place of Work* if not repaired within 5 *Working Days* or written notice to repair or before final payment, whichever is earlier."

.14 GC 3.10 - Standard of Care

- .1 Add new General Condition 3.10 as follows:
 - .1 "3.10.1 In performing its services and obligations under the *Contract*, the *Contractor* shall exercise a standard of care, skill and diligence that would normally be provided by an experience and prudent *Contractor* supplying similar services for similar projects. The *Contractor* acknowledges and agrees throughout the *Contract*, the *Contractor's* obligations, duties and responsibilities shall be interpreted in accordance with this standard. The *Contractor* shall exercise the same standard of due care and diligence in respect of any *Products*, personnel, or procedures which may be recommended to/by the *Owner*.
 - .2 3.10.2 The *Contractor* further represents, covenants and warrants to the *Owner* that:
 - .1 .1 There are no pending, threatened or anticipated claims that would have a material effect on the financial ability of the *Contractor* to perform its *Work* under the *Contract*.
 - .2 .2 The personnel it assigns to the Project are appropriately experienced;
 - .3 .3 It has a sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the *Owner's* approval, in the event of death, incapacity, removal, or resignation."

.15 GC 4.1 - Allowances

- .1 Paragraph 4.1.4 is amended by adding the following sentence to the end:
"The maximum mark up on the authorized overrun on cash allowances shall be 5%."
- .2 Add new paragraph 4.1.8:
 - .1 "The *Owner* reserves the right to have the *Contractor* call for competitive bids for portions of the *Work* which are to be paid for from cash allowances."

.16 GC 5.1 - Financing Information Required of the Owner

- .1 Delete GC 5.1 in its entirety.

.17 GC 5.2 - Applications for Payment and GC 5.3 - Payment

- .1 Delete GC 5.2 and GC 5.3, and replace them with the following:
 - .1 5.2.1 A "proper invoice" (as that term is defined in the *Construction Act*) shall be delivered to the *Owner* and the *Consultant* by the first day of every month for the previous month's work. Subject the terms of the Contract Documents, including the holdback provisions of the Contract Documents and the *Construction Act*, and subject to any notice of non-payment delivered by the *Owner* under the *Construction Act*, the *Owner* shall pay the amount approved and certified by the *Consultant* as payable under a proper invoice no later than 28 days after receiving the invoice from the *Contractor*.
 - .2 5.2.2 The copy of the proper invoice delivered to the *Owner* shall be provided by email along with a hard copy to the *Owner's* electronic mail address.
 - .3 5.2.3 No less than 7 days prior to the delivery of a proper invoice, the *Contractor* shall submit to the *Owner* and the *Consultant* a payment certificate (in a form prescribed by the *Consultant*) and all necessary supporting documentation, a WSIB clearance certificate and a Statutory Declaration of Progress Payment Distribution. For clarity, no proper invoice shall be submitted earlier than 7 days following submission of a duly completed payment certificate.
 - .4 5.2.4 Notice of non-payment may be made by email to the *Contractor*. For greater clarity, this provision constitutes the consent of the *Contractor* to service of the notice of non-payment in this manner.
 - .5 5.2.5 The *Contractor* shall, within 10 days of signing the *Contract*, and prior to the first claim for payment, submit to the *Owner* a detailed breakdown of the lump sum tender price for the purpose of establishing monthly expenses. The *Owner*, acting reasonably, reserves the right to modify costs allocated to the various breakdown items to prevent unbalancing.
 - .6 5.2.6 Payment for mobilizing and setting up plant, temporary buildings and services, premiums and other disbursements, shall be prorated based on the value of the *Work* performed during a billable period.

- .7 5.2.7 Payment for bonds and insurance will be paid 100 percent on the first progress payment, provided that respective invoices are submitted as proof of payment.
 - .8 5.2.8 Prior to the first progress draw, the Contractor shall submit a monthly projected payment schedule based on the detailed construction schedule for the duration of the Contract.”
- .18 GC 5.4 - Substantial Performance of the Work and Payment of Holdback**
- .1 Delete paragraph 5.4.2 in its entirety.
 - .2 Delete paragraph 5.4.3 in its entirety and replace it with the following:
 - .1 “Immediately prior to the issuance of the certificate of *Substantial Performance of the Work*, the *Contractor*, in consultation with the *Consultant*, shall establish a schedule for completion of the *Work* and correcting deficient *Work*, and the construction schedule shall be deemed to be amended to include the completion schedule.”
 - .3 Delete paragraphs 5.4.4 and 5.4.5 and replace with:
 - .1 “5.4.4 Prior to submitting its written application for *Substantial Performance of Work*, the *Contractor* shall submit to the *Consultant* all:
 - .1 Guarantees;
 - .2 Warranties;
 - .3 Certificates;
 - .4 Testing and balancing reports;
 - .5 Distributing system diagrams;
 - .6 Spare parts;
 - .7 Maintenance/operation manuals;
 - .8 Training manuals;
 - .9 Samples;
 - .10 Reports and correspondence from authorities having jurisdiction in the *Place of the Work*;
 - .11 *Shop Drawings*, and marked up *Drawings*;
 - .12 Completed as-built drawings in an electronic format acceptable to the *Consultant*;
 - .13 Inspection certificates.
 - .2 And any other materials or documentation required to be submitted under the *Contract* or otherwise reasonably requested by the *Consultant*, together with written proof of acceptance to the *Owner* and the *Consultant* that the *Work* has been substantially performed in conformance with the requirement of the municipal, government and utility authorities having jurisdiction in the *Place of the Work*.
 - .3 5.4.5 Where the *Contractor* is unable to deliver the documents and materials described in paragraph 5.4.4, then, provided that none of the missing documents and materials interferes with the use and occupancy of the *Project* in a material way, and except as described herein, the failure to deliver shall not be grounds for the *Consultant* to refuse to certify the *Substantial Performance of the Work*.
 - .4 However, certification of the *Substantial Performance of the Work* may be withheld if the *Contractor* fails to deliver maintenance manuals or completed as-built drawings.”
- .19 GC 5.5 - Final Payment**
- .1 Amend paragraph 5.5.1 by adding the following to the end of the paragraph:
 - .1 “The *Contractor’s* application for final payment shall be accompanied by any documents or materials not yet delivered pursuant to paragraph 5.4.4. The *Work* shall be deemed not to be complete until all of the aforementioned materials have been delivered, and the *Owner* may withhold payment in respect of the delivery of any documents in an amount determined by the *Consultant*.”
 - .2 Amend paragraph 5.5.4 by deleting the number “5” and replacing it with “61”.
- .20 GC 6.2 - Change Order**
- .1 Add new paragraph 6.2.3 as follows:

- .1 "6.2.3.1 Any agreement reached by the *Owner* with the *Contractor* on an adjustment of the *Contract Price*, on either a lump-sum or unit price basis shall be subject to the conditions contained in paragraph 6.2.3.
 - .2 6.2.3.2 Where a change in the *Work* is performed by the *Contractor's* own forces, the negotiated lump sum price for change in the *Work*, or negotiated unit price(s) for each unit priced items shall be all-inclusive, except HST and mark-up as provided hereafter, and shall include, without limitation, all costs, charges, expenses and fees whatsoever required or related to perform such change, or such unit price item. The *Contractor* shall be allowed a mark-up to a maximum amount of 10% of the lump sum price, or aggregate of unit items and applicable unit price(s). The *Contractor* shall provide a written quotation identifying each amount to be charged for transportation, labour, *Product*, *Construction Equipment* and services and all other costs for the performance of the *Work*. The HST, as applicable, shall be identified separately in a manner satisfactory to the *Owner*.
 - .3 6.2.3.3 Where a change in the *Work* is performed by a *Subcontractor's* forces, the *Subcontractor's* lump sum price for change in the *Work*, or unit price(s) for each unit priced item shall be inclusive, except HST and mark-up, as provided hereafter, and shall include all of its costs, charges, expenses and fees whatsoever required or related to perform such change or such unit price item. The *Contractor* shall provide a written quotation with back-up documentation from the *Subcontractor* identifying each amount to be charged for transportation, *Product*, *Construction Equipment* and services and all other costs for the performance of the *Work* and the total price charged by the *Subcontractor*. The *Subcontractor* shall be allowed a mark-up to a maximum amount of 10% of the lump sum price, or aggregate of unit items and applicable unit price(s). The *Contractor* is allowed a mark-up of 5% on the total price charged by the *Subcontractor* to the *Contractor* for such change, net of taxes and *Subcontractor* mark-up. The HST, as applicable, shall be identified separately in a manner satisfactory to the *Owner*.
 - .4 6.2.3.4 Notwithstanding paragraphs 6.2.3.2 and 6.2.3.3, in the event that any of the change in the *Work* contains items or parts that, in the opinion of the *Consultant*, are the same or equivalent to items for which the *Contractor* submitted unit prices in the tender submitted by the *Contractor*, then the prices in the tender shall be the prices paid by the *Owner* for the work or parts of the work in respect of any change in the *Work*.
 - .5 6.2.3.6 The mark-ups provided for in paragraphs 6.2.3.2, 6.2.3.3 and 6.2.3.4 shall constitute the only compensation the *Contractor* shall be entitled to for any and all overhead, profit, incidental and administrative costs whatsoever related to the change, including but not limited to, costs related to superintendence and supervision, shop drawing production, estimating, site office and home office expenses, workers tools, temporary facilities and controls, and coordination of any and all *Work*-related activities.
 - .6 6.2.3.7 No claim whatsoever for a change in the *Contract Time*, delay, prolongation charges, remobilization or otherwise shall be permitted with respect to a change, unless authorized by the *Consultant* and approved by the *Consultant* and set out in the *Change Order* or *Change Directive*, as the case may be, by the *Owner*.
 - .7 6.2.3.8 No compensation for any change in the *Work* shall be allowed unless such change is first ordered in writing by the *Consultant* and authorized by the *Owner*.
- .21 **GC 6.3 - Change Directive**
- .1 Delete paragraph 6.3.7.1 in its entirety and replace it with the following:
 - .1 ".1 salaries, wages and benefits paid to personnel in the direct employ of the *Contractor*, applying the labour rates set out in the wages schedule in the *Contract Documents* or as otherwise agreed between the *Owner* and the *Contractor* for personnel,
 - .1 Carrying out the *Work*, including necessary supervisory services;
 - .2 Engaged in expediting the production or transportation of material or equipment, at shops or on the road; or
 - .3 Engaged in the preparation of Shop Drawings, fabrication drawings, coordination drawings and Contract as-built drawings."
 - .2 Delete paragraph 6.3.7.17 in its entirety.
 - .3 Amend paragraph 6.3.8 by adding the words "except for paragraph 6.3.14" after the word "*Contract*" in the first line.
 - .4 Add new paragraph 6.3.14 as follows:

- .1 "6.3.14 For greater certainty, and without limitation, the cost of performing the *Work* attributable to the *Change Directive* does not include, and no payment shall be made for:
 - .1 Head office salaries and benefits and all other overhead or general expenses, except only for wages, benefits, compensation, contributions, assessments, or taxes described in paragraph 6.3.7.1;
 - .2 Capital expenses and interest on capital;
 - .3 General clean-up, except where the performance of the *Work* in the *Change Directive* causes specific additional and extraordinary clean-up requirements;
 - .4 Wages paid for project managers, superintendents, assistants, watch persons and administrative personnel, provided the *Change Directive* does not result in extension of *Contract Time*;
 - .5 Wages, salaries, rentals, or other expenses that exceed the rates that are standard in the locality of the *Place of the Work*, that are otherwise deemed unreasonable by the *Consultant*;
 - .6 Any costs or expenses attributable to the negligence, improper *Work*, deficiencies, or breaches of *Contract* by the *Contractor* or *Subcontractor*;
 - .7 Any cost of quality assurance, such as inspection and testing services, charges levied by authorities, and any legal fees unless any such costs or fees are pre-approved in writing by the *Owner*."
- .22 **GC 6.4 - Concealed or Unknown Conditions**
 - .1 Add new subparagraph 6.4.5:
 - .1 6.4.5 The Contractor confirms that, prior to bidding the Project, it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.14.1, given the amount of time provided between the issue of the tender documents and the actual closing of tender, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor is not entitled to compensation or to an extension of the Contract Time for conditions which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.
- .23 **GC 6.5 - Delays**
 - .1 Amend paragraphs 6.5.1, and 6.5.2 by deleting the period at the end of each paragraph, and substituting the following words, " , but excluding any consequential, indirect or special damages, loss of profits, loss of opportunity or loss of productivity resulting from such delay."
 - .2 Add new paragraphs 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, as follows:
 - .1 "6.5.6 If the *Contractor* is delayed in the performance of the *Work* by an act or omission of the *Contractor* or anyone employed or engaged by the *Contractor* directly or indirectly, or by any cause within the *Contractor's* control, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may decide in consultation with the *Contractor*. The *Owner* shall be reimbursed by the *Contractor* for all reasonable costs incurred by the *Owner* as the result of such delay, including all services required by the *Owner* from the *Consultant* as a result of such delay by the *Contractor* and, in particular, the cost of the *Consultant's* services during the period between the date of *Ready-for-Takeover* stated in Article A-1 (as may be extended) and any later, actual date of *Ready-for-Takeover* achieved by the *Contractor*.
 - .2 6.5.7 The *Contractor* shall be responsible for the care, maintenance and protection of the *Work* in the event of any suspension of construction as a result of the delay described in paragraph 6.5.1, 6.5.2 or 6.5.3. In the event of such suspension, the *Contractor* shall be reimbursed by the *Owner* for the reasonable costs incurred by the *Contractor* for such care, maintenance and protection, but excluding the costs of the *Contractor's* head office personnel. The *Contractor's* entitlement to costs pursuant to paragraph 6.5.7, if any, shall be in addition to amounts, if any, to which the *Contractor* is entitled pursuant to paragraphs 6.5.1, 6.5.2, or 6.5.3.
 - .3 6.5.8 Without limiting the obligations of the *Contractor* described in GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS and GC 9.4 – CONSTRUCTION SAFETY, the *Owner* may, by *Notice in Writing*, direct the *Contractor* to stop the *Work* where the *Owner* determines that there is an imminent risk to the safety of the persons or property at the *Place of the Work*. In the event that the *Contractor* receives such notice, it shall immediately stop the *Work* and secure the *Project* site. The *Contractor* shall not be entitled to an extension of the *Contract Time* or to an increase in the *Contract Price* unless the resulting

delay, if any, would entitle the *Contractor* to an extension of the *Contract Time* or the Reimbursement of the *Contractor's* costs as provided in paragraphs 6.5.1, 6.5.2, or 6.5.3.

- .4 6.5.9 In addition to the amount set out in paragraph 6.5.6, the *Contractor* recognizes and agrees that the *Owner* will suffer a financial loss if the *Work* is not completed within the time prescribed by the *Contract*. The *Contractor* also recognizes the delays, expenses and difficulties involved in proving the actual loss suffered by the *Owner* if the *Work* is not completed on time. Accordingly, instead of requiring any such proof, the *Contractor* agrees that as liquidated damages for delay (but not as penalty) the *Contractor* shall pay the *Owner* an amount per day, as designated in the Special Conditions of Contract for each and every day's delay from the specified time for *Ready-for-Takeover* until the actual date of *Ready-for-Takeover*, and it is further expressly acknowledged and agreed by the *Contractor* that:
 - .1 This amount is a reasonable estimate of the actual damages that will be incurred by the *Owner* due to any failure to attain *Ready-for-Takeover* within the time required by this *Contract*;
 - .2 The *Owner* may deduct the amount due under this section from any monies that may be due or payable to the *Contractor*, whether under the *Contract* or any other agreement; and,
 - .3 The liquidated damages provided for in this section shall be without prejudice to any other remedy to which the *Owner* is entitled at law or in equity.
- .5 6.5.10 In the event that paragraph 6.5.9 is held by a court of competent jurisdiction to be invalid, unenforceable or void, or if no liquidated damages are designated in the Special Conditions of the *Contract*, the *Contractor* shall be held responsible for the payment of the *Owner's* actual costs associated with the delay in achieving *Ready-for-Takeover*. The *Owner's* costs will include, but are not limited to, the amounts relating to the items set out in paragraph 6.5.6 and all other costs directly or indirectly associated with the delay in the completion of the *Work* by the *Contractor*. The amounts payable pursuant to paragraph 6.5.10 are in addition to the amounts payable by the *Contractor* to the *Owner* pursuant to paragraph 6.5.6.
- .6 6.5.11 Any such claim by the Contractor and/or the Owner with respect to delay, shall be made in accordance with GC 6.6 - Claims for a Change in Contract Price."

.24 GC 6.6 - Claims for a Change in Contract Price

- .1 Amend paragraph 6.6.1 by deleting the period at the end of the paragraph and adding the following:
 - .1 "within 30 *Working Days* of the commencement of the *Work* giving rise to the claim."
- .2 Add new paragraph 6.6.7:
 - .1 6.6.7 The Owner may make claims arising out of the costs incurred for additional services provided by the Consultant (or other design professionals) resulting from the Contractor's failure to reasonably perform the Work in accordance with the terms and conditions of the Contract, including the Contractor's issuance of unnecessary Requests for Information, improper and/or repeated shop drawings, or other such actions that fail to conform to the requirements of the Contract. The Consultant will notify the Owner and Contractor where it has been determined that additional services will be required or have been provided in order not to cause a delay. The Owner shall make claims based on the Consultant's invoices.

.25 GC 7.1 - Owner's Right to Perform the Work, Terminate the Contractor's Right to Continue with the Work or Terminate the Contract

- .1 Delete paragraph 7.1.2 in its entirety and replace it with the following:

"If the *Contractor* neglects to perform the *Work* properly or otherwise fails to comply with the requirements of the *Contract* to a substantial degree, the *Owner* may, without prejudice to any other right or remedy the *Owner* may have, give the *Contractor Notice in Writing*, containing particulars of the default including references to applicable provisions of the *Contract*, that the *Contractor* is in default of the *Contractor's* contractual obligations and instruct the *Contractor* to correct the default in the 5 *Working Days* immediately following the receipt of such *Notice in Writing*. Failure by the *Owner* to provide such notice shortly after the default has occurred shall not constitute condonation of the default."
- .2 Add a new subparagraph 7.1.5.5 as follows:
 - .1 ".5 charge the *Contractor* for any damages the *Owner* may have sustained as a result of the default."

.26 GC 7.2 - Contractor's Right to Suspend the Work or Terminate the Contract

- .1 Delete paragraph 7.2.1 and 7.2.3.1 in their entirety.
 - .2 Delete subparagraph 7.2.3.4 and replace it with the following:
 - .1 “.4 the *Owner* violates the requirements of the *Contract* to a substantial degree.”
 - .3 Delete paragraph 7.2.5 and replace it with the following:
 - .1 “7.2.5 If the default cannot be corrected within the 5 *Working Days* specified in paragraph 7.2.4, the *Owner* shall be deemed to have cured the default if it:
 - .1 Commences the correction of the default within the specified time;
 - .2 Provides the *Contractor* with an acceptable schedule for such correction; and,
 - .3 Completes the correction in accordance with such schedule.”
 - .4 Add new paragraph 7.2.6:
 - .1 “7.2.6 If the *Contractor* terminates the *Contract* under the conditions described in this GC 7.2, the *Contractor* shall be entitled to be paid for all *Work* performed to the date of termination. The *Contractor* shall also be entitled to recover the costs associated with termination, including the costs of demobilization, losses sustained on *Products* and *Construction Equipment*. The *Contractor* shall not be entitled to any recovery for special, indirect or consequential losses, loss of use or loss of profit.”
- .27 GC 9.1 - Protection of Work and Property**
- .1 Delete subparagraph, 9.1.1.1 in its entirety and replace it with new subparagraph 9.1.1.1:
 - .1 “9.1.1.1 errors in the *Contract Documents* which the *Contractor* could not have discovered applying the standard of care described in GC 3.14 – STANDARD OF CARE.”
 - .2 Amend paragraph 9.1.1.2 by adding the word, “negligent” at the beginning thereof.
 - .3 Add new paragraphs 9.1.5 and 9.1.6 as follows:
 - .1 “9.1.5 Without in any way limiting the *Contractor’s* obligations under this GC 9.1, should the *Contractor* or any *Subcontractor* or supplier cause loss or damage to trees or other plantings, whether owned by the *Owner* or third parties, the *Contractor* shall be liable for the replacement cost of the trees or the plantings damaged, including the cost of any arborist or other *Consultant*, and such costs may be deducted by the *Owner* from amounts otherwise owing to the *Contractor*.
 - .2 9.1.6 The *Contractor* shall neither undertake to repair and/or replace any damage whatsoever to the *Work* of other *Contractors*, or to adjoining property, nor acknowledge the same was caused or occasioned by the *Contractor*, without first consulting the *Owner* and receiving written instructions as to the course of action to be followed from either the *Owner* or the *Consultant*. However, where there is danger to life or public safety, the *Contractor* shall take such emergency action as it deems necessary to remove the danger.”
- .28 GC 9.4 - Construction Safety**
- .1 Delete paragraph 9.4.1 in its entirety and substitute new paragraph 9.4.1:
 - .1 “9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations and practices required by the applicable construction health and safety legislation and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the *Work*.”
 - .2 Add new paragraphs 9.4.6 and 9.4.7:
 - .1 “9.4.6 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owner*:
 - .1 A current *WSIB* clearance certificate;
 - .2 Documentation of the *Contractor’s* in-house safety-related programs; and,
 - .3 A copy of the Notice of Project filed with the Ministry of Labour naming itself as “Constructor” under the *OHSA*.
 - .2 9.4.7 The *Contractor* shall indemnify and save harmless the *Owner*, its agents, officers, directors, employees, consultants, successors and assigns from and against the consequences of any and all safety infractions committed by the *Contractor* or *Subcontractors* under the *OHSA*, including the payment of legal fees and disbursements on a full indemnity basis.

.29 GC 10.1 - Taxes and Duties

- .1 Add the following to the end of paragraph 10.1.1:
 - .1 “Any *Value Added Taxes* (including Harmonized Sales Tax), where applicable, shall be listed as line items separate from the total *Contract Price*.”
- .2 Delete paragraph 10.1.2 and replace it with the following:
 - .1 “Any increase or decrease in costs to the *Contractor* due to changes in such included taxes and duties at the time of the bid closing shall increase or decrease the *Contract Price* accordingly. For greater certainty, the *Contractor* shall not be entitled to any mark-up for overhead or profit on any increase in such taxes and duties.”
- .3 Add new paragraphs 10.1.3, 10.1.4, 10.1.5 and 10.1.6 as follows:
 - .1 “10.1.3 Where the *Owner* is entitled to an exemption or a recovery of sales taxes, custom duties, excise taxes or *Value Added Taxes* applicable to the *Contract*, the *Contractor* shall, at the request of the *Owner* or the *Owner’s* representative, assist with the application for any exemption, recovery or refund of all such taxes and Duties and all amounts recovered or exemptions obtained shall be for the sole benefit of the *Owner*. The *Contractor* agrees to endorse over to the *Owner* any cheques received from the Federal or provincial governments, or any other taxing authority, as may be required to give effect to this paragraph.
 - .2 10.1.1.4 The *Contractor* shall maintain accurate records of *Construction Equipment*, *Product* and component costs reflecting the taxes, custom duties, excise taxes and *Value Added Taxes* paid.
 - .3 10.1.1.5 Any refund of taxes, including, without limitation, any government sales tax, customs duty, excise tax or *Value Added Tax*, whether or not paid, which if found to be inapplicable or for which exemption may be obtained, is the sole and exclusive property of the *Owner*. The *Contractor* agrees to cooperate with the *Owner* and to obtain from all *Subcontractors* and *Suppliers* cooperation with the *Owner* in the application for any refund of any taxes, which cooperation shall include but not be limited to, making or concurring in the making of an application for any such refund or exemption and providing to the *Owner* copies, or where required, originals of records, invoices, purchase orders and other documentation necessary to support such applications for exemptions or refunds. All such refunds shall either be paid to the *Owner*, or shall be a credit to the *Owner* against the *Contract Price*, in the *Owner’s* discretion. The *Contractor* agrees to enable, assist with and submit to any reasonable audit requested by the *Owner* with respect to the potential refunds under this paragraph.
 - .4 10.1.1.6 Custom duties, penalties, or any other penalty, fine or assessment levied against the *Contractor*, shall not be treated as a tax or customs duty for the purpose of this GC 10.1.”

.30 GC 10.2 - Laws, Notices, Permits and Fees

- .1 Add to the end of paragraph 10.2.4, the following:
 - .1 “The *Contractor* shall notify the Chief Building Official or the registered code agency where applicable, of the readiness, substantial completion, and Ready-for- Takeover stages of construction. The *Contractor* shall be present at each site inspection by an inspector or registered code agency as applicable under the Ontario *Building Code*.”
- .2 Delete paragraph 10.2.6 and replace it with the following:
 - .1 “10.2.6 If the *Contractor* fails to notify the *Owner* and the *Consultant* in writing, fails to obtain direction required in paragraph 10.2.5, or performs work that contravenes any laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes, the *Contractor* shall be responsible for and shall correct the violations thereof, and shall bear the costs, expenses, and damages attributable to the failure to comply with the provisions of such laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes and, notwithstanding any limitation described in Part 13, shall indemnify and hold harmless the *Owner* and the *Consultant* from and against any claims, demands, losses, costs, damages, actions, suits or proceeding resulting from failure or breach of law.”
- .3 Add a new paragraph 10.2.8 as follows:
 - .1 “10.2.8 Without limiting the generality of any other provision in the *Contract Documents*, the *Contractor* shall cause all certificates to be furnished that are required or given by the appropriate governmental or quasi-governmental authorities as evidence that the *Work* as installed conforms with the laws and regulations of any authorities having jurisdiction over the *Place of the Work*, including, without limitation, certificates of compliance for the *Owner’s* occupancy or partial occupancy. The certificates are to be final certificates giving complete

clearance of the *Work*, in the event that such governmental or quasi-governmental authorities furnish such certificates.”

.31 GC 10.3 - Patent Fees

- .1 Amend paragraph 10.3.1 by adding the words, “indemnify and” before the words, “hold the”, in the second line.
- .2 In paragraph 10.3.2, add the words, “by the *Owner*”, after the words, “supplied to the *Contractor*”.

.32 GC 12.3 - Warranty

- .1 Delete from the first line of paragraph 12.3.2 the word, “The” and substitute the words: ““Subject to paragraph 3.14.1, the”.
- .2 Add the following clauses as 12.3.7, 12.3.8 and 12.3.9:
 - .1 “12.3.7 Any *Product*, or equipment requiring excessive servicing during the warranty period (or free maintenance period, if applicable) shall be considered defective and the warranty (or free maintenance period) shall be deemed to take effect from the time that the defect has been corrected so as to cause excessive servicing to terminate.
 - .2 12.3.8 Following *Substantial Performance of the Work*, and without limiting the *Contractor’s* warranty under GC 12.3, the *Contractor* shall assign to the *Owner*, to the extent assignable, the benefit of all warranties and guarantees relating to the *Work*. The assignment shall expressly reserve the rights of the *Contractor* to make any claims under such warranty and guarantees and such assignment shall in no way prejudice any rights of or benefits accruing to the *Contractor* pursuant to such warranties and guarantees.
 - .3 12.3.9 The provisions of GC 12.3 shall not deprive the *Owner* of any action, right or remedy otherwise available to the *Owner* for the *Contractor’s* failure to fulfill its obligations or responsibilities under the *Contract* and shall not be construed as a waiver of claims in favour of the *Contractor* or as limitation on the time in which the *Owner* may pursue such other action, right to remedy. The warranties set out in the *Contract* are supplemental to and do not limit or preclude the application of any other conditions and warranties, express or implied, by law or trade usage.”

.33 GC 13.1 - Indemnification

- .1 Delete paragraph 13.1.1 through 13.1.6 and replace them with the following:
 - .1 “13.1.1 The *Contractor*, both during and after the term of this Agreement, shall at all times, and at its own cost, expense and risk, defend, indemnify and hold harmless the City, its elected officials, officers, employees, volunteers, agents, contractors, and all respective heirs, administrators, executors, successors and assigns from any and all losses, damages (including, but not limited to, incidental, indirect, special and consequential damages, or any loss of use, revenue or profit by any person, organization or entity), fines, penalties and surcharges, liabilities (including, but not limited to, any and all liability for damage to property and injury to persons, including death), judgments, claims, demands, causes of action, contracts, suits, actions or other proceedings of any kind (including, but not limited to proceedings of a criminal, administrative or quasi criminal nature) and expenses (including, but not limited to, legal fees on a substantial indemnity basis), which the indemnified person or persons may suffer or incur, howsoever caused, arising out of or in consequence of or directly or indirectly attributable to the Services required to be performed by the Contractor, its agents, employees and sub- contractors on behalf of the City, provided such losses, damages, fines, penalties and surcharges, liabilities, judgments, claims, demands, causes of action, contracts, suits, actions or other proceedings of any kind and expenses as defined above are due or claimed to be due to the negligence, breach of contract, and/or breach of law of the Contractor, its agents, employees or sub-contractors.”

.34 GC 13.2 - Waiver of Claims

- .1 Delete paragraph 13.2.5 in its entirety.
- .2 In paragraph 13.2.8, replace the words, “The Party” with “The *Contractor*.”

.35 Part 14 - Other Provisions

- .1 Add new PART 14 as follows:
 - .1 “**GC 14.1 – Ownership of Materials**
 - .1 14.1.1 Unless otherwise specified, all materials existing at the *Place of the Work*, at the time of execution of the *Contract* shall remain the property of the *Owner*. All *Work* and *Products* delivered to the *Place of the Work* by the *Contractor* shall be the property of the

Owner. The *Contractor* shall remove all surplus or rejected materials as its property when notified in writing to do so by the *Consultant*.

.2 GC 14.2 – Construction Liens

- .1 14.2.1 In the event that a construction lien is registered or is delivered to the *Owner*. In respect of the *Project*, or written notice of lien is delivered to the *Owner*, the *Contractor*, at its own expense and within ten (10) days, shall ensure that such lien or notice of lien is vacated, discharged or withdrawn.
- .2 14.2.2 In the event that the *Contractor* fails to comply with the requirements of 14.2.1, the *Owner* may set off and deduct from any amount owing to the *Contractor*, all costs and associated expenses, including legal fees and disbursements incurred to vacate or discharge the lien, including costs of obtaining and posting a lien bond or other security. The *Contractor* shall reimburse the *Owner* for all of the said cost and associated expenses.
- .3 14.2.3 Notwithstanding any other provision of the *Contract*, the *Owner* shall not be obligated to pay any amount otherwise owing to the *Contractor* until any liens are vacated or discharged.

.3 GC 14.3 - Contractor Discharge of Liabilities

- .1 14.3.1 In addition to the obligation assumed by the *Contractor* pursuant to GC 3.6 and 3.7, the *Contractor* agrees to discharge all liabilities incurred by it for labour, materials, services, *Subcontractors* and *Products* used or reasonably required for use in the performance of the *Work*, except for amounts withheld by reason of legitimate dispute and which have been identified to the party or parties, from whom payment has been withheld.

.4 GC 14.4 - Daily Reporting/Daily Logs

- .1 14.4.1 The *Contractor* shall cause its supervisor or such competent person as it may delegate, to prepare a daily log or diary reporting on weather conditions, work force of the *Contractor*, *Subcontractors*, *Suppliers* and any other forces on site and also record the general nature of *Project* activities. Such log or diary shall also include any extraordinary or emergency events which may occur and also the identities of any persons who visit the site who are not part of the day-to-day work force.
- .2 14.4.2 The *Contractor* shall also maintain records, either at its head office or at the job site, recording manpower and material resourcing on the *Project*. The *Contractor* shall make these records available to the *Owner* and/or the *Consultant* for inspection upon reasonable notice.

.5 GC 14.5 - Public Statements

- .1 14.5.1 The *Contractor* shall not publish issue or make any statements or news release, electronic or otherwise concerning the *Contract*, the *Work*, or the *Project*, without the express written consent of the *Owner*.

.6 GC 14.6 - Owners Set-Off

- .1 14.6.1 In addition to and without limiting any other rights the *Owner* may have under the *Contract* and at law, the *Owner* may retain from monies owing to the *Contractor* under the *Contract* an amount sufficient to cover any outstanding or disputed liabilities including the cost to remedy deficiencies, the reduction in value of substantial portion of the *Work*, claims for damages by third parties, and any assessment due to the Workplace Safety and Insurance Board.”

.7 GC 14.7 – Confidentiality, Freedom of Information and Publicity

- .1 14.7.1 Without limiting the generality of the sections of the *Contract* relating to compliance with all applicable laws and statutes, the *Contractor* acknowledges that the *Owner* is governed by the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990 c. M.56 (“MFIPPA”) and the *Contractor* covenants to comply with this Act and to protect the privacy of residents in keeping with this Act, as agent of the *Owner* for the purpose of this section.
- .2 14.7.2 The *Contractor* shall not at any time before, during or after the completion of the *Contract*, divulge any confidential information communicated to or acquired by the *Contractor* or disclosed by the *Owner* in the course of carrying out *Work* provided for herein. No such information shall be used by the *Contractor* before, during or after the completion of the *Contract* on any project without the prior written consent of the *Owner*.

For the purpose of this *Contract*, “confidential information” means any information that is not in the public domain.

- .3 14.7.3 In accordance MFIPPA or other applicable privacy legislation, the *Contractor* agrees that any personal information it has provided as a proponent or bidder in the course of submitted a proposal or tender has been collected under the authority of the *Municipal Act, 2001*, S.O. 2001 c. 25 and has been properly used in the proposal or tender evaluation process and is now properly used for the purpose of this *Contract*. All correspondence, documentation and other information, including the proposal or tender, provided to the *Owner* or its employees, agents or representatives by the *Contractor*, as a proponent or bidder or now, or in the future in connection with, or arising out of, the proposal or tender process or this *Contract*, is or shall become property of the *Owner* and a record of the *Owner*. Such records and the Contract Documents are subject to the provision of MFIPPA and the *Owner*'s obligations under this or other privacy legislation and may be released pursuant to such Acts. The *Contractor*'s name at a minimum will be made public on request. In addition, certain contractual information must be disclosed to the *Owner* and accordingly may become part of the public record. All correspondence, documentation and information provided to the *Owner* may be produced for the purpose of evaluating the *Contractor*'s or proponent's proposal or bid, or for purposes of this *Contract*.
- .4 14.7.4 All correspondence, documentation and information provided by the *Owner* to any bidder or contractor in connection with or arising out of any tender, request for proposal, or contract or the acceptance of any of the aforesaid remains the property of the *Owner* and must not be used for any purpose other than as related to the tender or proposal or in the fulfilment of any purpose other than as related to the tender or proposal or this *Contract* must be maintained at all times by the *Contractor*. Where any proprietary or confidential information belonging to or in the care of the *Owner* is disclosed to the *Contractor*, the *Contractor* shall:
 - .1 Safeguard all information provided by the *Owner* at the request of the *Owner*;
 - .2 Maintain in strict confidence and not reproduce or disclose any such information to any person except as required by law or as expressly permitted in advance and in writing by the *Owner*;
 - .3 Return forthwith upon demand all such information as may be in documentary form or recorded electronically; and,
 - .4 Not use any such information for any purpose other than the purpose for which it was provided by the owner or by any other person at the request of the *Owner*.
- .5 14.7.5 Any publicity or press releases with respect to this *Contract* shall be within the sole discretion and control of the *Owner*. The *Contractor* shall obtain prior approval from the *Owner* before making any information public with regard to this *Contract* at any time, during or after the term of the *Contract*.”

End of Section

Part 1 General

1.1 Section Includes

- .1 Documents and terminology.
- .2 Associated requirements.
- .3 Work expectations.
- .4 Work by other parties.
- .5 Occupancy and Premises usage.

1.2 Related Requirements

- .1 Section 01 21 00 - Allowances.
- .2 Section 01 14 00 - Work Restrictions.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Related Documents

- .1 Section 00 73 03 - Supplementary Conditions.
- .2 All other Division 01 specification sections.
- .3 Division 01 sections describe requirements applicable to all Sections within Divisions 02 to 49 inclusive.

1.4 Words And Terms

- .1 Refer to and acknowledge other words, terms, and definitions in CCDC 2 Definitions. Additional words and terms are included in Contract Documents.

1.5 Complementary Documents

- .1 Drawings, specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents that leave doubt as to the intent or meaning, abide by Precedence of Documents article below or obtain direction from the Consultant.
- .2 Drawings indicate general location and route of conduit and wire/conductors. Install conduit or wiring/conductors and plumbing piping not shown or indicated diagrammatically in schematic or riser diagrams to provide an operational assembly or system.
- .3 Install components to physically conserve headroom, to minimize furring spaces, or obstructions.
- .4 Locate devices with primary regard for convenience of operation and usage.
- .5 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.6 Description Of The Work

- .1 Work of this Contract includes, but is not limited to, the construction of a new fire station facility, including related site servicing, and all other related works detailed in the Contract Documents.
- .2 Division of the Work among Subcontractors is solely the Contractor's responsibility. Neither the Owner nor Consultant assumes any responsibility to act as an arbiter to establish subcontract terms between sectors or disciplines of work.

1.7 Contract Method

- .1 Construct Work under single, stipulated price, CCDC 2 - 2020 contract.
- .2 Relations and responsibilities are between the Contractor and the Owner.
- .3 Provide the required bonds and liability insurance to ensure such specified assurances to the Owner.
- .4 Assigned Subcontractors are required to provide requested bonds covering faithful performance of subcontracted work, to the Owner plus payment of related obligations.

- .5 Refer to Section 01 21 00 for cash allowance amounts applicable to assignable contracts.
- .6 Assume responsibility for assigned contracts as Subcontracts forming part of the Work.
- .7 Contract Documents were prepared by the Consultant for the Owner. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Consultant and Owner accepts no responsibility for damages, suffered by any third party as a result of decisions made or actions based on the Contract Documents.
- .8 For purposes of reference in these Contract Documents, the term "Contractor" shall mean the party in contract with the Owner.

1.8 Documents Provided

- .1 Electronic documents, in electronically delivered Adobe PDF formats.
- .2 Owner will supply the Contractor with one (1) electronic version, Issued for Construction set of Drawings for municipal building permit and construction purposes.
- .3 Contractor to supply hardcopy documents for their own use as required.
- .4 An electronic set of documents will be provided near the end of the Project for purposes of transferring changed information recorded on as-built documents to the electronic Record Documents.

1.9 Performance Of The Work

- .1 Substantial Performance of the Work is required for Owner occupancy by no later than **September 30, 2023**.
- .2 In the event of delays or deficiencies to the construction schedule that are the Contractor's responsibility, the Contractor will be responsible to pay for any additional fees, expenses, or other such costs borne by the Owner as a result of the Contractor's delay in the performance of the Work.

1.10 Work Sequence

- .1 Construct Work in to accommodate Owner's usage requirements during the construction period, coordinate construction schedule and operations with Consultant and Owner.
- .2 Owner requires access and use of the existing municipal office and municipal water system facilities during the entire period of construction. Contractor to coordinate and manage any potential access impacts to these existing works.
- .3 Coordinate Progress Schedule and with Owner use during construction.
- .4 Account for any Work restrictions imposed by the Owner.
- .5 Maintain fire access and control of fire protection equipment.

1.11 Work By Owner

- .1 Items noted N.I.C. (Not in Contract) shall be managed and coordinated by the Owner with the Contractor as required during the course of the Work.
- .2 Owner will remove and retain possession of the following items before start of work:
 - .1 Existing shed building and contents, and any other desired fixtures identified by the Owner, as noted on Drawings.
 - .2 Relocated electrical servicing from overhead to underground from existing utility poles adjacent to County Road 10. All existing utility poles, guy wires, anchors to be removed.

1.12 Owner-supplied Products

- .1 Obtain the necessary Shop Drawings from the Owner and proceed to coordinate details for installation, expedite, receive, unload, install, connect and test the specified equipment, and be responsible for warranty.
- .2 Equipment specifications for pre-purchased items are included at the end of the project specification, printed on blue paper for confirmation only.
- .3 Receive Owner-supplied Products and equipment F.O.B. and store and process Products and equipment until installation.
- .4 Owner Responsibilities:
 - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.

- .2 Deliver supplier's bill of materials to Contractor.
- .3 Arrange and pay for delivery to the Place of the Work in accordance with Progress Schedule.
- .4 Inspect deliveries jointly with Contractor.
- .5 Submit claims for transportation damage.
- .6 Arrange for replacement of damaged, defective or missing items.
- .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- .5 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each Product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant, notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload Products at site.
 - .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
 - .5 Handle Products at site, including uncrating and storage.
 - .6 Protect Products from damage, and from exposure to elements.
 - .7 Assemble, install, connect, adjust, and finish Products.
 - .8 Arrange for installation inspections required by public authorities.
 - .9 Repair or replace items damaged by Contractor or Subcontractor on site (under their control).
- .6 Schedule of Owner-supplied Products.
 - .1 King Industrial stationary air compressor unit model KC6160V1, 6.5 peak HP, 60 gallon, 15A 240V 1-phase.

1.13 Work By Others

- .1 Work of Project which will be executed after completion of Work of this Contract, and which is specifically excluded from this Contract:
 - .1 Electrical site re-servicing for Municipal Office as per approved layouts and easements by Hydro One Networks Inc.

1.14 Permits

- .1 The following permits related to the project are the sole responsibility of the Contractor:
 - .1 Municipal demolition permit.
 - .2 Municipal building permit.
- .2 Any/all permit fees are the responsibility of the Owner.

1.15 Contractor Use Of Premises

- .1 Contractor has general use of the site until Substantial Performance of the Work.
- .2 Owner requires access and use of all existing buildings and facilities on the site during such time that the new building is ready for occupancy. Contractor to permit Owner's access, and provide such measures to ensure safe and unobstructed access.
- .3 Construction Operations: Limited to areas noted on Drawings.

1.16 Owner Occupancy

- .1 Owner will occupy Municipal Office building, associated southern parking area, and municipal water supply system works/areas throughout the course of construction.
- .2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.
- .3 Maintain fire and life safety systems and public access to exits during all stages of the Work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Connecting to existing services.
- .2 Special scheduling requirements.

1.2 Related Requirements

- .1 Section 01 53 00 - Temporary Construction.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 32 00 - Construction Progress Documentation.
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Existing Services

- .1 Notify Owner and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Owner, forty-eight (48) hours of notice for necessary interruption of mechanical or electrical service throughout course of work.
 - .1 Keep duration of interruptions minimum.
 - .2 Perform interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for vehicular and pedestrian traffic.
- .4 Construct barriers in accordance with Section 01 53 00.

1.4 Special Requirements

- .1 Perform noise generating work:
 - .1 During normal business days from 07:00 to 19:00 hours, unless restricted by municipal approvals, which shall take precedence.
 - .2 On Saturdays, Sundays, and statutory holidays to Owner approval.
- .2 Submit schedule of special requirements or disruptions in accordance with Section 01 33 00.

End of Section

Part 1 General

1.1 Section Includes

- .1 Words and terms.
- .2 Complementary documents.
- .3 Precedence of Documents.
- .4 Specification grammar.

1.2 Related Documents

- .1 Document 00 73 03 - Supplemental Conditions.
- .2 Section 01 11 00 – Summary of Work.
- .3 This section describes requirements applicable to all sections within Divisions 02 to 49.

1.3 Definitions Declaration

- .1 CCDC 2 - 2020 Edition, Stipulated Price Contract as maybe amended, forms the basis of Definitions between the Owner and Contractor.
- .2 These Definitions are bound to the CCDC 2 Definitions and CCDC 2 General Conditions.

1.4 Words And Terms

- .1 Conform to definitions and their defined meanings in the Agreement and Definitions portion of CCDC 2 for supplementary words and terms.
- .2 The following words and terms are applicable to the Contract Documents for this project:
- .3 Addendum: A document that amends the Bid Documents during the Bidding Period and becomes part of the Contract Documents when a Contract is executed. (Plural: Addenda).
- .4 Agreement: The signed and sealed legal instrument binding parties in a Contract, describing in strict terms their mutual arrangement, roles and responsibilities, commencement, and completion responsibilities.
- .5 Alternative Price: The amount stipulated by a Bidder for an Alternative and stated as an addition, a deduction, or no change to the Bid Price.
- .6 Bid: To offer as a Bid stating for what price a Contractor will assume a Contract.
- .7 Bid Documents: A set of documents consisting of the Instructions to Bidders, Bid Form, Contract Documents, and other information issued for the benefit of Bidders to prepare and submit a Bid.
- .8 Bid Form: The specific and detailed form used to collect information about a Bid.
- .9 Bidding: The process of preparing and submitting a Bid.
- .10 Contractor: The person or entity that works under a single contract with the Owner to provide construction services.
- .11 Construction Documents: The Drawings and Project Manual. When combined with a Contract and Contract conditions, these documents form the Contract Documents.
- .12 Contingency Allowance: An additional monetary amount added to a Project cost estimate and designated to cover unpredictable or unforeseen items of Work. The amount is usually based on some percentage of the estimated cost and expended and adjusted by Change Order. It is not intended to cover additions to the scope of Work.
- .13 Cost Plus Contract: A Contract under which a Contractor is reimbursed for the direct and indirect costs for the performance of a Contract and, in addition, is paid a Fee for services. The Fee is usually stated as a stipulated price or as a percentage of cost.
- .14 General Conditions: That part of the Contract Documents that sets forth many of the rights, responsibilities and relationships of the parties involved in a Contract.
- .15 Instructions To Bidders: Instructions contained in the Bid Documents to convey an Owner's expectations and criteria associated with submitting a Bid.
- .16 Payment Certifier: The payment Certifier may also be the consultant.

- .17 Section: A portion of a Project Specification covering one or more segments of the total Work or requirements. Sections are included in a Project manual as required to meet Project requirements.
- .18 Standard: A document describing a grade or a level of quality, which has been established by a recognized agency or organization, utilizing an internal voting process.
- .19 Separate Price: A separate price for work to be added to the base price if selected by the Owner. This price type is not a part of the base bid price.
- .20 Stipulated Price: An amount set forth in a Stipulated Price Contract as the total payment for the performance of the Work. Sometimes referred to as a stipulated sum or a lump sum stipulated price.
- .21 Tender: A term that was formally abandoned by CCDC and the Canadian Construction industry in the early 1980's in favour of the preferred term Bid.
- .22 Unit Price: The amount payable for a single unit of Work as stated in a Schedule of Prices.
- .23 Install: To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.
- .24 Supply: To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.

1.5 Complementary Documents

- .1 Generally, drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate specific components, assemblies, and identify quality.
- .2 Drawings, specifications, diagrams and schedules are complementary, each to the other, and what is required by one, to be binding as if required by all.
- .3 Should any conflict or discrepancy appear between documents, which leaves doubt as to the intent or meaning, apply the Precedence of Documents article below or obtain guidance or direction from Consultant.
- .4 Examine all discipline drawings, specifications, schedules, diagrams and related Work to ensure that Work can be satisfactorily executed.
- .5 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.6 Precedence Of Documents

- .1 In the event of conflict within and between the Contract Documents, the order of priority within specifications and drawings for this project are - from highest to lowest:
 - .1 the Agreement and Definitions between the Owner and the Contractor;
 - .2 the Definitions;
 - .3 Supplementary Conditions;
 - .4 the General Conditions;
 - .5 Sections of Division 01 of the specifications;
 - .6 Sections of Divisions 02 through 49 of the specifications.
 - .7 Schedules and Keynotes:
 - .1 Material and finishing schedules within the specifications, then;
 - .2 Material and finishing schedules on drawings, then;
 - .3 Keynotes and definitions thereto, then;
 - .8 Diagrams.
 - .9 Drawings:
 - .1 Drawings of larger scale shall govern over those of smaller scale of the same date, then;
 - .2 Dimensions shown on drawings shall govern over dimensions scaled from drawings, then;
 - .3 Location of utility outlets indicated on architectural detail drawings takes precedence over positions or mounting heights located on mechanical or electrical Drawings.
 - .10 Later dated documents shall govern over earlier documents of the same type.
- .2 In the event of conflict between documents, the decision of the Consultant shall be final, without liability to the Consultant.

1.7 Specification Grammar

- .1 Specifications are written in the imperative (command) mode, in an abbreviated form.
- .2 Imperative language of the technical sections is always directed to the Contractor identified as a primary constructor, as sole executor of the Contract, unless specifically noted otherwise.
 - .1 This form of imperative (command) mode statement requires the primary constructor to perform such action or Work.
 - .2 Perform all requirements of the Contract Documents whether stated imperatively or otherwise.
- .3 Division of the Work among subcontractors, suppliers, or others is solely the prime constructor's responsibility. The Consultant(s) and specification authors assume no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of Work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Cash allowances.
- .2 Inspection and testing allowances.

1.2 Related Requirements

- .1 Section 01 25 00 - Substitution Procedures.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Cash Allowances

- .1 Refer to GC 4.1 and related conditions.
- .2 Costs Included in Cash Allowances: Cost of Product to Contractor less applicable trade discounts; delivery to site, and applicable taxes.
- .3 If a Cash Allowance item described in the Allowances Schedule below indicates the inclusion of installation, include in the Cash Allowance amount, provision for Product handling at the site, including unloading, uncrating, storage, protection of Products from elements and from damage, labour for installation and finishing, insurance, labour costs, taxes, bonding if applicable, equipment rental, overhead and profit.
- .4 If a Cash Allowance item described in the Allowances Schedule below indicates supply only, include in the Contract Price costs not included in Cash Allowances but included in the Contract Price: Product handling at the site including unloading, uncrating, storage, protection of Products from elements and from damage, labour for installation and finishing, insurance, labour costs, taxes, bonding if applicable, equipment rental, overhead and profit.
- .5 Consultant Responsibilities:
 - .1 Consult with Contractor for consideration and selection of Products, suppliers, and installers.
 - .2 Owner and Consultant to select Products.
 - .3 Review shop drawings/submittals as applicable to the allowance item.
 - .4 Issue instructions to Contractor relative to the Owner's selection of a product, supplier, and/or installer as applicable to the allowance item.
- .6 Contractor Responsibilities:
 - .1 Assist Consultant in selection of Products, suppliers and installers.
 - .2 Obtain proposals from suppliers and installers and offer recommendations.
 - .3 On notification of selection by Consultant or Owner, execute purchase agreement with designated supplier and installer.
 - .4 Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - .5 Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
 - .6 Include relevant information in close out documentation.
- .7 Cash Allowances Schedule:
 - .1 Include the sum of \$10,000 for all materials, labour, equipment, and tools associated with the decommissioning and removal of the three (3) existing geotechnical groundwater monitoring wells existing on the site.
 - .2 Include the sum of \$175,000 for all materials, labour, equipment, and tools associated with the design, specification, layout, coordination, supply, and installation of building furniture, fixtures, and equipment (FF&E), and related works for the new building, including, but not necessarily limited to:
 - .1 Furniture for Rooms 002, 101, 102, 103, 104, 107, 121, 122, 123.
 - .2 Projector Equipment for Training Room 107.
 - .3 PPE/Bunker Gear Racking for PPE Storage Room 111.
 - .4 Cabinetry/Work Bench in PPE Cleaning Room 112.

- .3 Include the sum of \$20,000 for all materials, labour, equipment, and tools associated with the design, layout, coordination, supply, and installation of Kitchen and PCCP Rest Area cabinetry, appliances, equipment, and related works for the new building.
- .4 Include the sum of \$125,000 for all materials, labour, equipment, and tools associated with the engineering, design, layout, coordination, supply, and installation of site pylon sign and building signage, flagpoles, and related works for the project.
- .5 Include the sum of \$50,000 for all materials, labour, equipment, and tools associated with the provision of new electrical servicing materials, equipment, and connections at the point of service connection (at/on the pole) to service the site in accordance with the requirements of the local distribution company (Hydro One Networks, etc.).
- .6 Include the sum of \$150,000 for all materials, labour, equipment, and tools associated with the provision of natural gas servicing for the site/building.
- .7 Include the sum of \$15,000 for all materials, labour, equipment, and tools associated with the provision of new telecommunications and wireless internet servicing by a qualified supplier for the new site/building.
- .8 Include the sum of \$25,000 for all materials, labour, equipment, and tools associated with the design, layout, and installation of trees, shrubs, and related landscaping features for the new site development, all in accordance with Municipal Standards.

1.4 Inspecting And Testing Allowances

- .1 Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.
- .2 Costs Not Included in the Inspecting and Testing Allowance But Included in the Contract Price:
 - .1 Costs of incidental labour and facilities required to assist inspecting or testing agency.
 - .2 Costs of testing services used by Contractor separate from Contract Document requirements.
 - .3 Costs of retesting upon failure of previous tests as determined by Consultant.
- .3 Payment Procedures:
 - .1 Submit one (1) copy of the inspecting or testing firm's invoice with next application for payment.
 - .2 Pay invoice on approval by Consultant.
- .4 Inspecting and Testing Allowances Schedule:
 - .1 Include the sum of \$50,000 for an independent, third-party specialist inspection and testing company to perform required pre-qualification, progress, and post-installation testing and inspection services for: soils, aggregates, cast-in-place concrete, masonry mortar/grout, asphalt, and other related works as specified in the Contract Documents.
- .5 Differences in cost will be adjusted by Change Order.

End of Section

Part 1 General

1.1 Section Includes

- .1 Alternative products.
- .2 Alternative systems.
- .3 Alternative methods/procedures.

1.2 Related Requirements

- .1 Sections within Division 00.
- .2 Section 01 21 00 - Allowances.
- .3 Section 01 25 00 - Substitution Procedures.
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Alternatives

- .1 Accepted Alternatives will be identified in Owner-Contractor Agreement.
- .2 Submit alternatives identifying the effect on adjacent or related components.
- .3 Alternatives quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted alternatives will be identified in the Owner-Contractor Agreement.
- .4 Coordinate related work and modify surrounding work to integrate the Work of each alternative.

End of Section

Part 1 General

1.1 Section Includes

- .1 Substitutions.

1.2 Related Requirements

- .1 Section 01 21 00 - Allowances.
- .2 Section 01 23 00 - Alternates.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Substitutions

- .1 Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.
- .2 Consultant will consider requests for Substitutions only within fifteen (15) days after date established in Notice to Proceed.
- .3 Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- .4 Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- .5 A request constitutes a representation that the Contractor:
 - .1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - .2 Will provide the same warranty for the Substitution as for the specified Product.
 - .3 Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - .4 Waives claims for additional costs or time extension that may subsequently become apparent.
 - .5 Will reimburse Owner and Consultant for review or redesign services associated with re-approval by authorities.
- .6 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- .7 Substitution Submittal Procedure:
 - .1 Submit three (3) copies of request for Substitution for consideration. Limit each request to one (1) proposed Substitution.
 - .2 Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 - .3 The Consultant will notify Contractor in writing of decision to accept or reject request.

End of Section

Part 1 General

1.1 Section Includes

- .1 Coordination Work with other contractors and work by Owner under administration of Consultant.
- .2 Scheduled progress meetings.
- .3 Project Site Documentation.

1.2 Related Requirements

- .1 Section 01 32 00 - Construction Progress Documentation.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Coordination

- .1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities and construction Work, with progress of Work of others, under instructions of Consultant.

1.4 Construction Organization And Start-up

- .1 Within fifteen (15) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of the Owner, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Schedule of Work, progress scheduling as specified in Section 01 32 00.
 - .3 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences as specified in Section 01 51 00.
 - .5 Delivery schedule of specified equipment as specified in Section 01 32 00.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .7 Owner-furnished Products.
 - .8 Record drawings as specified in Section 01 78 23.
 - .9 Maintenance material and data as specified in Section 01 78 23.
 - .10 Take-over procedures, acceptance, and warranties as specified Section 01 78 23.
 - .11 Monthly progress claims, administrative procedures, photographs, and holdbacks.
 - .12 Appointment of inspection and testing agencies or firms as specified in Section 01 43 00.
 - .13 Insurances and transcript of policies.
- .6 Comply with Consultant's allocation of mobilization areas of site; for field offices and sheds, for staging materials, access, traffic, and parking facilities.
- .7 During construction, coordinate use of site and facilities through Consultant's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.
- .8 Comply with instructions of Consultant for use of temporary utilities and construction facilities.
- .9 Coordinate field engineering and layout work with Consultant.

1.5 On-site Documents

- .1 Maintain at job site, one hard copy each of the following:
 - .1 Contract drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed shop drawings.
 - .5 Change orders.
 - .6 Other modifications to Contract.
 - .7 Field test reports.
 - .8 Copy of approved Work schedule.
 - .9 Manufacturers' installation and application instructions.
 - .10 Labour conditions and wage schedules.
 - .11 Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.

1.6 Schedules

- .1 Submit preliminary construction progress schedule as specified in Section 01 32 00 to Consultant coordinated with Consultant's project schedule.
- .2 Submit preliminary shop drawing and submittal schedule as specified in Section 01 32 00, 01 33 00, et al.
- .3 After review, revise and resubmit schedule to comply with revised project schedule.
- .4 During progress of Work revise and resubmit as directed by Consultant.

1.7 Construction Progress Meetings

- .1 During course of Work and 2 weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Owner, Contractor, and Consultant are to be in attendance, at a minimum. Subcontractors, subconsultants, and other parties may be permitted to attend, subject to Consultant approval, with prior request of the Contractor/Owner.
- .3 Notify parties minimum of 5 business days prior to meetings.
- .4 Record minutes of meetings, and circulate to attending parties and affected parties not in attendance within 5 business days after meeting.
- .5 Agenda to include following:
 - .1 Health, safety, and the environment.
 - .2 Review, approval of minutes of previous meeting.
 - .3 Review of Work progress since previous meeting.
 - .4 Field observations, problems, conflicts.
 - .5 Problems that impede construction schedule.
 - .6 Review of off-site fabrication delivery schedules.
 - .7 Corrective measures and procedures to regain projected schedule.
 - .8 Revision to construction schedule.
 - .9 Review proposed changes for effect on construction schedule and on completion date.
 - .10 Other business.
 - .11 Next meeting.

1.8 Submittals

- .1 Prepare and issue submittals to Consultant for review.
- .2 Submit preliminary Shop Drawings, product data and samples as specified in Section 01 33 00 for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant.

- .3 Submit requests for payment for review, and for transmittal to Consultant.
- .4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.
- .5 Process substitutions through Consultant.
- .6 Process change orders through Consultant.
- .7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.9 Coordination Drawings

- .1 Provide information required by Consultant for preparation of coordination Drawings.
- .2 Review and approve revised Drawings for submittal to Consultant.

1.10 Closeout Procedures

- .1 Refer to Section 01 78 10 and Contract requirements for Substantial Performance of the Work.
- .2 Notify Consultant when Work is considered ready for Substantial Performance.
- .3 Notify Consultant when Work is considered ready for Ready-For-Takeover.
- .4 Accompany Consultant on preliminary inspection to determine items listed for completion or correction.
- .5 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.
- .6 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection.
- .7 Ensure compliance with all related aspects of Contract.

End of Section

Part 1 General

1.1 Section Includes

- .1 Schedules, form, content, submission.
- .2 Critical path scheduling.
- .3 Progress videos & photographs.
- .4 Submittals schedule.

1.2 Related Requirements

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 31 00 - Project Management and Coordination.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Schedules

- .1 Submit schedules as follows:
 - .1 Submittal Schedule for Shop Drawings and Product Data.
 - .2 Submittal Schedule for Samples.
 - .3 Submittal Schedule for timeliness of Owner-furnished Products.
 - .4 Product Delivery Schedule.
 - .5 Cash Allowance Schedule for acquiring Products only or Products and Installation, or Installation only.
 - .6 Shutdown or closure activity.
- .2 Schedule Format.
 - .1 Prepare schedule in form of a horizontal GANTT bar chart.
 - .2 Provide a separate bar for each major item of work.
 - .3 Split horizontally for projected and actual performance.
 - .4 Provide horizontal time scale identifying first Working Day of each week.
 - .5 Format for listings: Chronological order of start of each item of work.
 - .6 Identification of listings: By systems description & specification subjects.
- .3 Schedule Submission.
 - .1 Submit initial format of schedules within fifteen (15) days after award of Contract.
 - .2 Submit schedules in electronic format, forward through e-mail as *.pdf files.
 - .3 Consultant will review schedules and return reviewed submissions within ten (10) days after receipt.
 - .4 Resubmit finalized schedule within seven (7) days after return of review copy.
 - .5 Submit revised progress schedule with each application for payment.
 - .6 Distribute copies of revised schedule to:
 - .1 Job site office.
 - .2 Owner.
 - .3 Consultant.
 - .4 Subcontractors.
 - .5 Other concerned parties.
 - .7 Instruct recipients to report to Contractor within ten (10) days, any problems anticipated by timetable shown in schedule.

1.4 Construction Progress Scheduling

- .1 Submit initial schedule in duplicate within fifteen (15) days after date established in Notice to Proceed.

- .2 Revise and resubmit as required.
- .3 Submit revised schedules with each Application for Payment, identifying changes since previous version.
- .4 Submit revised schedules on a monthly basis, identifying changes since previous version.
- .5 Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first workday of each week.
- .6 Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- .7 Indicate estimated percentage of completion for each item of Work at each submission.
- .8 Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.
- .9 Include dates for commencement and completion of each major element of construction as follows.
 - .1 Site clearing.
 - .2 Site utilities.
 - .3 Foundation Work.
 - .4 Structural framing.
 - .5 Special Subcontractor Work.
 - .6 Equipment Installations.
 - .7 Finishes.
- .10 Indicate projected percentage of completion of each item as of first day of month.
- .11 Indicate progress of each activity to date of submission schedule.
- .12 Indicate 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.
- .13 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 prime contractors.

1.5 Critical Path Scheduling

- .1 Include complete sequence of construction activities.
- .2 Include dates for commencement and completion of each major element of construction as follows.
 - .1 Site clearing.
 - .2 Site utilities.
 - .3 Foundation work.
 - .4 Structural framing.
 - .5 Special subcontractor work.
 - .6 Equipment installations.
 - .7 Finishes.
- .3 Show projected percentage of completion of each item as of first day of month.
- .4 Indicate progress of each activity to date of submission schedule.
- .5 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.
- .6 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 prime contractors.

1.6 Progress Photographs

- .1 Digital Photography:
 - .1 Contractor shall submit electronic copies of digital photography as required/requested by the Consultant/Owner.
 - .2 Identification: Name and number of project and date of exposure indicated.

1.7 Submittals Schedule

- .1 Include schedule for submitting Shop Drawings, product data, samples.
- .2 Indicate dates for submitting, review time, resubmission time, and last date for meeting fabrication schedule.
- .3 Include dates when delivery will be required for Owner-furnished products.
- .4 Include dates when reviewed submittals will be required from Consultant.

1.8 Testing And Inspection Schedule

- .1 Submit schedule for anticipated physical material testing and inspections (including soils, concrete, asphalt, etc.)

End of Section

Part 1 General

1.1 Section Includes

- .1 Shop Drawings and product data.
- .2 Samples.
- .3 Certificates and transcripts.

1.2 Related Requirements

- .1 Section 01 32 00 - Construction Progress Documentation.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Other sections requesting submittals.
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Administrative

- .1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit 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.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present Shop Drawings, product data, samples and mock-ups in applicable units.
- .4 Where items or information is not manufactured or produced in SI metric units, converted values within the metric measurement tolerances are acceptable.
- .5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents.
- .6 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.
- .7 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .8 Verify field measurements and affected adjacent Work are coordinated.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .11 Keep one (1) reviewed copy of each submission on site.

1.4 Shop Drawings And Product Data

- .1 Refer to GC 3.8 Shop Drawings.
- .2 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that are to be provided by Contractor to illustrate details of a portion of Work.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Adjustments made on Shop Drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .5 Make changes in Shop Drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
- .6 Accompany submissions with transmittal letter, containing:
 - .1 Date.

- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.
- .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to other parts of the Work.
- .8 After Consultant's review, distribute copies.
- .9 Submit electronic copy of Shop Drawings for each requirement requested in specification Sections and as consultant may reasonably request.
- .10 Submit electronic copy of product data sheets or brochures for requirements requested in specification sections and as requested by Consultant where Shop Drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.5 Samples

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

1.6 Mock-ups

- .1 Erect mock-ups to Section 01 45 00.

End of Section

Part 1 General

1.1 Section Includes

- .1 Air and noise.
- .2 Site fires.
- .3 Site Drainage.
- .4 Site clearing and plant protection.
- .5 Work adjacent to waterways.
- .6 Pollution control.
- .7 Work in conformance with Authority permits.

1.2 Related Requirements

- .1 Section 01 35 29 - Health, Safety, and Emergency Response Procedures.
- .2 Section 01 52 00 - Construction Facilities.
- .3 Section 01 33 00 - Submittal Procedures.
- .4 Section 01 74 19 - Construction Waste Management and Disposal.
- .5 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Air And Noise

- .1 Contractor to manage and control fumes, exhaust, dust, odour and other airborne materials during the course of the Work.
- .2 Refer to Section 01 14 00. Contractor to limit noise during the course of the Work.
- .3 Abide by municipal by-laws or other governing authorities in the performance of the Work.

1.4 Fires

- .1 Fires on site are not permitted.
- .2 Fires and burning of rubbish on site not permitted.

1.5 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .4 Obtain any/all permits required for the management of water and/or drainage associated with the Work. Pay for and include all associated costs in Bid Price.

1.6 Site Clearing And Plant Protection

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m (6 ft).
- .3 Protect roots of designated trees to drip-line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated, or as designated by Consultant.

1.7 Work Adjacent To Waterways

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material without Consultant's approval.
- .3 Do not dump excavated fill, waste material or debris in waterways.

- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m (350 ft) of indicated spawning beds.

1.8 Pollution Control

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .5 Manage and keep clean all public roads or areas travelled during the course of the Work.
- .6 Restore an/all areas disturbed by construction and/or Contractor's activities to pre-construction conditions, and/or as otherwise indicated in Contract Documents.

1.9 Work In Accordance With Authority Permits

- .1 Review and be responsible for the performance of the Work in accordance with any/all measures and conditions of permits issued by Authorities related to the Work.
- .2 Review and coordinate Work in relation to other works adjacent to the project site.
- .3 Be responsible for any non-compliances, and associated penalties, related to Authority permits.

End of Section

Part 1 General

1.1 Section Includes

- .1 Laws, notices, permits and fees.
- .2 Discovery of hazardous materials.

1.2 Related Requirements

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Laws, Notices, Permits And Fees

- .1 The laws of the Place of the Work shall govern the Work.
- .2 The Owner shall obtain and pay for the building permit, permanent easements and rights of servitude. The Contractor shall be responsible for permits, licenses or certificates necessary for the performance of the Work that were in force at the date of executing the Agreement.
- .3 Give the required notices and comply with the laws, ordinances, rules, regulations or codes which are or become in force during the performance of the Work and which relate to the Work, to the preservation of the public health and to construction safety.
- .4 If the Contractor knowingly performs or allows work to be performed that is contrary to any laws, ordinances, rules, regulations or codes, the Contractor shall be responsible for and shall correct the violations thereof; and shall bear the costs, expenses and damages attributable to the failure to comply with the provisions of such laws, ordinances, rules, regulations or codes.
- .5 Determine detailed requirements of authorities having jurisdiction.
- .6 Pay construction damage deposits levied by municipality in connection with the issuance of a building permit.

1.4 Hazardous Material Discovery

- .1 Refer to Section 00 30 00.
- .2 Refer to GC 9.2 Toxic and Hazardous Substances.
- .3 Asbestos: If material resembling asbestos is encountered in course of demolition work, immediately stop work and notify Consultant.

1.5 Personnel Smoking

- .1 Comply with regulatory and Owner imposed smoking restrictions during execution of the Work within or outside the premises.

End of Section

Part 1 General

1.1 Section Includes

- .1 Quality assurance criteria.

1.2 Related Requirements

- .1 Section 01 21 00 - Allowances.
- .2 Section 01 45 00 - Quality Control.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Reference Standards

- .1 AABC (Associated Air Balance Council): National Standards For Field Measurements and Instrumentation, Total Systems Balance, Air Distribution-Hydronics Systems.

1.4 Quality Assurance

- .1 Cooperate with testing organization services as specified in Section 01 45 00.
- .2 Testing organization: Current member in good standing of their respective professional or industry organization and certified to perform specified services.
 - .1 Selection to be confirmed by Owner/Consultant.
- .3 Comply with applicable procedures and standards of the certification sponsoring association.
- .4 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.
- .5 Qualifications:
 - .1 Provide adequate workforce training through meetings and demonstrations.
 - .2 Have someone on site with deconstruction experience throughout project for consultation and supervision purposes.

End of Section

Part 1 General

1.1 Section Includes

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups.
- .4 Mill tests.
- .5 Written and electronic reports.
- .6 Equipment and system adjust and balance.

1.2 Related Requirements

- .1 Section 01 21 00 - Allowances.
- .2 Section 01 43 00 - Quality Assurance.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Reference Standards

- .1 Ontario Building Code, Ontario Regulation 332/12, as amended.
- .2 Canadian Standards Association (CSA) standards, as amended and applicable to the Work.
- .3 ISO/IEC 17025-2017 - General Requirements for the Competence of Testing and Calibration Laboratories.
- .4 SCC (Standards Council of Canada).
- .5 Any/all other standards applicable to the Work.

1.4 Inspection By Authority

- .1 Allow Authorities Having Jurisdiction access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection whenever portions of the Work are designated for special tests, inspections or approvals, either when described in the Contract Documents or when required by law in the Place of the Work.
 - .1 Minimum forty-eight (48) business hours.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
 - .1 At no additional cost to the Contract.

1.5 Review By Consultant

- .1 Consultant may order any part of the Work to be reviewed or inspected if Work is suspected to be not in accordance with Contract Documents.
- .2 If, upon review such work is found not in accordance with Contract Documents, correct such Work and pay cost of additional review and correction.
 - .1 Including fees, expenses, and any additional Consultant servicing fees.
- .3 If such Work is found in accordance with Contract Documents, Owner will pay cost of review and replacement.
 - .1 By Change Order.

1.6 Access To Work

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

1.7 Procedures

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
 - .1 Such notifications shall not be less than 2 working days.
- .2 Submit samples and 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 Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.8 Rejected Work

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price the difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.
- .4 Contractor to provide extended warranty for work that has been rejected or is deficient. Owner and Consultant to determine length of extended warranty period, at their sole discretion.

1.9 Reports

- .1 Submit one (1) electronic copy of signed inspection and test reports to Consultant.
- .2 Provide signed copies to Subcontractor of work being inspected or tested.

1.10 Tests And Mix Designs

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

1.11 Mock-ups

- .1 Prepare mock-up for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Consultant.
- .3 Prepare mock-ups for Consultant's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups 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 dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Consultant. Repair any damage and clean-up at place of mock-up.
- .7 Approved mock-up may remain as part of Work.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed.

1.12 Mill Tests

- .1 Submit mill test certificates as requested and/or required of specification Sections.

1.13 Equipment And Systems

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to application Sections and Drawings for definitive requirements.

End of Section

Clauses

1.1 Section Includes

- .1 Construction aids.
- .2 Offices and sheds.
- .3 Parking.
- .4 Project identification.
- .5 Waste management.

1.2 Related Sections

- .1 Section 01 11 00.
- .2 Section 01 14 00.
- .3 Section 01 35 43.
- .4 This section describes requirements applicable to all Sections within Divisions 00 to 45.

1.3 Installation And Removal

- .1 Provide construction facilities in order to execute work expeditiously and as may be required by health and safety legislation.
- .2 Remove from site all such work and facilities after use, restore areas to pre-construction conditions, or as otherwise indicated in Contract Documents.

1.4 Scaffolding

- .1 Provide and maintain ladders, ramps, platforms, scaffolding, work platforms, temporary stairs, swing staging, and other such equipment as may be required in a manner which meets the requirements of governing authorities.

1.5 Hoisting

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make arrangements with approved others for use thereof.
- .2 Hoists and Cranes shall be operated by qualified operator(s), with applicable certificates available at the place of Work.

1.6 Use Of The Work

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with Products or Equipment.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.7 Construction Parking

- .1 Limited construction parking will be permitted on site within the Contract Limits, provided it does not disrupt the performance of Work and will not conflict with Owner's adjacent use of the site.
- .2 Location of construction parking to be confirmed by Owner.

1.8 Security

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays, as may be required, and as determined solely by the Contractor.

1.9 Offices

- .1 Provide and maintain in clean condition during the progress of Work, adequately lighted, heated and ventilated Contractor's Office with space for filing and layout of Contract Documents and Contractor's normal site office staff, and site progress meetings with the Owner and Consultant. Coordinate location with the Consultant/Owner.
- .2 Provide adequate first aid facilities as required by applicable legislation and standards.

- .3 Subcontractors may provide their own offices as necessary. Direct the location of these offices, with prior approval of Consultant/Owner.

1.10 Equipment, Tool And Materials Storage

- .1 Provide and maintain, in a clean and orderly condition, lockable, weatherproof sheds for storage of tools, equipment and materials. Contractor responsible for equipment safety and security.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.11 Hoarding

- .1 Provide hoarding, protecting public and private property from injury or damage. Provide lockable gates within hoarding for access to site by workers and vehicles.
- .2 Erect compliant fencing around perimeter of site to protect the public, workers, public and private property from injury or damage as required.
- .3 Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to building.
- .4 Provide barriers around trees and plants designated to remain. Protect from damage, restore is damaged.

1.12 Guard Rails And Barricades

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

1.13 Weather Enclosures

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

1.14 Weather Protection Of Existing Building And Facilities

- .1 Conduct the Work at all times in such a manner as to prevent the ingress of precipitation into existing building elements, and repair promptly any damage which results from any ingress of precipitation in areas adjacent to the Work.
- .2 Protect and maintain use of existing facilities and site associated with existing Owner operations.

1.15 Dust, Sound, And Barriers

- .1 As required, construct temporary barriers complete with sound attenuating batt insulation in stud wall cavity to protect adjacent areas from dust, sound and access between occupied portions of the building and all construction activity, which provide for the security and safety of residents, staff and visitors at all times. Install lockable doors c/w required hardware as required to keep areas secure.
- .2 In addition to the above, provide dust tight screens or partitions to localize dust generating activities, and for the protection of workers, finished areas of work, residents, staff and visitors, as required.
- .3 Maintain and relocate barriers and screens until such work is complete.

1.16 Dewatering

- .1 Provide all required measures to account for subsurface conditions in the execution of the Work.
- .2 During construction, provide all necessary requirements for water drainage and pumping facilities to maintain underground openings and site free of standing/pooling water, in order to perform the Work.
- .3 Ensure the protection of the environment in the installation and operation of any/all dewatering measures. Coordinate with Consultant and/or authorities having jurisdiction.
- .4 Undertake dewatering measures in accordance with applicable regulations and authorities having jurisdiction. Pay for all costs associated with any/all dewatering activities, and required permits.

1.17 Site Storage/loading

- .1 Confine the Work and the operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.
- .2 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work or adjacent areas.

1.18 Access To Site

- .1 Provide, maintain, and repair existing site accesses, gates, parking lots, roads, sidewalk crossings and related features at the site. Allow for unimpeded access to the site by those requiring access.
- .2 Provide and maintain temporary ramps and construction runways as may be required for access to the Work, and for use by Owner and public.

1.19 Roads And Traffic

- .1 The Contractor shall provide all necessary flagpersons, detour signs, warning lights, signs and barricades necessary to notify, direct and protect pedestrian and vehicular traffic en route to and from and within the project limits, and shall conduct his operations to cause the least possible interruption to the travelling public and nearby residents and facility users.
- .2 Roads and access subject to interference by the work shall be kept open to at least single lane traffic, or suitable detours shall be provided and maintained by the Contractor, at his own expense to the satisfaction of the Consultant.
- .3 In the event of the Contractor's traffic causing delay and inconvenience to the flow of traffic on adjacent roads, the Owner may restrict the number of trucks driving onto the road during certain hours. The Contractor shall have no claim for additional payment as a result of such restrictions.
- .4 Trucks hauling excavated material, concrete, sand, stone, or other loose materials from or to the site shall have their loads trimmed and their bodies shall be tight in order that no spillage of their loads will occur on roads.
- .5 The Contractor shall prevent dust occurring in the work area and becoming a nuisance to users and property owners in the vicinity by applying from time to time water when directed by the Consultant and when he deems it necessary.
- .6 Should the Contractor be negligent in his duties in maintaining the proper cleanliness in the opinion of the Owner, the Owner will take the necessary steps to perform such cleaning and shall charge the Contractor all costs incurred.
- .7 The Contractor shall maintain access streets to the site clean of dust, mud, and debris. The Owner/Consultant may request that the Contractor sweep such access streets, if in the opinion of the Consultant, the Contractor's operations have created the need. No payment to the Contractor for such demands will be made.

1.20 Protection And Control Of Public Traffic

- .1 Comply with requirements of Acts, Regulations and By-laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.
- .2 Provide competent flag persons, properly equipped as specified in applicable legislation:
 - .1 When public traffic is required to pass working vehicles or equipment, which may block all or part of travelled roadway.
 - .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
 - .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

1.21 Informational And Warning Devices

- .1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work, which may require road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified for Temporary Conditions Signs and Devices, of manual titled Uniform Traffic Control Devices.
- .3 Place signs and other devices in locations recommended in said manual or as directed.

- .4 Meet with the Consultant and Owner's staff prior to commencement of work to prepare list of signs and other devices required for project.
- .5 Continually maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
 - .2 Removing or covering signs which do not apply to conditions existing from day to day.

1.22 Restriction On The Use Of Construction Equipment And Unlicensed Vehicles

- .1 Unlicensed vehicles and construction equipment shall not travel, work or stop within 4m of a lane carrying traffic except where construction operations necessitates the work area be less than 4m from the traffic in which case, the Contractor shall erect delineators along the edge of the traveled lane. In no case shall the distance between traffic and working area be less than 1.5m. Measures shall be in accordance with authorities having jurisdiction.

1.23 Location And Storage Of Materials And Equipment

- .1 Coordinate and obtain approval for the location of material storage areas with the Owner, prior to receiving.
- .2 Materials shall not be stored within 2.5m (8.2 ft) of the traveled portion of any roadway. Equipment shall not be stored within 2.5m (8.2 ft) of the traveled portion of any roadway.
- .3 Notwithstanding the foregoing, the Contractor shall, at his own expense, remove any equipment or material, which in the Consultant's opinion, constitutes a traffic hazard.

1.24 Delivery And Trucking

- .1 The Contractor shall plan and schedule the routes of vehicles transporting all materials to, from or within the job, so that vehicular movements are accomplished with minimum interference and interruptions to traffic. This will necessitate vehicles to "slip-off" or "slip-on" in the direction of traffic, in order to merge with and thereby avoid crossing traffic lanes.
- .2 The Owner reserves the right to alter, reject or close same as considered necessary. The Contractor shall notify suppliers of materials and equipment of the above requirements.

1.25 Excavation

- .1 Protect the public and others on the site from excavations and other hazards by whatever means are deemed necessary, per applicable regulations.

1.26 Failure Of Contractor To Provide

- .1 If at any time the Contractor fails to provide for the safe passage and control of traffic on any existing road or detour for which, under the Contract, he is responsible, and if the Contractor fails to correct forthwith such an unsatisfactory condition upon being so directed, the Consultant may immediately correct the unsatisfactory condition and take such other action as he deems necessary to provide for the safe passage and control of traffic. The Owner may deduct from any monies due or to become due to the Contractor on any account any cost or expenses incurred by the Owner under this paragraph. No act or failure to act on the part of the Consultant under this paragraph shall relieve the Contractor from his responsibilities under the Contract.

1.27 Notifications

- .1 When streets are to be closed, or traffic restricted, notify the appropriate fire, ambulance and police departments and waste collection contractor, giving at least seven (7) day notice of the closing or restriction.
- .2 If bus routes are affected, notify the School Board and bus company, giving at least seven (7) days notice.
- .3 When streets are to be reopened, or restrictions removed, notify the fire, police, waste collector and bus authorities, and others, as appropriate.
- .4 Give at least forty-eight (48) business hours' notice, not including weekends or statutory holidays, to affected property owners where interruptions to access to properties adjoining the work or where garbage collection, sewer or water services and transit interruptions is authorized by the Consultant. Arrange interruptions so as to create a minimum interference to those affected.

- .5 Submit schedule of expected interruptions for approval by Consultant and adhere to approved schedule.
- .6 Give notification of unscheduled shut-downs of Municipal facilities by whatever means determined by the Consultant to all users of the facilities and pay cost of notification.

1.28 Water Supply

- .1 Water required for construction shall be provided and paid for by the Contractor.
- .2 Once permanent water supply is in place, the Contractor may utilize it at Contractor's expense, with the prior approval of the Consultant.

1.29 Temporary Heating

- .1 Provide and pay for temporary heating required during construction period, including attendance, maintenance, and fuel.
- .2 Construction heaters used inside the building must be vented to the outside or be non-flameless type. Solid fuel salamanders and similar equipment types are not permitted.
- .3 Maintain temperatures of minimum 10°C (50°F) in areas where construction is in progress, unless indicated otherwise in specifications and ensure that the comfort of residents and staff in adjacent occupied spaces is not adversely affected by temperature, as applicable.
- .4 Ventilate heated areas and keep building free of exhaust or combustion gases. Monitor conditions to ensure safe conditions.
- .5 The permanent heating system of the building, or portions thereof, may be used when available, with prior approval of the Consultant. Be responsible for damage thereto.
- .6 On completion of Work for which the permanent heating system is used with approvals, replace filters, and turn over equipment in new condition.
- .7 Pay costs for maintaining temporary heat, when using permanent heating system.
- .8 The existing or the new permanent heating and ventilating systems of the building or portions thereof, may be used when available and when approved by the Consultant and the Owner. Be responsible for damage to permanent heating system.
- .9 Be responsible for damage to the Work due to failure in providing adequate heat and protection during construction.
- .10 Date of Substantial Performance of the Work and Warranties for heating system do not commence until the entire system is in as near final condition as possible and is so certified by the Consultant.

1.30 Temporary Power And Lighting

- .1 Provide and pay for temporary power required during construction for temporary lighting and the operating or power tools.
- .2 Pay all costs for the installation, and distribution of temporary power and lighting.
- .3 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
- .4 Interruption of electrical power supply to the building, for purpose of service upgrading and transformer installation must be minimized and under no circumstances may power to the building be interrupted for more than twelve (12) consecutive hours.
- .5 Provide and maintain temporary lighting throughout the project. The level of illumination on all floors and stairs shall not be less than 15 foot candles.

1.31 Temporary Communication Requirements

- .1 As a minimum, the Site Superintendent shall be outfitted with a cellular telephone to be carried on his person during normal working hours complete with message recording services.
- .2 In the event of an emergency outside of normal working hours, the Contractor shall provide for a contact number and person that can be contacted for notification and action.

1.32 Utilities, Fences, And Private Property

- .1 The Contractor shall be responsible for the protection of all utilities, fences and private property at the job site during the time of construction.

- .2 Utilities:
 - .1 General:
 - .1 The Contractor shall pay all costs deemed necessary by the Utility authorities to provide all protective measures within the limits of the Contract. The Contractor shall remain responsible for any unauthorized disruptions of service and any damage to utilities arising out of the Contractor's work, notwithstanding such protection. The Utility authorities will carry out all the work of temporary rearranging and shielding of lines deemed necessary. The cost of all such protective measures, together with the cost of restoring the lines to their original state and location, will be at the expense of the Contractor, and will be billed to the Contractor by the Utility authority.
 - .2 Whenever, in the opinion of the Utility authority, standby crews are necessary during blasting operations, the Contractor shall make the necessary arrangements with the Utility authority and the cost of such crews and equipment shall be billed to the Contractor by the Utility authority. These measures will apply to those utilities located within all blasting areas.
 - .3 The Contractor shall notify in writing the appropriate Utility Companies of construction commencement, with a copy submitted to the Consultant within three (3) business days of being granted permission to start work.
 - .4 The Contractor shall notify the appropriate Utility Companies one week in advance of any rock blasting, with a copy submitted to the Consultant within three (3) business days.
 - .2 Adjacent Structures and Utilities:
 - .1 Perform temporary and permanent support and temporary relocation and replacement of underground or overhead utilities.
 - .2 Permanent relocation of underground or overhead utilities will be carried out by others, if necessitated by coincidence of lines or grades.
 - .3 Existing Drainage and Water Supply:
 - .1 Maintain temporary and permanent flow in all sewers, watermains, drains, gutters, ditches, watercourses, house and inlet connections.
 - .2 Maintain the flow in and from the existing utility mains and services by whatever means or material that is necessary until the Consultant permits the use of the constructed main. Include all cost for maintaining flow in the tender prices for sewer and water pipe construction related items.
 - .4 Support of Permanent Underground Utilities:
 - .1 Where permanent pipes are uncovered or during the construction of new systems, it is found that the pipes cross each other, the Consultant may direct that concrete be placed to provide support for the pipes. The concrete shall be placed as directed and in locations as determined by the Consultant. The concrete shall be measured in place and payment made in accordance with the allowances of the contract.
 - .2 Where permanent existing services have been uncovered during excavation of trenches for installation of utility mains the Consultant may require a 50mm x 150mm (2 in x 6 in) wood plank be placed under each pipe on a thoroughly compacted bed throughout the entire width of excavation so that this pipe is fully supported by the timber. Sand cushion material shall be surrounding each pipe and be of no less than 150mm (6 in) thickness from the outside diameter of the pipe, hand compacted and backfilled. Wooden planks to be provided by the Contractor.
 - .3 Place concrete in accordance with the Contract Documents. Supply and place concrete in accordance with applicable codes and standards applicable to the work.
 - .5 Support Of Gas Pipelines:
 - .1 General
 - .1 This following applies to all excavations of gas company underground plant.
 - .2 Gas pipelines shall be supported at all times to prevent damage to the pipeline from deflection due to its own weight plus any other load that may be imposed on it.
 - .2 Temporary Support:
 - .1 A suitable method of supporting gas pipelines shall be used when an excavation will result in unsupported pipe spans exceeding the maximum spans permitted by the gas company. Provide suitable, temporary support acceptable to the gas company.

- .2 Temporary support shall remain in place until permanent support is provided and shall be inspected at least every three weeks by personnel from the gas company.
- .3 Permanent Support:
 - .1 Permanent support of a gas pipeline shall be provided by either a properly compacted backfill method or a structural method. A properly compacted backfill method is preferred.
 - .2 Where proper support cannot be provided with backfill material, permanent structural supports shall be installed. The appropriate gas authority shall provide some typical designs. Where these designs are not suitable, the Engineer shall be consulted for a custom design.
- .4 Protection and Locations:
 - .1 Prior to commencing any excavation work, notify applicable utility authorities, establish location and state of use of buried services. Clearly mark such locations to prevent disturbances during work.
 - .2 Maintain and protect from damage, water, sewer, gas electric or other utilities encountered.
 - .3 Obtain direction of Owner of utility and Consultant before moving or otherwise disturbing utility.
 - .4 Utilities that require permanent relocation will be the responsibility of the utility company concerned at no expense to the Contractor. Co-operate with the utility companies who shall have free access to their plant at all times.
 - .5 Where existing pipes, ducts, or other underground services intersect the pipe trench, support the pipe trench to the approval of the Consultant and the utility company.
 - .6 Where existing overhead poles are adjacent to the excavation, temporarily support them to the approval of the Consultant and the utility company concerned.
 - .7 Notify Fire Department of any planned or accidental interruption of water supply to hydrants.
 - .8 The position of all pole lines, conduits, watermains, sewers and other underground and overhead utilities and structures is not necessarily shown on the contract drawings, and, where shown, the accuracy of the position of such utilities and structures is not guaranteed and the Owner disclaims, on behalf of himself and those responsible for such drawings, all liability with respect to same. Before starting work, the Contractor shall inform himself of the exact locations of such utilities and structures, and shall be liable for damages to them as a result of any act or omission, whether or not the result of negligence, by those for whom he is responsible. The Contractor waives any claim and releases the Owner and the agents of the Owner from all liability for damages suffered as a result of such contract drawings. Size, depth and location of existing utilities as shown is for guidance only; completeness and accuracy of information is not guaranteed.
 - .9 Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires or paving located within right-of-way or adjoining properties from damage while work is in progress and repair damage resulting from work.
 - .10 Where excavation necessitates root or branch cutting, do so only under direct control of the Consultant.
 - .11 Whenever shoring, sheeting, timbering and bracing of excavations is required, engage services of a Professional Engineer to design and assume the responsibility for adequacy of shoring and bracing. Professional Engineer to be registered in province of territory in which work is to be carried out.
 - .12 When requested, submit for review, drawings and calculations signed and stamped by Professional Engineer responsible for their preparation. Close sheeting, when required, to be designated and constructed to prevent adjacent soil or water from entering excavation.
 - .13 Maintain unobstructed access to fire and police appurtenances, telephone, electric, water, sewer, gas, or other public utilities and private properties.
 - .14 Immediately take all necessary action for the repair of damaged utilities and pay all cost for the repair work.
 - .15 Refer to existing utility information that may be contained in this Contract.
- .3 Private Lands:

- .1 The Contractor shall not enter upon or occupy with personnel, equipment or materials of any nature or store any materials on any private property unless he has obtained written consent from the property owner and a copy of such consent has been furnished to the Consultant.
- .2 Any resulting costs for occupying private lands shall be at the Contractor's sole expense.

1.33 Fire Protection

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Open fires and burning of rubbish are not permitted on the site.

1.34 First Aid

- .1 The Contractor shall provide and maintain on the site where construction is being carried out, completely equipped first aid facilities in a clean orderly condition, which shall be readily accessible at all times to all his employees and the Consultant and his staff.
- .2 The Contractor shall designate certain employees who are properly instructed to be in charge of first aid. At least one such employee shall always be available on the site while work is being carried on.
- .3 An emergency contact list for summoning aid such as doctors, ambulances, and rescue squads from outside sources shall be conspicuously posted.

1.35 Protection Of Building Finishes & Equipment

- .1 Provide protection for finished and partially finished building components and equipment during performance of Work.
- .2 Provide necessary screens, covers, hoardings as required.
- .3 Be responsible for damage incurred due to lack of, or improper protection.

1.36 Spills Reporting

- .1 Spills or discharges of pollutants or contaminants under the control of the Contractor, and spills or discharges of pollutants or contaminants that are a result of the Contractor's operations that cause or are likely to cause adverse effects shall forthwith be reported to the Engineer. Such spills or discharges and their adverse effects shall be as defined in the *Environmental Protection Act R.S.O. 1980*, as amended.
- .2 All spills or discharge of liquid, other than accumulated rain water, from luminaries, internally illuminated signs, lamps, and liquid type transformers under the control of the Contractor, and all spills or discharges from this equipment that are a result of the Contractor's operations shall, unless otherwise indicated in the Contract, be assumed to contain PCB's and shall forthwith be reported to the Consultant.
- .3 This reporting will not relieve the Contractor of his legislated responsibilities regarding such spills or discharges.

1.37 Protection Of Water Quality

- .1 At all times, the Contractor shall maintain existing stream flows and shall control all construction work so as not to allow sediment or other deleterious materials to enter nearby watercourses or other sensitive areas.
- .2 No waste or surplus organic material including topsoil is to be stored or disposed of within 30 metres of any watercourses. Run-off from excavation piles will not be permitted to drain directly into watercourses but shall be diffused onto vegetative areas a minimum of 30 metres (98.4 ft) from the watercourse. Where this measure is not sufficient or feasible to control sediment entering the watercourses, sedimentation traps or geotextile coverage will be required.
- .3 If dewatering is required, the water shall be pumped into a sedimentation pond or diffused onto vegetated areas a minimum of 30 metres (98.4 ft) from the watercourses and not pumped directly into watercourses.
- .4 No machinery shall enter an area below the high water mark any watercourse, without authority approval. Movement of construction equipment in the vicinity of any creek shall be limited to the minimum required for construction, as permitted by authorities

- .5 The Contractor shall not carry out equipment maintenance or refueling or store fuel containers within 100metres of any watercourse. The Contractor shall not stockpile construction debris or empty fuel/pesticide containers within the Contract limits.

1.38 Project Cleanliness

- .1 Maintain the Work in tidy condition, free from the accumulation of waste products and debris.
- .2 Remove waste material and debris from the site and deposit in waste container at the end of each working day.
- .3 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.39 Work Place Hazardous Material Information System (WHMIS)

- .1 Reporting:
 - .1 Prior to the commencement of work, the Contractor shall provide, to the Consultant, a list of those products controlled under the WHMIS, which he expects to use on the contract. Related Material Safety Data Sheets shall accompany the submission. All containers used in the application of products controlled under WHMIS shall be labelled.
 - .2 The Contractor shall notify the Consultant of changes to the list in writing and provide relevant material Safety Data Sheets.

1.40 Waste Management

- .1 Solid, non-hazardous waste materials are to be managed responsibly at the project site in appropriately-sized containers without blowing litter, water infiltration, or other deleterious effect.
- .2 Solid, non-hazardous, waste materials generated from the Work are to managed solely by the Contractor. Tipping fees shall be paid by the Contractor, as required.

1.41 Temporary Sanitary Facilities

- .1 Contractor to provide and maintain their own temporary washroom facilities for construction personnel use only throughout the timeline for construction, in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities.
- .3 Always keep sanitary facilities clean and fully stocked with the necessary supplies.
- .4 Except where connected to municipal sewer system, periodically remove wastes from site.

End of Section

Part 1 General

1.1 Section Includes

- .1 Field engineering survey services to measure and stake site.
- .2 Recording of subsurface conditions found.
- .3 Survey services to determine measurement inverts for the Work.
- .4 Requirements and limitations for cutting and patching the Work.

1.2 Related Requirements

- .1 Section 01 25 00 - Substitution Procedures.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Reference Standards

- .1 Owner's identification of existing survey control points and property limits.

1.4 Submittals

- .1 Submit name and address of Surveyor to Consultant.
- .2 On request of Consultant, submit documentation to verify accuracy of field engineering work.
- .3 Submit building location survey as soon as possible following the completion of foundations, as described below.
- .4 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.5 Qualifications Of Surveyor

- .1 Qualified registered land surveyor, licensed to practise in the Place of the Work, acceptable to Consultant.
- .2 Ontario Land Surveyor and/or Canada Land Surveyor.

1.6 Survey Reference Points

- .1 Existing base horizontal and vertical control points are as per surveys completed by Owner. Review and coordinate for site control information accordingly.
- .2 Locate, confirm and protect control points prior to starting site Work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Consultant.
- .4 Report to Consultant when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.7 Survey Requirements

- .1 Establish a minimum of three (3) permanent benchmarks on site, referenced to established benchmarks by survey control points.
- .2 Record locations, with horizontal and vertical data in Project Record Documents.
- .3 Establish lines and levels, locate and layout, by instrumentation.
- .4 Stake for earthworks as required.
- .5 Stake slopes and drainage features.
- .6 Establish pipe invert elevations.
- .7 Establish foundation column locations and floor elevations.
- .8 Establish lines and levels for mechanical and electrical work.

1.8 Subsurface Conditions

- .1 Promptly notify Consultant in writing if discovered surface or subsurface conditions at Place of Work differ materially from those indicated in Contract Documents.
- .2 Advise the Consultant of a reasonable assumption of probable conditions when determined.
- .3 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes or Change Orders set out in Section 01 29 00.

1.9 Examination

- .1 Inspect existing conditions, including elements or adjacent Work subject to irregularities, damage, movement, including Work during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of the Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Coordinate the Work between all relevant subcontractors. Ensure that full consideration of alternatives and options are considered in the coordination of the Work. In the event that after full coordination effort reveals persistent conflict in the Work, notify Consultant for review.

1.10 Preparation

- .1 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .2 Provide protection from elements for areas that may be exposed by uncovering work; maintain excavations free of water.

1.11 Existing Services

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
- .2 Remove abandoned service lines within 2 m of structures. Cap or seal lines at cut-off points as directed by Consultant.

1.12 Location Of Equipment And Fixtures

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Consultant of impending installation and obtain approval for actual location.
- .4 Coordinate meetings and all trades, suppliers, and others to ensure location of equipment and fixtures are not in conflict with other aspects of the work.
- .5 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.13 Survey Record

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.
- .4 As part of close-out procedures (Section 01 78 00), provide electric versions of site surveys and related field engineering records in both PDF and AutoCAD (*.dwg) formats as applicable, also include drawing pen file(*.ctb).
- .5 Provide five (5) original, full-size, 24" x 36" (610mm x 914mm), OLS/CLS sealed, hardcopies of the site record survey to the Owner, complete with new locations and elevations of the Work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Submittal requirements associated with connecting to new and existing facilities.
- .2 Execution requirements for all Work.

1.2 Related Requirements

- .1 Section 01 71 00 - Examination and Preparation.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Submittals - Attaching To Existing Work

- .1 Submit written request in advance of cutting or alteration that 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 separate 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 separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.4 Tolerances

- .1 Tolerances as per applicable industry standards, statutes, codes (i.e. CSA, etc.) shall take precedence unless noted by the Engineer.
- .2 Monitor fabrication and installation tolerance control of Products to produce acceptable Work.
- .3 Do not permit tolerances to accumulate beyond effective or practical limits.
- .4 Comply with manufacturers' tolerances. In case of conflict between manufacturers' tolerances and Contract Documents, request clarification from Consultant before proceeding.
- .5 Adjust Products to appropriate dimensions; position and confirm tolerance acceptability, before permanently securing Products in place.

1.5 Execution

- .1 Execute cutting, fitting, and patching to complete the Work.
- .2 Perform all required excavation and fill to complete the Work.
- .3 Fit several parts together, to integrate with other Work.
- .4 Uncover Work to install ill-timed Work.
- .5 Remove and replace defective or non-conforming Work.
- .6 Remove samples of installed Work for testing, if not designated in the respective Section as remaining as part of the Work.
- .7 Provide openings in non-structural elements of Work for penetrations of associated Work. Limit opening dimensions to minimal sizes required, and performed in a neat and clean fashion.
- .8 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

- .9 Employ qualified workers to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .10 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry or concrete work without prior approval.
- .11 Restore work with new products in accordance with requirements of Contract Documents.
- .12 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .13 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, for full thickness of the constructed element.
- .14 Re-finish surfaces to match adjacent finishes: For continuous surfaces re-finish to nearest intersection; for an assembly, re-finish entire unit.
- .15 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

End of Section

Part 1 General

1.1 Section Includes

- .1 Progressive cleaning.
- .2 Cleaning prior to acceptance.

1.2 Related Requirements

- .1 Section 01 74 19 - Construction Waste Managing and Disposal.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

Part 2 Products

2.1 Cleaning Materials

- .1 Cleaning Agents and Materials: Low VOC content.

Part 3 Execution

3.1 Progressive Cleaning

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .3 Clear snow and ice from area of construction, bank or pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Containers:
 - .1 Provide on-site steel framed, hinged lid containers for collection of waste materials and debris.
 - .2 Provide and use clearly marked, separate bins for recycling.
 - .3 Refer to Section 01 74 19.
- .6 Remove waste material and debris from site and deposit in waste container at end of each working day.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of enclosure ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

3.2 Cleaning Prior To Acceptance

- .1 Prior to applying for Substantial Performance of the Work, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fittings, walls, floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Clean and polish surface finishes, as recommended by manufacturer.
- .12 Inspect finishes, fittings and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to a sanitary condition; replace filters of mechanical equipment.
- .18 Clean roof surfaces, down-spouts, and drainage components.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to facilities.

3.3 Final Product Cleaning

- .1 Execute final cleaning prior to final project assessment. Refer to Section 01 74 10.
- .2 Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- .3 Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- .4 Replace filters of operating equipment.
- .5 Clean site; sweep paved areas, rake clean landscaped surfaces.
- .6 Remove waste and surplus materials, rubbish, and construction facilities from the site.

End of Section

Part 1 General

1.1 Section Includes

- .1 Waste goals and objectives.
- .2 Third party responsibilities.
- .3 Disposal of waste.
- .4 Forms for documenting program.

1.2 Related Requirements

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 10 - Cleaning.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Definitions

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and re-manufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the Project site to another site for re-manufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the Project site.
- .11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOCs): Chemical compounds common in and emitted by many building products over time through outgassing:
 - .1 Solvents in paints and other coatings.
 - .2 Wood preservatives; strippers and household cleaners.
 - .3 Adhesives in particleboard, fibreboard, and some plywood; and foam insulation.
 - .4 When released, VOCs can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, and damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

- .18 Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 Submittal

- .1 Section 01 33 00: Submission procedures.

1.5 Owner Waste Management Goals

- .1 Owner has established this Project is to generate the least amount of waste possible. This requires that construction processes ensure as little waste as possible, either due to error, poor planning, breakage, mishandling, contamination, or other factors.
- .2 Owner recognizes that waste in any project is inevitable, but indicates that as much of the waste materials as economically feasible. Reused, salvage, or recycle as required.
- .3 Minimize waste disposal to landfills.

1.6 Third Party Responsibility

- .1 Cooperate with all parties on site to implement a Waste Reduction Plan.
- .2 Such result may involve penalties being assessed to Contractor.

1.7 Storage, Handling And Protection

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Consultant.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant.
- .7 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

1.8 Scheduling

- .1 Coordinate work with other activities at site to ensure timely and orderly progress of the work.

Part 2 Products - Not Used

Part 3 Execution

3.1 Preparation

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 Site Visit

- .1 Pre-bid site visit: Walk-through of project site prior to completion of bid submittal is mandatory. Date, time and location to be arranged by Consultant.
- .2 Maintain at job site, one (1) copy of following documents:
 - .1 Material Source Separation Plan (MMSP).

3.3 Use Of Site And Facilities

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility.
- .3 Provide temporary security measures as approved by Consultant.

3.4 Waste Management Plan Implementation

- .1 Manager: Designate an on-site party responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for Project.
- .2 Distribution: Distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Consultant.
- .3 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by parties at appropriate stages of Project.
- .4 Separation facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
- .5 Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.
- .6 Application for Progress Payments: Submit with each Application for Progress Payment a Summary of Waste Generated by the Project:
 - .1 Failure to submit information shall render Application for Payment incomplete and delay Progress Payment.
 - .2 Submit summary on a form acceptable to Owner containing the following information:
 - .1 Amount in tonnes or cubic metres (tons or cubic yards) of material land filled from the Project.
 - .2 Identity of the landfill, and total amount of tipping fees paid at the landfill, and.
 - .3 Total disposal cost. Include manifests, weight tickets, receipt, and invoices.
 - .4 Each material recycled, reused, or salvaged from the Project.
 - .5 Amount tonnes or cubic metres (tons or cubic yards).
 - .6 Date removed from the job site, the receiving party, and the transportation cost.
 - .7 Amount of any money paid or received for the recycled or salvaged material.
 - .8 Net total cost or savings of salvage or recycling each material.
 - .3 Attach manifests, weight tickets, receipts, and invoices.

3.5 Disposal Of Waste

- .1 Burying of rubbish and waste materials is prohibited unless approved by authority having jurisdiction.
- .2 Disposal of waste into waterways, storm, or sanitary sewers is prohibited.

3.6 Cleaning

- .1 Remove tools and waste materials on completion of work, leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.7 Special Programs

- .1 Be responsible for final implementation of programs involving tax credits or rebates or similar incentives related to recycling, if applicable to the Project.
- .2 Revenues or other savings obtained for recycling or returns to accrue to Contractor.
- .3 Recycling facility accessible from the Project site: to be determined during bid period.
- .4 Obtain information packets relevant to all of the above listed programs prior to starting work on the Project, and confirm facility's ability to accept waste from Project.
- .5 Document work methods, recycled materials, alternative disposal methods that qualify for tax credits, rebates, and other savings under programs listed by authority having jurisdiction.

End of Section

Part 1 General

1.1 Section Includes

- .1 Inspections and declarations.
- .2 Closeout submittals.
- .3 Operation and maintenance manual format.
- .4 Contents each volume.
- .5 Recording actual site conditions.
- .6 Record (as-built) documents and samples.
- .7 Record documents.
- .8 Final survey.
- .9 Warranties and bonds.

1.2 Related Requirements

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 79 00 - Demonstration and Training.
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Inspections And Declarations

- .1 Refer to relevant aspects of Contract conditions.
- .2 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Consultant's Inspection.
- .3 Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify defects or deficiencies. Correct defective and deficient Work accordingly.
- .4 Completion: Submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, balanced and are fully operational.
 - .4 Certificates required by authorities having jurisdiction have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for Final Inspection.
- .5 Final Inspection: When items noted above are completed, request final inspection of Work by Consultant & Owner, and Contractor. If Work is deemed incomplete by Consultant, complete outstanding items and request re-inspection.
- .6 Declaration of Substantial Performance: When Consultant considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Substantial Performance of the Work.
- .7 Commencement of Warranty Periods: The date of Substantial Performance of the Work shall be the date for commencement of the warranty period.
- .8 Commencement of Lien Periods: The date of publication of the certificate of Substantial Performance of the Work shall be the date for commencement of the lien period, unless required otherwise by the lien legislation applicable at the Place of the Work.
- .9 Final Payment: When Consultant considers final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment.

- .10 Payment of Hold-back: After issuance of certificate of Substantial Performance of the Work, submit an application for payment of hold-back amount.

1.4 Closeout Submittals

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection with Consultant's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, two(2) final copies of operating and maintenance manuals in Canadian English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.5 Operation And Maintenance Manual Format

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm (8.5 x 11 inch) with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in *.dwg AutoCAD Release 2012 or more recent format on USB Drive.

1.6 Contents - Each Volume

- .1 Table of Contents: Provide:
 - .1 Title of project.
 - .2 Date of submission.
 - .3 Names, addresses, and telephone numbers of Consultant and subcontractor and suppliers with name of responsible parties.
 - .4 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.
- .4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Certificate of Acceptance: Relevant certificates issued by authorities having jurisdiction, including pressure vessel acceptance code compliance certificate life safety systems performance certificate.
- .6 Training: Refer to Section 01 79 00.

1.7 Recording Actual Site Conditions

- .1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Consultant.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.
- .4 Contract drawings and Shop Drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: Maintain manufacturer's certifications field test records inspection certifications required by individual specifications sections.

1.8 Record (as-built) Documents And Samples

- .1 In addition to requirements in General Conditions, maintain at the site for Owner and Consultant, one (1) record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store as-built documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label as-built documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document AS-BUILT DOCUMENTS in neat, large, printed letters.
- .4 Maintain as-built documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.
- .5 Keep as-built documents and samples available for inspection by Consultant.

1.9 Record Documents

- .1 Prior to Substantial Performance of the Work, electronically transfer the marked up information from the as-built documents to a master set of Drawing and specification and specification files provided by the Consultant, as follows:
 - .1 Drawings: Autodesk AutoCAD and electronic PDF formats.
 - .2 Specifications: Electronic PDF.

- .2 Mark revised documents as RECORD DOCUMENTS. Include all revisions, with special emphasis on mechanical and electrical.
- .3 Employ a competent computer draftsman to indicate changes on the electronic set of record drawings. Provide updated Record Drawings in PDF format and AutoCAD (2012 or more current).
- .4 Employ a competent specification writer to indicate changes to the electronic set of record specifications. Provide updated record specifications in Adobe Acrobat on flash drive.
- .5 Submit three (3) hardcopies and one (1) electronic of completed record documents to Owner.

1.10 Final Survey

- .1 Submit final site survey certificate in accordance with Section 01 71 00, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.
- .2 Final survey shall be prepared by a Ontario and/or Canada Land Surveyor as applicable to the project.
- .3 Surveys shall be relative to current and standard geodetic cadastral control, in a working electronic format.
- .4 Inaccurate or neglectful information shall become a liability of the Contractor.

1.11 Warranties And Bonds

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of the responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittals.

End of Section

Part 1 General

1.1 Section Includes

- .1 Procedures for demonstration and instruction of Products, equipment and systems to Owner's personnel.
- .2 Seminars and demonstrations.

1.2 Related Requirements

- .1 Section 01 91 00 - Commissioning.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 Description

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two (2) weeks prior to date of substantial performance.
- .2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.4 Component Demonstration

- .1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.
- .2 Instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.
- .3 Coordinate and schedule demonstrations to minimize number of events.

1.5 Submittals

- .1 Submit schedule of time and date for demonstration of each item of equipment and each system two (2) weeks prior to designated dates, for Consultant's approval.
- .2 Submit reports within one (1) week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.6 Conditions For Demonstrations

- .1 Equipment has been inspected and put into operation in accordance with:
 - .1 Mechanical drawings and specifications.
 - .2 Electrical drawings and specifications.
 - .3 Civil drawings and specifications.
- .2 Contract and manufacturer's requirements.
- .3 Testing, adjusting, and balancing have been performed in accordance with Section 01 91 00, and equipment and systems are fully operational.
- .4 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

Part 2 Products - Not Used

Part 3 Execution

3.1 Preparation

- .1 Verify that suitable conditions for demonstration and instructions are available.
- .2 Verify that designated personnel are present.
- .3 Present system demonstrations.

3.2 Demonstration And Instructions

- .1 Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of equipment at scheduled times, at the designated location.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Instruct personnel on control and maintenance of sensory equipment and operational equipment associated with maintaining energy efficiency and longevity of service.
- .4 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .5 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

End of Section

Part 1 General

1.1 Section Includes

- .1 Demolition of designated structures and removal of materials from site.
- .2 Demolition and removal of foundations and slabs-on-grade.
- .3 Disconnecting and capping of identified utilities.
- .4 Filling and Removal of underground tanks and piping.
- .5 Refer to items as indicated on Drawings.

1.2 Related Requirements

- .1 Section 31 05 13 - Soil Materials: Backfill materials.

1.3 Administrative Requirements

- .1 Sequencing: Sequence work to requirements of Section 01 11 00.
- .2 Scheduling: Schedule work to requirements of Section 01 31 00.
 - .1 Describe demolition removal procedures and schedule.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings: Indicate removal sequence and location of salvageable items; location and construction of barricades, temporary work.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.6 Closeout Submittals

- .1 Section 01 78 00: Closeout submittals.
- .2 Record Documentation: Accurately record actual locations of capped utilities and subsurface obstructions.

1.7 Quality Assurance

- .1 Demolition Contractor/Subcontractor: specialization and experience in demolition and removal Work.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for demolition of structures, safety of adjacent structures, dust control , disposal.
 - .2 Obtain required permits from authorities.
 - .3 Notify affected utility companies before starting work and comply with their requirements.
 - .4 Do not close or obstruct roadways, sidewalks and hydrants without permits.
 - .5 Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.
 - .6 Test soils around buried tanks for contamination.

Part 3 Execution

3.1 Preparation

- .1 Provide, erect, and maintain temporary barriers and security devices as required to permit Work to proceed.

- .2 Protect existing landscaping materials, appurtenances and structures which are not to be demolished.
- .3 Prevent movement or settlement of adjacent structures. Provide bracing and shoring.
- .4 Mark location of utilities.

3.2 Demolition Requirements

- .1 Conduct demolition to minimize interference with adjacent structures and occupancies.
- .2 Cease operations immediately if adjacent structures appear to be in danger. Notify Consultant and authority having jurisdiction. Do not resume operations until directed.
- .3 Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access at all times.
- .4 Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- .5 Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

3.3 Demolition

- .1 Disconnect remove and cap and identify designated utilities within demolition areas.
- .2 Remove foundation walls and footings to a minimum of 24 inches below finished grade within area of new construction.
- .3 Remove concrete slabs on grade.
- .4 Break up concrete slabs on grade to permit natural moisture drainage.
- .5 Empty buried tanks located within demolition area. Remove buried tanks, components, and piping from site.
- .6 Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 61 00.
- .7 Backfill areas excavated, and open pits and holes caused as a result of demolition in accordance with Section 31 23 23.13.
- .8 Rough grade and compact areas affected by demolition to maintain site grades and contours.
- .9 Remove demolished materials from site.
- .10 Do not burn or bury materials on site. Leave site in clean condition.
- .11 Remove temporary work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- .2 Openings in forms for other work.
- .3 Form accessories.
- .4 Form stripping.

1.2 Related Requirements

- .1 Section 03 20 00 - Concrete Reinforcing.
- .2 Section 03 30 00 - Cast-in-Place Concrete: Supply of concrete accessories for placement by this section.
- .3 Section 04 05 19 - Masonry Anchorage and Reinforcing: Supply of masonry accessories for placement by this section.
- .4 Section 07 46 16 - Preformed Metal: Supply of flashing reglets for placement by this section.

1.3 Reference Standards

- .1 ACI 301-16 - Specifications for Structural Concrete for Buildings.
- .2 ASME A17.1-2016/CSA-B44-2016 - Safety Code for Elevators and Escalators.
- .3 CSA-S269.1-16 - Falsework for Construction Purposes.CSA-S269.1-16 - Falsework for Construction Purposes.
- .4 CAN/CSA-S269.3-M92 (R2013) - Concrete Formwork.
- .5 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .6 CSA-O121-17 - Douglas Fir Plywood.
- .7 CSA-O151-17 - Canadian Softwood Plywood.
- .8 CSA-O153-19 - Poplar Plywood.
- .9 CSA-O437 Series-93 (R2011) (Withdrawn) - Standards on OSB and Waferboard.
- .10 CSA-S269.1-16 - Falsework for Construction Purposes.CSA-S269.1-16 - Falsework for Construction Purposes.
- .11 COFI (Council of Forest Industries of British Columbia) - Exterior Plywood for Concrete Formwork.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on void form materials and installation requirements.
- .3 Shop Drawings:
 - .1 Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
 - .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
 - .3 Comply with CAN/CSA-S269.3, for form work Drawings.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.

1.6 Quality Assurance

- .1 Perform Work in accordance with CSA-S269.1, CAN/CSA-S269.3.

1.7 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver void forms and installation instructions in manufacturer's packaging.
- .3 Store off ground in ventilated and protected manner to prevent deterioration from moisture.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for design, fabrication, erection and removal of formwork.

2.2 Performance / Design Criteria

- .1 Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.
- .2 Conform to CSA-S269.1.

2.3 Wood Form Materials

- .1 Form Materials - Building: At the discretion of the Contractor.
- .2 Form Materials - Retaining Wall: Refer to Drawings.

2.4 Formwork Accessories

- .1 Form Ties - Building: Snap-off type, galvanized metal, fixed length, back break dimension 20mm min., cone type, free of defects that could leave holes larger than 25 mm in concrete surface.
- .2 Form Ties - Retaining Wall: Coil type, with cone spreaders to ensure regular pattern.
- .3 Form Release Agent:
 - .1 Colourless mineral oil which will not stain concrete, or absorb moisture or impair natural bonding or colour characteristics of coating intended for use on concrete.
 - .2 Biodegradable.
- .4 Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete. Confirm use/application with Engineer as part of shop drawing process.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify lines, levels and centres before proceeding with formwork.
- .3 Ensure that dimensions agree with drawings.

3.2 Earth Forms

- .1 Earth forms are not permitted.
- .2 Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 Erection - Formwork

- .1 Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of CAN/CSA-S269.3.
- .2 Fabricate and erect false work in accordance with CSA-S269.1.
- .3 Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- .4 Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- .5 Align joints and make watertight. Keep form joints to a minimum.

- .6 Obtain approval before framing openings in structural members which are not indicated on Drawings.
- .7 Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.
- .8 Coordinate this section with other sections of work which require attachment of components to formwork.
- .9 If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Consultant.

3.4 Application - Form Release Agent

- .1 Apply form release agent on formwork in accordance with manufacturer's recommendations.
- .2 Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- .3 Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 Inserts, Embedded Parts, And Openings

- .1 Provide formed openings where required for items to be embedded in passing through concrete work.
- .2 Locate and set in place items that will be cast directly into concrete.
- .3 Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- .4 Install accessories in accordance with manufacturer's written instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- .5 Install waterstops to manufacturer's written instructions continuous without displacing reinforcement. Heat seal joints watertight.
- .6 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- .7 Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 Form Cleaning

- .1 Clean forms as erection proceeds, to remove foreign matter within forms.
- .2 Clean formed cavities of debris prior to placing concrete.
- .3 Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- .4 During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 Formwork Tolerances

- .1 Construct formwork to maintain tolerances in accordance with CSA-A23.1/A23.2.
- .2 Construct and align formwork for elevator hoistway in accordance with ASME A17.1/CSA-B44.

3.8 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

3.9 Form Removal

- .1 Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- .2 Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

- .3 Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged.
Discard damaged forms.

End of Section

Part 1 General

1.1 Section Includes

- .1 Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 Related Requirements

- .1 Section 03 11 00 - Concrete Forming.
- .2 Section 03 30 00 - Cast-in-place Concrete.
- .3 Section 03 35 00 - Concrete Finishing: Reinforcement for concrete floor toppings.
- .4 Section 04 05 19 - Masonry Anchorage and Reinforcing: Reinforcement for masonry.

1.3 Reference Standards

- .1 ASTM A1064/A1064M-18a - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A184/A184M-19 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
- .4 ASTM A416/A416M-18 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
- .5 ASTM A704/A704M-19e1 - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
- .6 ASTM A775/A775M-19 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
- .7 ASTM D3963/D3963M-15 - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
- .8 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .9 CSA-A23.3-19 - Design of Concrete Structures.
- .10 CSA-G30.18-09 (R2014) - Carbon Steel Bars for Concrete Reinforcement.
- .11 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .12 CSA-S806-12 (R2017) - Design and Construction of Building Structures with Fibre-Reinforced Polymers.
- .13 CSA-W186-M1990 (R2016) - Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .14 RSIC (Reinforcing Steel Institute of Canada) – Manual of Standard Practice.

1.4 Action Submittals

- .1 Section 01 33 00: Procedures for submittals.
- .2 Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, supporting and spacing devices.

1.5 Informational Submittals

- .1 Section 01 33 00: Procedures for submittals.
- .2 Test Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.6 Quality Assurance

- .1 Perform Work in accordance with CSA-A23.1/A23.2. Maintain one (1) copy of document on site.
- .2 Provide Consultant with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.
- .3 Design reinforcement under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

- .4 Welders' Certificates: Submit to Section 01 43 00, Manufacturer's Certificates, certifying welders employed on the Work, verifying CSA-qualification within the previous 12 months.

Part 2 Products

2.1 Reinforcement

- .1 Reinforcing Steel, Deformed: CSA-G30.18, billet steel, Grade 400R, regular bars, unfinished, unless noted otherwise.
- .2 Welded Steel Wire Reinforcement, Plain: ASTM A1064/A1064M, in flat sheets, unfinished, unless noted otherwise.

2.2 Accessories

- .1 Reinforcing:
 - .1 Rebar connectors:
 - .1 Dayton Superior; Product: Bar Lock L-Series.
 - .2 Approved equal.
 - .2 Tie Wire:
 - .1 Minimum 1.65 mm (16 gauge) annealed type
- .3 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapour barrier puncture.
- .4 Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 Fabrication

- .1 Fabricate concrete reinforcing in accordance with:
 - .1 CSA-A23.1/A23.2.
 - .2 RSIC Manual of Standard Practice.

Part 3 Execution

3.1 Placement

- .1 Place, support and secure reinforcement against displacement to CSA-A23.1/A23.2 and as indicated on reviewed placing Drawings.
- .2 Do not displace or damage vapour barrier.
- .3 Accommodate placement of formed openings.
- .4 Conform to applicable code for concrete cover over reinforcement.

3.2 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Inspect for acceptability and compliance with applicable standards.

End of Section

Part 1 General

1.1 Section Includes

- .1 Cast-in-place concrete floors and slabs on grade, foundation walls, equipment pads and supported slabs.
- .2 Site work retaining walls, sidewalks, curbs, light pole bases, flagpole bases and manholes.
- .3 Control, expansion and contraction joint devices associated with concrete work including embedments and joint sealants.

1.2 Related Requirements

- .1 Section 03 11 00 - Concrete Forming: Formwork and accessories.
- .2 Section 03 20 00 - Concrete Reinforcing.
- .3 Section 05 12 00 - Structural Steel: Steel columns and beams.
- .4 Section 07 92 00 - Joint Sealants.

1.3 Reference Standards

- .1 ACI 305R-10 - Guide to Hot Weather Concreting.
- .2 ACI 306R-16 - Guide to Cold Weather Concreting.
- .3 ASTM A820/A820M-16 - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
- .4 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .5 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .6 ASTM C260/C260M-10a(2016) - Standard Specification for Air-Entraining Admixtures for Concrete.
- .7 ASTM C330/C330M-17a - Standard Specification for Lightweight Aggregates for Structural Concrete.
- .8 ASTM C494/C494M-19 - Standard Specification for Chemical Admixtures for Concrete.
- .9 ASTM C1017/C1017M-13e1 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .10 ASTM D412-16 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
- .11 ASTM D624-00(2020) - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- .12 ASTM D994/D994M-11(2016) - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- .13 ASTM D1751-18 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .14 ASTM D1752-18 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .15 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .16 CSA-A3000-18 - Cementitious Materials Compendium.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on joint devices, attachment accessories, admixtures.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

- .2 Test Data: Minimum four (4) weeks prior to starting concrete work, submit manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Portland-limestone cement.
 - .4 Supplementary cementing materials.
 - .5 Grout.
 - .6 Admixtures.
 - .7 Aggregates.
 - .8 Water.
- .3 Certification: Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2.
- .4 Certification: Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.
- .5 Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.
- .6 Material: Provide material specifications (mix design) in conformance with RMCO standard forms.

1.6 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Record Documentation: Accurately record actual locations of embedded utilities and components.

1.7 Quality Assurance

- .1 Perform Work in accordance with CSA-A23.1/A23.2.
- .2 Maintain one (1) copy of document on site.
- .3 Acquire cement and aggregate from same source for all work.

1.8 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Construct and erect a field sample for architectural concrete surfaces receiving special treatment or finish as result of formwork.
- .3 If requested by Consultant, cast concrete against sample panel. Obtain acceptance of resultant surface finish prior to erecting formwork.
- .4 Accepted sample panel is considered basis of quality for the finished work. Keep sample panel exposed to view for duration of concrete work.
- .5 Locate where directed by Consultant.
- .6 Approved mock-up may remain as part of the Work.

Part 2 Products

2.1 Concrete Materials

- .1 As specified on Drawings.
- .2 Water: CSA-A23.1/A23.2, clean and not detrimental to concrete.

2.2 Accessories

- .1 Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 17 MPa in 48 hours and 48 MPa in 28 days.

2.3 Joint Devices And Filler Materials

- .1 Joint Filler: ASTM D1751, asphalt impregnated fibreboard or felt, 10mm thick; tongue and groove profile.
- .2 Joint Filler: bituminous joint filler, 10mm thickness.
- .3 Seismic Joint Materials: as indicated on Drawings.
- .4 Product: Colourseal / Seismic Colourseal, by Emseal.
- .5 Sealant and Primer: specified type, as specified in Section 07 92 00.

2.4 Concrete Mix

- .1 Refer to mix specifications on Drawings.
- .2 Use accelerating admixtures in cold weather only when approved by Consultant. Use of admixtures will not relax cold weather placement requirements.
- .3 Use calcium chloride only when approved by Engineer.
- .4 Use set retarding admixtures during hot weather only when approved by Engineer.
- .5 Add air entraining agent to normal weight concrete mix for work exposed to exterior.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify all dimensions and locations required on drawings.
- .3 Verify requirements for concrete cover over reinforcement.
- .4 Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not impede concrete placement.
- .5 Verify locations of all openings and embedments required for other aspects of the work.

3.2 Preparation

- .1 Prepare previously placed concrete and apply bonding agent to manufacturer's written instructions.
 - .1 Prepare by:
 - .1 Cleaning with steel brush.
- .2 Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.3 Placing Concrete

- .1 Place concrete in accordance with CSA-A23.1/A23.2.
- .2 Notify Consultant minimum twenty-four (24) hours prior to commencement of operations.
- .3 Ensure reinforcement, and inserts are not disturbed during concrete placement.
- .4 Extend joint filler from bottom of slab to within 6 mm (1/4 inch) of finished slab surface. Conform to Section 07 92 00 for finish joint sealer requirements.
- .5 Install joint devices to manufacturer's written instructions.
- .6 Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- .7 Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor/wall finish.
- .8 Apply sealants in joint devices in accordance with Section 07 92 00.
- .9 Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- .10 Place concrete continuously between predetermined expansion, control, and construction joints.
- .11 Do not interrupt successive placement; do not permit cold joints to occur.
- .12 Screed slabs on grade level, maintaining surface flatness to either:
 - .1 CSA-A23.1/A23.2.

3.4 Separate Floor Toppings

- .1 Place monolithic topping before base course has completely set, to CSA-A23.1/A23.2.
- .2 Prior to placing bonded concrete topping, roughen substrate concrete surface and remove deleterious material to CSA-A23.1/A23.2. Broom and vacuum clean.
- .3 Place required reinforcing, etc. and other items to be cast into concrete.
- .4 Apply concrete topping using epoxy grout procedures to CSA-A23.1/A23.2.
- .5 Place concrete floor toppings to required lines and levels.

3.5 Tolerances

- .1 Slab and Floor Tolerances: To CSA-A23.1/A23.2, to tolerance schedule as indicated.
- .2 Slab and Floor Tolerances: As specified in Section 03 35 00.

3.6 Curing And Protection

- .1 Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical damage.
- .2 Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- .3 Cure floor surfaces in accordance with CSA-A23.1/A23.2.
- .4 Fill any depressions left from concrete form ties with cementitious parging congruent with wall surface and finish.

3.7 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Provide free access to Work and cooperate with appointed firm.
 - .3 Submit proposed mix design of each class of concrete to inspection, testing, and engineering firm for review prior to commencement of Work.
 - .4 Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

3.8 Patching

- .1 Allow Consultant to inspect concrete surfaces immediately upon removal of forms.
- .2 Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Consultant upon discovery.
- .3 Patch imperfections in accordance with CSA-23.1.

3.9 Defective Concrete

- .1 Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- .2 Repair or replacement of defective concrete will be determined by the Consultant.
- .3 Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Consultant for each individual area.

End of Section

Part 1 General

1.1 Section Includes

- .1 Floor planks.
- .2 Connection plates, brackets, hangers.
- .3 Grouting plank joint keys.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-place Concrete: Concrete topping, superstructure building frame, reinforcement.
- .2 Section 04 26 19 - Reinforced Unit Masonry: Masonry load bearing support walls.
- .3 Section 05 12 00 - Structural Steel: Supporting steel headers, lintels.
- .4 Section 05 50 00 - Metal Fabrications: Supporting steel lintels, headers.
- .5 Section 07 84 00 - Firestopping.
- .6 Section 07 92 00 - Joint Sealants: Caulking of butt joints of precast units at exposed underside of floor members.

1.3 Reference Standards

- .1 ASTM A325-10e1 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .2 ASTM F3125/F3125M-19 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .3 ASTM A416/A416M-18 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
- .4 ASTM A421/A421M-15 - Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete.
- .5 ASTM A615/A615M-18e1 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- .6 ASTM A666-15 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- .7 AWS D1.1/D1.1M-2015 - Structural Welding Code - Steel.
- .8 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .9 CSA-A23.3-19 - Design of Concrete Structures.
- .10 CSA-A23.4-16 - Precast Concrete - Materials and construction.
- .11 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .12 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .13 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .14 CPCI (Canadian Precast/Prestressed Concrete Institute) - Design Manual (5th Edition).
- .15 CPCI (Canadian Precast/Prestressed Concrete Institute) - Structural Floor and Roof Systems - Technical Guide.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the Work of framing components not post tensioned but directly associated with the Work of this section.

- .3 Coordinate field cut openings with affected section.
- .4 Coordinate location of hanger tabs and devices for mechanical and electrical work.
- .3 Pre-installation Meetings:
 - .1 Convene one (1) week before starting work of this section.
 - .2 Discuss anchor and weld plate locations, sleeve locations, and cautions regarding cutting or core drilling.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Indicate standard component configuration, design loads, deflections, and cambers.
- .3 Shop Drawings:
 - .1 Provide Shop Drawings indicating plank locations, unit identification marks connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, openings intended to be field cut and relationship to adjacent materials.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Fabricator's special installation requirements, indicating special procedures, perimeter conditions requiring special attention.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work by a specialty precast company certified to CSA-A23.4.
- .3 Perform welding to CSA-W55.3.
- .4 Welder: Qualified within previous twelve (12) months to CSA-W47.1.
- .5 Maintain plant records and quality control program during production of precast planks. Make records available upon request.
- .6 Fabricator Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .7 Erector: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by fabricator.
- .8 Delegated Design Professional Qualifications: Professional Structural Engineer experienced in design of this Work and licensed in the place where the project is located.

1.9 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- .3 Mark each member with date of production and final position in structure.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for design load and on-site handling requirements.
 - .2 Conform to PCI MNL-124 to achieve 1 hour rating for floor assembly.

2.2 Performance / Design Criteria

- .1 Size components to withstand design loads noted on Structural Drawings.

- .2 Maximum Allowable Deflection of Floor Planks: 1/360 span, cambered to achieve flat surface under dead load.
- .3 Design components to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.
- .4 Calculate structural properties of precast planks in accordance with CSA-A23.3.
- .5 Conform to CPCI Design Manual.

2.3 Materials

- .1 Materials: CSA-A23.1/A23.2, CSA-A3000.
- .2 Tensioning Steel Tendons: ASTM A421/A421M, ASTM A416/A416M, Grade 250, 270 K, of sufficient strength commensurate with member design.
- .3 Reinforcing Steel: ASTM A615/A615M, deformed steel bars.
- .4 Non-shrink Grout: Non-metallic, minimum compressive strength of 69 MPa (10000 psi), at 28 days.
- .5 Cement Grout: Minimum compressive strength of 21 MPa (3000 psi) at 28 days.

2.4 Accessories

- .1 Connecting and Supporting Devices: CSA-G40.20/G40.21, carbon steel, ASTM A666, stainless steel plates, angles, items cast into concrete, items connected to steel framing members and inserts; fasteners to ASTM A325M (ASTM A325).
- .2 Bearing Pads: Tetrafluoroethylene (TFE) 3 mm (1/8 inch) thick.
- .3 Shims: Steel.

2.5 Fabrication

- .1 Conform to CSA-A23.4.
- .2 Embed anchors, inserts, plates, angles, and other items at locations indicated.
- .3 Provide openings required by other sections, at locations indicated.
- .4 Cut exposed ends recessed for grout fill of stressing tendons.

2.6 Finishes

- .1 Plant Finish: Finish members to CPCI Standard Grade.
- .2 Plant Finish: Exposed to view surfaces may contain small surface holes caused by small air bubbles, minor chipping or spalling at edges or ends, without major discolouration.
- .3 Connecting and Supporting Steel Devices: Unfinished. Do not paint surfaces in contact with concrete or surfaces requiring field welding Hot dip galvanized.
- .4 Connecting and Supporting Stainless Steel Devices: Dull finish.

2.7 Fabrication Tolerances

- .1 Conform to CPCI Design Manual tolerances for precast concrete.
- .2 Maximum Variation From Nominal Dimensions:
 - .1 Width: 6 mm (1/4 inch).
 - .2 Length: 12 mm (1/2 inch).
 - .3 Thickness: 6 mm (1/4 inch).
- .3 Maximum Variation From Intended Camber: 6 mm in 3 m (1/4 inch in 10 ft).
- .4 Maximum Out of Square: 3 mm in 3 m (1/8 inch in 10 ft), non-cumulative.
- .5 Maximum Misalignment of Anchors, Inserts, Openings: 3 mm (1/8 inch).
- .6 Maximum Bowing of Members: Length of Bow/360.
- .7 Maximum Bowing of Members: 6 mm in 3 m (1/4 inch in 10 ft), 10 mm in 3 m (3/8 inch in 10 ft).

2.8 Source Quality Control

- .1 Section 01 43 00: Manufacturer quality control.

- .2 Provide testing, analysis of site placed concrete and grout.
- .3 Provide shop testing, inspection for stressing tendons.
- .4 Test samples in accordance with specified standards.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that site conditions are ready to receive work and field measurements are as indicated on Shop Drawings, indicated on Drawings, instructed by the installer.
- .3 Verify supporting structure is ready to receive work.

3.2 Preparation

- .1 Prepare support devices for the erection procedure and temporary bracing.

3.3 Erection

- .1 Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- .2 Align and maintain uniform horizontal and end joints, as erection progresses.
- .3 Maintain temporary bracing in place until final connection is made. Protect members from staining.
- .4 Install bearing pads and sill seal at bearing ends of planks as indicated.
- .5 Adjust differential camber between precast members to tolerance before final attachment and grouting.
- .6 Adjust differential elevation between precast members to tolerance before final attachment.
- .7 Grout plank joints, trowel smooth.
- .8 Place sealant backer rod to underside of plank joints to prevent grout leakage.
- .9 Transition differential elevation of adjoining planks with grout to a maximum slope of 1:12.
- .10 Secure units in place. Perform welding in accordance with CSA-W59.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Erect members level and plumb, within allowable tolerances.
- .3 Erect to the following tolerances:
 - .1 Maximum Variation from Plane or Location Indicated on Drawings: 6 mm in 3 m (1/4 inch in 10 ft) and 9 mm in 30 m (3/8 inch in 100 ft), non-cumulative.
 - .2 Maximum Offset from True Alignment Between Members: 6 mm (1/4 inch).
 - .3 Maximum Variation From Dimensions Indicated on Drawings, Indicated on Reviewed Shop Drawings: Plus or minus 3 mm (1/8 inch).
- .4 Exposed Joint Dimension: 9 mm (3/8 inch), plus or minus 6 mm (1/4 inch).

3.5 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Clean weld marks, dirt, or blemishes from surface of exposed members.

3.6 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Protect members from damage caused by field welding or erection operations.
- .3 Provide non-combustible shields during welding operations.

End of Section

Part 1 General

1.1 Section Includes

- .1 Mortar grout for masonry.
- .2 Parging mortar.

1.2 Related Requirements

- .1 Section 04 26 00 - Single Wythe Masonry: Installation of mortar.
- .2 Section 04 26 16 - Reinforced unit masonry.
- .3 Section 04 29 00 - Veneer Masonry: Installation of mortar.
- .4 Section 04 29 00 - Reinforced Unit Masonry: Installation of grout.
- .5 Section 08 12 13.13 - Standard Hollow Metal Frames: Grouted steel door frames.

1.3 Reference Standards

- .1 ASTM C207-18 - Standard Specification for Hydrated Lime for Masonry Purposes.
- .2 ASTM C494/C494M-19 - Standard Specification for Chemical Admixtures for Concrete.
- .3 ASTM C780-19 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- .4 ASTM C1329/C1329M-16a - Standard Specification for Mortar Cement.
- .5 ASTM C1489-15 - Standard Specification for Lime Putty for Structural Purposes.
- .6 CAN/CSA-A179-14 (R2019) - Mortar and Grout for Unit Masonry.
- .7 CAN/CSA-A371-14 (R2019) - Masonry Construction for Buildings.
- .8 CSA-A3000-18 - Cementitious Materials Compendium.
- .9 CSA-S304-14 (R2019) - Design of Masonry Structures.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Include design mix, indicate whether the Proportion or Property specification of CAN/CSA-A179 is to be used, required environmental conditions, and admixture limitations.
- .3 Samples: Submit two (2) samples of mortar, illustrating mortar colour and colour range.
- .4 Colour to be selected by Owner/Consultant within a standard range.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Reports:
 - .1 Submit reports on mortar indicating conformance of per CAN/CSA-A179.
 - .2 Submit reports on grout indicating conformance of component grout materials to requirements of CAN/CSA-A179 test and evaluation reports to CAN/CSA-A179.
- .3 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
- .4 Installation Data: Manufacturer's special installation requirements for premix mortar.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Section 01 78 00: Close-out procedures.

1.7 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.8 Site Conditions

- .1 Section 01 35 43: Environmental conditions affecting products on site.
- .2 Maintain materials and surrounding air temperature to minimum 10 degrees C (50 degrees F) prior to, during, and forty-eight (48) hours after completion of masonry work.
- .3 Cold and Hot Weather Requirements: CAN/CSA-A371.

Part 2 Products

2.1 Materials

- .1 Cementitious Material:
 - .1 Portland Cement: CSA-A3001, Type GU, colour grey white.
 - .2 Masonry Cement: CSA-A3000, Type S, colour grey.
 - .3 Mortar Cement: CSA-A3000.
 - .4 Blended Hydraulic Cement: CSA-A3001.
 - .5 Lime Putty: ASTM C1489.
- .2 Mortar Aggregate: CAN/CSA-A179, fine aggregate.
- .3 Grout Aggregate: CAN/CSA-A179, coarse, fine aggregate.
- .4 Water: Clean and potable.
- .5 Bonding Agent: Epoxy type.

2.2 Mortar Colour

- .1 Mortar Colour: as selected by Owner from a standard range

2.3 Mortar Mixes

- .1 Mortar for Exterior Above Grade:
 - .1 Loadbearing Walls: CAN/CSA-A179, Type N using the Proportion specification.
 - .2 Foundation Walls: CAN/CSA-A179, Type N using the Proportion specification.
- .2 Mortar for Exterior Below Grade:
- .3 Mortar for Interior Above Grade:
 - .1 Loadbearing walls: CAN/CSA-A179, Type N using the Proportion specification.

2.4 Mortar Mixing

- .1 Mix mortar ingredients to CAN/CSA-A179 in quantities needed for immediate use.
- .2 Add mortar colour admixtures to manufacturer's written instructions. Provide uniformity of mix and colouration.
- .3 Do not use antifreeze liquids, calcium chloride, frost inhibitors based on calcium chloride, salts or other substances used for lowering the freezing point or accelerating setting time.
- .4 If moisture is lost by evaporation, retemper as directed by the manufacturer with water in quantities and at intervals sufficient to restore workability.
- .5 Use mortar within period and temperatures as specified in CAN/CSA-A179 within period specified by mortar manufacturer.

2.5 Grout Mixes

- .1 Bond Beams Lintels: 21 MPa (3000 psi) strength at 28 days; 200-250 mm (8-10 inches) slump; premixed type to CAN/CSA-A179 mixed to CAN/CSA-A179, fine grout.
- .2 Engineered Masonry: 21 MPa (3000 psi) strength at 28 days; 200-250 mm (8-10 inches) slump; premixed type to CAN/CSA-A179 mixed to CAN/CSA-A179, fine grout.

2.6 Grout Mixing

- .1 Mix grout to CAN/CSA-A179.

- .2 Thoroughly mix grout ingredients in quantities needed for immediate use to CAN/CSA-A179, coarse, fine grout.
- .3 Add admixtures into manufacturer's written instructions; mix uniformly.
- .4 Do not use antifreeze liquids, calcium chloride, frost inhibitors based on calcium chloride, salts or other substances used for lowering the freezing point or accelerating setting time.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Request inspection of spaces to be grouted.

3.2 Preparation

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

3.3 Installation

- .1 Install grout, mortar to CAN/CSA-A179.
- .2 Install mortar, grout to manufacturer's written instructions and as specified in related sections.

3.4 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Test mortar, grout.
 - .2 Test mortar, grout mix to CAN/CSA-A179.
 - .3 Test mortar mix to CAN/CSA-A179 for flexural bond strength, aggregate ratio, water content, compressive strength, air content.
 - .4 Test grout mix to CAN/CSA-A179 for slump, water penetration, compressive strength.

End of Section

Part 1 General

1.1 Section Includes

- .1 Continuous wire reinforcement and reinforcing rods.

1.2 Related Requirements

- .1 Section 04 26 16 - Reinforced Unit Masonry.

1.3 Reference Standards

- .1 ASTM A1064/A1064M-18a - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A167-99(2009) (Withdrawn) - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .5 ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .6 ASTM A580/A580M-18 - Standard Specification for Stainless Steel Wire.
- .7 ASTM A666-15 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- .8 ASTM A780/A780M-09(2015) - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- .9 ASTM A1018/A1018M-18 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- .10 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.
- .11 ASTM C1242-19a - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems.
- .12 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .13 CSA-G30.18-09 (R2014) - Carbon Steel Bars for Concrete Reinforcement.
- .14 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .15 CAN/CSA-A370-14 (R2018) - Connectors for Masonry.
- .16 CAN/CSA-A371-14 (R2019) - Masonry Construction for Buildings.
- .17 CSA-S304-14 (R2019) - Design of Masonry Structures.

1.4 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.5 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

Part 2 Products

2.1 Materials

- .1 Steel Wire: ASTM A1064/A1064M .
- .2 Steel Bars, Bars, Plates, Angles: CSA-G40.20/G40.21, Type W.

- .3 Steel Bolts: ASTM A307, Type A.
- .4 Stainless Steel Wire: ASTM A580/A580M, Type 304 or 316.
- .5 Stainless Steel Sheet: ASTM A167, Type 304 or 316.
- .6 Stainless Steel Sheet, Strip, Plate and Bar: ASTM A666, Type 304 or 316.

2.2 Masonry Connectors

- .1 As specified on Drawings.

2.3 Fabrication

- .1 Fabricate connectors to CAN/CSA-A370.
- .2 Fabricate bar reinforcing to CSA-A23.1/A23.2.

Part 3 Execution

3.1 Installation

- .1 Install anchors and reinforcing as indicated on Drawings and as specified by material manufacturer.

End of Section

Part 1 General

1.1 Section Includes

- .1 Concrete Masonry Units:
 - .1 Concrete block units.
 - .2 Concrete brick units.
- .2 Clay Brick Masonry Units:
 - .1 Burned clay brick (solid units).

1.2 Related Requirements

- .1 Section 04 05 10 - Masonry Mortar And Grout.
- .2 Section 04 05 19 - Masonry Anchorage and Reinforcement.
- .3 Section 04 26 13 - Masonry Veneer.
- .4 Section 04 29 00 - Reinforced Unit Masonry.

1.3 Reference Standards

- .1 ASTM C34-17 - Standard Specification for Structural Clay Load-Bearing Wall Tile.
- .2 ASTM C56-13(2017) - Standard Specification for Structural Clay Nonloadbearing Tile.
- .3 ASTM C73-17 - Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).
- .4 ASTM C126-19 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
- .5 ASTM C216-19 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
- .6 ASTM C315-07(2016) - Standard Specification for Clay Flue Liners and Chimney Pots.
- .7 ASTM C652-19b - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- .8 ASTM C744-16 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
- .9 CAN/CSA-A165 Series-14 (2019) - Standards on Concrete Masonry Units.
- .10 CAN/CSA-A371-14 (R2019) - Masonry Construction for Buildings.
- .11 CSA-S304-14 (R2019) - Design of Masonry Structures.

1.4 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.5 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

Part 2 Products

2.1 Concrete Block Masonry Units

- .1 Concrete Block Masonry Units (CMU): CAN/CSA-A165 Series, Type H/7.5/C/M.
- .2 Manufacturers - Concrete Block Masonry Units.
 - .1 Brampton Brick; Product: 190mm, PCR Blocks, Atlas FR2.
 - .2 Brampton Brick; Product: 140mm, PCR Blocks, Atlas FR2.

2.2 Concrete Brick Masonry Units

- .1 Prefaced Concrete Brick Units: CAN/CSA-A165 Series, bevelled edges and special corner pieces, smooth finish, colour Chamois (or equivalent as selected by Owner).
- .2 Manufacturers - Concrete Brick Masonry Units.

- .1 Size and Shape: Standard 90 thick, 190 high, 590 long; Corner 90 thick, 190 high, 590 long, 290 return.
- .2 Shouldice; Product: Tapestry.
- .3 Sills - Size and Shape: Shouldice 424 Sloped (cut standard or 90 thick, 90 high, 590 long under sill).
- .4 Substitutions: Refer to Section 01 25 00.

2.3 Clay Brick Masonry Units

- .1 Solid Clay Brick: CAN/CSA-A82.
 - .1 Size and Shape: Nominal modular size of 90 thick, 57 high, 190 long.
 - .2 Finish: Rough face.
 - .3 Colour: Wheatland Velour (or equivalent as selected by Owner).
- .2 Manufacturers – Clay Brick Units.
 - .1 Brampton Brick; Product: Modular 90.
 - .2 Substitutions: Refer to Section 01 25 00.

2.4 Fabrication

- .1 Manufacture masonry units to CSA-S304.

Part 3 Execution

3.1 Installation

- .1 Install masonry units as specified in masonry Section 04 26 16.
- .2 Refer to Drawings for masonry layout, coursing, and configurations.

End of Section

Part 1 General

1.1 Section Includes

- .1 Common work results for veneer masonry construction.
- .2 Miscellaneous masonry flashing and accessories.

1.2 Related Sections

- .1 Section 03 30 00 - Cast-in-place Concrete
- .2 Section 04 04 05 - Mortar and Masonry Grout: Mortar and grout.
- .3 Section 04 04 15 - Masonry Anchorage and Reinforcement: Connectors and reinforcing.
- .4 Section 05 41 00 - Structural Metal Stud Framing: Structural wall backing.
- .5 Section 07 26 00 - Vapour Retarders: Vapour retarder membrane placed on interior face of wall insulation.
- .6 Section 07 27 00 - Air Barriers: Air barrier placed on interior face of wall insulation.
- .7 Section 07 62 00 - Sheet Metal Flashing and Trim: Cap flashings over masonry work and placement of reglets for flashings.
- .8 Section 07 92 00 - Joint Sealants: Rod and sealant at expansion joints control joints.
- .9 Section 09 21 16 - Gypsum Board Assemblies: Structural wall backing.

1.3 References

- .1 ASTM C1330-02(2013) - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- .2 CAN/CSA-A370-04 (R2009) - Connectors for Masonry.
- .3 CAN/CSA-A371-04 (R2014) - Masonry Construction for Buildings.
- .4 CSA-S304.1-04 (R2010) - Design of Masonry Structures.

1.4 Administration Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.

1.5 Submittals For Review

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on masonry units, mortar products, reinforcements sealants.
- .3 Shop Drawings: Indicate layout, pertinent dimensions of additional control jointing methods.
- .4 Samples: Submit four (4) samples of face brick units to illustrate colour, texture and extremes of colour range.

1.6 Submittals For Information

- .1 Section 01 33 00: Submission procedures.

1.7 Close Out Submittals

- .1 Section 01 78 10: Submission procedures.

1.8 Maintenance Material Submittals

- .1 Section 01 78 40: Maintenance and extra material requirements.
- .2 Extra Stock Materials: Provide fifty (50) of each size, colour, and type

1.9 Quality Assurance

- .1 Perform Work to CAN/CSA-A371, CSA-S304.1.

1.10 Mock-up

- .1 Provide 2.4 m (8 ft) long by full height masonry wall panel, including mortar and accessories, wall insulation, air barrier, vapour barrier, wall openings, flashings, and structural backup.
- .2 Locate where directed by Consultant.
- .3 Approved mock-up may remain as part of the Work.

1.11 Delivery, Storage And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Package and protect masonry units to arrive undamaged at the job site.
- .3 Store masonry under waterproof cover on pallets or plank platforms held off ground.

1.12 Environmental Requirements

- .1 Section 01 35 26: Environmental conditions affecting products on site.
- .2 Maintain materials and surrounding air temperature to minimum 10 degrees C (50 degrees F) prior to, during, and forty-eight (48) hours after completion of masonry work.
- .3 Cold and Hot Weather Requirements: CAN/CSA-A371.

Part 2 Products

2.1 Concrete Block Masonry Units

- .1 Concrete Block Masonry Units (CMU): Specified in Section 04 20 00.

2.2 Concrete Brick Units

- .1 Concrete Brick Masonry Units: Specified in Section 04 20 00.

2.3 Clay Brick Units

- .1 Hollow Clay Brick: Specified in Section 04 20 00.

2.4 Mortar And Grout

- .1 Mortar and Grout: Type as specified in Section 04 05 10.

2.5 Flashings

- .1 Flexible Flashings: Sheet rubberized asphalt with polyethylene facing
- .2 Cap Flashings: As specified in Section 07 46 16.
- .3 Lap Sealant: as specified in Section 07 92 00.

2.6 Accessories

- .1 Building Paper: No. 15 asphalt saturated felt.
- .2 Weeps: Preformed plastic vents with sloping louvers.
- .3 Mortar Collection Mesh: Nylon open mesh.
- .4 Bond Breaker: Sheet plastic.
- .5 Back Coating: Bituminous.
- .6 Setting Shims: Plastic type.
- .7 Spacers: Inorganic.
- .8 Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

Part 3 Execution

3.1 Examination

- .1 Verify that field conditions are acceptable and are ready to receive work.
- .2 Verify items provided by other sections of work are properly sized and located.

- .3 Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 Preparation

- .1 Direct and coordinate placement of metal anchors supplied to other sections.
- .2 Provide temporary bracing during installation of masonry work to CAN/CSA-A371. Maintain in place until building structure provides permanent bracing.
- .3 Establish lines, levels, and coursing; protect from disturbance.
- .4 Verify that items built-in under other sections are properly located and sized.
- .5 Clean as required prior to erection.
- .6 Do not use wire brushes or implements which will mark or damage exposed surfaces.

3.3 Coursing

- .1 Refer to Drawings.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Lay out coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum cutting.
- .4 Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- .5 Concrete Masonry Units:
 - .1 Refer to Drawings.
- .6 Brick Units:
 - .1 Refer to Drawings.
- .7 Mortar Joints: Concave

3.4 Placing And Bonding

- .1 Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- .2 Lay hollow masonry units with face shell bedding on head and bed joints.
- .3 Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
- .4 Remove excess mortar as Work progresses.
- .5 Interlock intersections and external corners.
- .6 Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- .7 Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- .8 To accommodate pointing mortar, rake out joints 19 mm (3/4 inch). Brush mortar joints clean.
 - .1 Fill joints with pointing mortar. Pack and work into voids.
 - .2 Neatly tool surface to concave joint.
- .9 Rake out joints to accommodate sealant and backing rod, bond breaker. Brush mortar joints clean.
- .10 10 Install sealant and backing rod, bond breaker at joints.

3.5 Provision For Movement

- .1 Leave space between top of non-loadbearing wall and structural elements. Do not use wedges.

3.6 Weeps

- .1 Install weeps in veneer at 600 mm (24 inches) on centre horizontally above shelf angles and lintels at bottom of walls.
- .2 Install cavity vents at top of each cavity space at spacing of 600 mm (24 inches) on centre, horizontally.

3.7 Cavity Behind Veneer

- .1 Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.

- .2 Install mortar dropping collection mesh to manufacturer's written instructions.

3.8 Reinforcement And Anchorage

- .1 Install anchors and ties to CAN/CSA-A370 and CAN/CSA-A371.
- .2 Space wall ties anchors at 400mm horizontally based on stud location, and 600mm vertically, with additional anchors above and below openings, and at the top of veneer masonry walls, as required.
- .3 Increase quantity of wall ties around perimeter of openings, at wall terminations and corners placed within 200 mm (8 inches) of openings and edges of masonry.
- .4 Materials - Anchorage:
 - .1 Blok-Lok; Stainless Steel, sized for application - refer to Drawings.
 - .2 Approved equivalent.

3.9 Masonry Flashings

- .1 Extend flashings horizontally above ledge or shelf angles and lintels at foundation walls under parapet caps at bottom of walls.
- .2 Turn flashing up minimum 200 mm (8 inches).
- .3 Lap end joints minimum 150 mm (6 inches) and seal watertight.
- .4 Turn flashing, fold, and seal at corners, bends, and interruptions.

3.10 Lintels

- .1 Refer to Drawings.
- .2 Install loose steel centred over openings.

3.11 Movement Joints

- .1 Provide continuous control joints as required.
- .2 Do not continue horizontal joint reinforcement through control joints.
- .3 Break vertical mortar bond with sheet building paper fitted to one (1) side of hollow contour end of block unit. Fill resultant elliptical core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- .4 Install preformed control joint device in continuous lengths. Seal butt and corner joints to manufacturer's written instructions.
- .5 Size control joint as specified in Section 07 92 00 for sealant performance.
- .6 Form expansion joint as detailed.

3.12 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Tolerances for unit masonry as recommended in CAN/CSA-A371.
- .3 Vertical Alignment: Maximum deviation from plumb 19 mm (3/4 inch) over height of building for walls and columns, edges and corners, movement joints, and head joints.
- .4 Lateral Alignment: Maximum deviation from gridline, 13 mm (1/2 inch) for constructed unit masonry surfaces of walls and columns.
- .5 Level Alignment: Maximum deviation for exposed horizontal surfaces, bed joints and bearing surfaces 13 mm (1/2 inch); unexposed horizontal surfaces 25 mm (1 inch).
- .6 Relative Alignment: Maximum deviation 6 mm in 3 m (1/4 inch in 10 ft).

3.13 Cutting And Fitting

- .1 Cut neatly for electrical switches, outlet boxes and other recessed or built-in objects. Coordinate with other sections of work to provide correct size, shape, and location.
- .2 Make cuts straight, clean and free of uneven edges.
- .3 Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 Field Quality Control

- .1 Section 01 45 00: Field inspection testing.
- .2 Test, Inspect all masonry work.

3.15 Cleaning

- .1 Section 01 74 00: Cleaning installed work.
- .2 Remove excess mortar and mortar smears.
- .3 Replace defective mortar. Match adjacent work.
- .4 Clean soiled surfaces with cleaning solution.
- .5 Use non-metallic tools in cleaning operations.

3.16 Protection Of Finished Work

- .1 Section 01 78 40: Protecting installed work.
- .2 Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

End of Section

Part 1 General

1.1 Section Includes

- .1 Common work results for reinforced unit masonry construction.
- .2 Miscellaneous masonry flashing and accessories.

1.2 Related Requirements

- .1 Section 04 05 10 - Mortar and Masonry Grout: Mortar and grout.
- .2 Section 04 05 19 - Masonry Anchorage and Reinforcement: Connectors and reinforcing.
- .3 Section 04 20 00 - Masonry Units: Unit masonry materials.
- .4 Section 07 27 00 - Air Barriers: Air barrier placed on interior face of wall insulation.
- .5 Section 07 62 00 - Sheet Metal Flashing and Trim: Cap flashings over masonry work and placement of reglets for flashings.
- .6 Section 07 84 00 - Firestopping: Firestopping at penetrations of masonry work.
- .7 Section 07 92 00 - Joint Sealants.

1.3 Reference Standards

- .1 ASTM A167-99(2009) (Withdrawn) - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM B370-12(R2019) - Standard Specification for Copper Sheet and Strip for Building Construction.
- .4 ASTM C1330-18 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- .5 CAN/CSA-A370-14 (R2018) - Connectors for Masonry.
- .6 CAN/CSA-A371-14 (R2019) - Masonry Construction for Buildings.
- .7 CSA-S304-14 (R2019) - Design of Masonry Structures.
- .8 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data for giant brick masonry units and fabricated wire reinforcement.
- .3 Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement and accessories.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Design Data: Indicate required mortar strength, masonry unit assembly strength in all planes, supportive test data.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.

- .2 Perform Work to CAN/CSA-A371, CSA-S304. Maintain one (1) copy of document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.9 Delivery, Storage, And Handling

- .1 Section 01 61 00: Deliver, store, protect and handle products to site.
- .2 Package and protect masonry units to arrive undamaged at the job site.
- .3 Store masonry under waterproof cover on pallets or plank platforms held off ground.

1.10 Site Conditions

- .1 Section 01 35 43: Environmental procedures.
- .2 Maintain materials and surrounding air temperature to minimum 10 degrees C (50 degrees F) prior to, during, and forty-eight (48) hours after completion of masonry work.
- .3 Cold and Hot Weather Requirements: CAN/CSA-A371.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for requirements for fire rated masonry construction.

2.2 Performance / Design Criteria

- .1 Fire Resistance Rating: 45 minute FRR.

2.3 Concrete Block Masonry Units

- .1 Concrete Block Units (CMU): Specified in Section 04 20 00.

2.4 Reinforcement And Anchorage

- .1 Joint Reinforcement: As Specified in Section 04 05 19.
- .2 Bar Reinforcing Steel: As Specified in Section 04 05 19.
- .3 Rod Anchors: As Specified in Section 04 05 19.

2.5 Mortar And Grout

- .1 Mortar and Grout: Type as specified in Section 04 05 10.

2.6 Accessories

- .1 Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

Part 3 Execution

3.1 Examination

- .1 Verify that field conditions are acceptable and are ready to receive work.
- .2 Verify items provided by other sections of work are properly sized and located.
- .3 Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 Preparation

- .1 Direct and coordinate placement of metal anchors supplied to other Sections.
- .2 Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- .3 Verify that items built-in under other sections are properly located and sized.

3.3 Coursing

- .1 Refer to Drawings.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Establish lines, levels, and coursing indicated. Protect from displacement.
- .4 Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

3.4 Placing And Bonding

- .1 Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- .2 Lay hollow masonry units with face shell bedding on head and bed joints.
- .3 Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
- .4 Remove excess mortar as work progresses.
- .5 Interlock intersections and external corners.
- .6 Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- .7 Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- .8 Cut mortar joints flush where AVB is to be applied.

3.5 Reinforcement And Anchorage

- .1 Refer to Drawings.
- .2 Install masonry connectors and reinforcement as indicated on the structural drawings to CAN/CSA-A370, CAN/CSA-A371 and CSA-S304.1.
- .3 Place joint reinforcement as indicated on the structural drawings.
- .4 For stack bond joint install joint and corner reinforcing at every course.
- .5 Lap joint reinforcement ends minimum 150 mm (6 inches).
- .6 Reinforce and grout masonry units and bond beams to CAN/CSA-A371.
- .7 Install vertical reinforcing steel with a minimum clearance of 13 mm from the masonry and not less than one bar diameter between bars.
- .8 Secure reinforcing steel in place. Inspect steel connections before grouting.
- .9 Provide cleanout openings at bottom of cores containing reinforcement.
- .10 Fill cells containing reinforcement and anchor bolts solidly with grout.

3.6 Lintels

- .1 Refer to Drawings.
- .2 Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled, to CAN/CSA-A371.
- .3 Maintain minimum 200 mm bearing on each side of opening.

3.7 Lateral Support And Anchorage

- .1 Install lateral support and anchorage as indicated.

3.8 Support Of Loads

- .1 Grout as indicated on the drawings.
- .2 Use grout to CAN/CSA-A179 where grout is used in lieu of solid units.
- .3 Use type N concrete where concrete is used in lieu of solid units.
- .4 Install building paper below voids to be filled with grout; keep paper 25 mm back from face of units.

3.9 Built-in Work

- .1 As work progresses, install built-in plates, metal door frames, wood nailing strips and other items to be built-in the work and furnished by other sections.
- .2 Install built-in items plumb and level.
- .3 Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 300 mm (12 inches) from framed openings.
- .4 Do not build in organic materials subject to deterioration.

3.10 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Tolerances for unit masonry as recommended in CAN/CSA-A371.
- .3 Vertical Alignment: Maximum deviation from plumb, 19 mm (3/4 inch) over height of building for walls and columns, edges and corners, movement joints, and head joints.
- .4 Lateral Alignment: Maximum deviation from gridline, 13 mm (1/2 inch) for constructed unit masonry surfaces of walls and columns.
- .5 Level Alignment: Maximum deviation for exposed horizontal surfaces, bed joints and bearing surfaces 13 mm (1/2 inch); unexposed horizontal surfaces 25 mm (1 inch).
- .6 Relative Alignment: Maximum deviation 6 mm in 3 m (1/4 inch in 10 ft).

3.11 Cutting And Fitting

- .1 Cut neatly for electrical switches, outlet boxes and other recessed or built-in objects. Coordinate with other sections of work to provide correct size, shape, and location.
- .2 Make cuts straight, clean and free of uneven edges.
- .3 Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 Parging

- .1 Parging mortar: Specified in Section 04 05 05.
- .2 Dampen masonry walls prior to parging.
- .3 Scarify each parging coat to ensure full bond to subsequent coat.
- .4 Parge masonry walls in two (2) uniform coats of mortar to a total thickness of 19 mm (3/4 inch).
- .5 Steel trowel surface smooth and flat with a maximum surface variation of 1 mm per m (1/8 inch per ft).
- .6 Strike top edge of parging at 45 degrees.

3.13 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Inspect, test all engineered masonry work.
 - .3 Inspect, test parging work.

3.14 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Remove excess mortar and mortar smears as work progresses.
- .3 Replace defective mortar. Match adjacent work.
- .4 Clean soiled surfaces with cleaning solution.
- .5 Use non-metallic tools in cleaning operations.

3.15 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

End of Section

Part 1 General

1.1 Section Includes

- .1 Structural steel framing members, support members.
- .2 Base plates.
- .3 Grouting under base plates.

1.2 Related Requirements

- .1 Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.
- .2 Section 09 91 00 - Painting.
- .3 Section 13 34 23 - Fabricated Structures.

1.3 Definitions

- .1 Delegated Design Professional: The specialist or supporting design professional contracted to the contractor, fabricator or manufacturer to design and/or review specific building components or sub-components, and provide Shop Drawings and Delegated Design Submittals to meet the requirements of authorities having jurisdiction.

1.4 Reference Standards

- .1 AISC 303-16 - Code of Standard Practice for Steel Buildings and Bridges.
- .2 ASTM A36/A36M-19 - Standard Specification for Carbon Structural Steel.
- .3 ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .4 ASTM A108-18 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- .5 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .6 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .7 ASTM A242/A242M-13(R2018) - Standard Specification for High-Strength Low-Alloy Structural Steel.
- .8 ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .9 ASTM F3125/F3125M-19 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .10 ASTM A449-14 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
- .11 ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .12 ASTM A501/A501M-14 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- .13 ASTM A514/A514M-18e1 - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
- .14 ASTM A529/A529M-19 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
- .15 ASTM A563-15 - Standard Specification for Carbon and Alloy Steel Nuts.
- .16 ASTM A568/A568M-19a - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
- .17 ASTM A572/A572M-18 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- .18 AWS A2.1-DC - Welding Symbols Chart - Desk Chart.
- .19 AWS D1.1/D1.1M-2015 - Structural Welding Code - Steel.

- .20 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .21 CSA-S16-19 - Design of Steel Structures.
- .22 CISC - Handbook of Steel Construction, Eleventh Edition (2017).
- .23 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .24 CSA-W48-18 - Filler Metals and Allied Materials for Metal Arc Welding.
- .25 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .26 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .27 FM (Factory Mutual) - Roof Assembly Classifications.
- .28 ITS (Intertek Testing Services).
- .29 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .30 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.
- .31 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Indicate openings, fasteners, spacing, locations of structural members, profiles attachments, and sizes.
 - .2 Connections.
 - .3 Cambers and loads.
 - .4 Indicate welded connections with AWS A2.1-DC welding symbols. Indicate net weld lengths.
 - .5 Provide Shop Drawings stamped and signed by the delegated design professional.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.
- .3 Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Fabricate structural steel members to CISC Code of Standard Practice, and CSA-W59.
- .3 Perform Work to AISC Section 10. Maintain one (1) copy of document on site.
- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .5 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.
- .6 Delegated Design Professional Qualifications: Professional Structural Engineer experienced in design of this Work and licensed in the province where the project is located.
- .7 Welders' Certificates: Submit to Section 01 33 00, certifying welders employed on the Work, verifying qualification within the previous twelve (12 months) to CSA-W55.3 CSA-W59 CSA-W47.1.
- .8 Design connection not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Ontario.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Delegated Design: Design structural steel components and connections by a licensed design professional using performance and design criteria as indicated.
- .2 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.

2.2 Materials

- .1 Structural Steel Members: CSA-G40.20/G40.21, Grade 350W unless otherwise noted.
- .2 Pipe: ASTM A53/A53M, Grade B.
- .3 Bolts, Nuts, and Washers: ASTM A325M unless noted otherwise.
- .4 Anchor Bolts: ASTM A307.
- .5 Welding Materials: Type required for materials being welded.
- .6 Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 48 MPa (7000 psi) at 28 days.
- .7 Shop and Touch-Up Primer: Manufacturer's standard, complying with SSPC-Paint 15, and compatible with topcoat.
- .8 Primer: As specified in Section 09 91 00.
- .9 Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic zinc-rich primer.

2.3 Fabrication

- .1 Fabricate structural steel to CSA-S16 and in accordance with reviewed Shop Drawings.
- .2 Continuously seal joined members by continuous welds. Grind exposed welds smooth.
- .3 Fabricate connections for bolt, nut, and washer connectors.
- .4 Develop required camber for members.

2.4 Finish

- .1 Clean, prepare surfaces, and shop prime structural members to CSA-S16, except as noted below.
- .2 Prepare structural component surfaces to SSPC-SP6.
- .3 Shop prime structural steel members. Do not prime surfaces that will be fireproofed, in contact with concrete, field welded or high strength bolted.
- .4 Leave structural steel members un-primed.
- .5 Hot-dip galvanized to ASTM A123/123M and CSA G164.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.

3.2 Erection

- .1 Erect structural members to CSA-S16.
- .2 Perform welding: CSA-W59.
- .3 Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- .4 Field weld components indicated on Shop Drawings.
- .5 Field connect members with threaded fasteners; torque to required resistance.
- .6 Do not field cut or alter structural members without approval of Consultant.
- .7 After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

- .8 Grout under base plates as specified in Section 04 05 10. Trowel grouted surface smooth, splay neatly to 45 degrees.
- .9 Field Painting - Touch-Up:
 - .1 Paint to requirements of Section 09 91 00.
 - .2 Touch up all damaged surfaces and exposed surfaces without shop coat, with primer.

3.3 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Offset From True Alignment: 6 mm.

3.4 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing of bolt torquing, welds torquing of fasteners.

End of Section

Part 1 General

1.1 Section Includes

- .1 Steel roof deck and accessories.
- .2 Bearing plates and angles.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-place Concrete: Concrete topping over metal roof deck.
- .2 Section 03 52 16 - Lightweight Insulating Concrete.
- .3 Section 05 12 00 - Structural Steel: Support framing for openings larger than 450 mm (18 inches).
- .4 Section 03 30 00 – Cast-In-Place Concrete: Placement of anchors for bearing plates/ angles cast in concrete.
- .5 Section 04 29 00 - Reinforced Unit Masonry: Placement of anchors for bearing plates/ angles embedded in masonry.
- .6 Section 07 52 00 - SBS APP Modified Bitumen Membrane – Conventional: Placement of acoustic deck insulation strips.

1.3 Definitions

- .1 Delegated Design Professional: The specialist or supporting design professional contracted to the contractor, fabricator or manufacturer to design and/or review specific building components or sub-components, and provide Shop Drawings and Delegated Design Submittals to meet the requirements of authorities having jurisdiction.

1.4 Reference Standards

- .1 ASTM A36/A36M-19 - Standard Specification for Carbon Structural Steel.
- .2 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 AWS D1.1/D1.1M-2015 - Structural Welding Code - Steel.
- .4 CSA-S136-16 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- .5 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .6 CSA-W48-18 - Filler Metals and Allied Materials for Metal Arc Welding.
- .7 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .8 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .9 CSSBI 12M-17 - Standard for Composite Steel Deck.
- .10 CSSBI - Design in Cold Formed Steel.
- .11 FM (Factory Mutual) - Roof Assembly Classifications.
- .12 ITS (Intertek Testing Services).
- .13 SDI (Steel Deck Institute) - Design Manual for Composite Decks, Form Decks and Roof Decks, No. 31.
- .14 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.
- .15 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide deck profile characteristics and dimensions, structural properties and finishes.
- .3 Shop Drawings:
 - .1 Indicate deck layout, spans, anchorage, support locations, openings, etc..
 - .2 Provide Shop Drawings stamped and signed by the delegated design professional.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Certificates: Certify that Products meet or exceed specified requirements.
- .3 Installation Data: Manufacturer's special installation requirements.
- .4 Delegated Design Submittals:
 - .1 Submit documentation indicating compliance to design criteria, signed and sealed by the delegated design professional responsible for their preparation.
 - .1 Design Data: Include material data, calculations and details.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Conform to CSA-S136.
- .3 Conform to CSSBI - Design in Cold Formed Steel..
- .4 Welders' Certificates: Submit to Section 01 33 00, certifying welders employed on the Work, verifying qualification within the previous twelve (12) months to CSA-W59.
- .5 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.
- .6 Delegated Design Professional Qualifications: Professional Structural Engineer experienced in design of this Work and licensed in the province where the project is located.

1.9 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Cut plastic wrap to encourage ventilation.
- .3 Store deck on dry wood sleepers; slope for positive drainage.

Part 2 Products

2.1 Manufacturers

- .1 Canam; Product: P-3606/P3615, 1 1/2" deep x 36" width.
- .2 Other acceptable manufacturers offering functionally and aesthetically equivalent products.

2.2 Performance / Design Criteria

- .1 Refer to Drawings.
- .2 Delegated Design: Design roof decking and connections by a licensed design professional using performance and design criteria as indicated.
- .3 Design metal roof deck to CSA-S136.
- .4 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.

2.3 Materials

- .1 Sheet Steel: ASTM A653/A653M, Structural Quality; with G90 galvanized coating.
- .2 Welding Materials: Type required for materials being welded.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.

3.2 Installation

- .1 Refer to Drawings.
- .2 Erect metal deck to manufacturer's written instructions.
- .3 Seal deck joints, laps, ends, and penetrations with sealant to achieve permanent air seal consistent with the air barrier system specified in Section 07 27 00.
- .4 Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

End of Section

Part 1 General

1.1 Section Includes

- .1 Wind/suction bearing formed steel stud for exterior wall assembly framing.
- .2 Formed steel slotted channel, purlin, truss, joist framing and bridging.

1.2 Related Requirements

- .1 Section 04 26 13 - Masonry Veneer: Veneer masonry supported by wall stud metal framing.
- .2 Section 05 12 00 - Structural Steel: Structural building framing.
- .3 Section 06 10 13 - Wood Blocking and Curbing: Rough wood blocking.
- .4 Section 06 10 00 - Rough Carpentry: Rough wood blocking.
- .5 Section 07 21 16 - Blanket Insulation: Insulation within framing members.
- .6 Section 07 26 00 - Vapour Retarders.
- .7 Section 07 27 00 - Air Barriers.
- .8 Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings.
- .9 Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.
- .10 Section 09 22 16 - Non-structural Metal Stud Framing: Lightweight, non-load bearing metal stud framing.

1.3 Reference Standards

- .1 AWS D1.3/D1.3M-2018 - Structural Welding Code - Sheet Steel.
- .2 ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .3 ASTM A325M-13 - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength.
- .4 ASTM A325-10e1 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .5 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .6 ASTM A792/A792M-10(2015) - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .7 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.
- .8 ASTM C955-11c - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- .9 CSA-S16-19 - Design of Steel Structures.
- .10 CSA-S136-16 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- .11 CAN/ULC-S101-14 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .12 CAN/CSA-A370-14 (R2018) - Connectors for Masonry.
- .13 CAN/CSA-A371-14 (R2019) - Masonry Construction for Buildings.
- .14 CSA-S304-14 (R2019) - Design of Masonry Structures.
- .15 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .16 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .17 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .18 CSSBI 51-06 - Lightweight Steel Framing Design Manual - 2nd Edition.
- .19 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.

.20 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the placement of components within the stud framing assembly.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on standard framing members; describe materials and finish, product criteria, and limitations.
- .3 Shop Drawings:
 - .1 Indicate component details, type and location of fasteners loading bearing framed openings anchorage welds and accessories or items required of related work.
 - .2 Indicate stud layout.
 - .3 Describe method for securing studs to tracks and for welded framing connections.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements including special procedures, perimeter conditions requiring special attention.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Provide mock-up of exterior framed wall including window frame interior and exterior finish specified in other sections insulation sheathing. Coordinate with installation of associated work of applicable Sections: 09 21 16, 07 27 00, 09 22 16, 09 22 13, 09 21 20, 07 26 00, 09 21 40.
- .3 Locate where directed by Consultant.
- .4 Approved mock-up may remain as part of the Work.

Part 2 Products

2.1 Manufacturers

- .1 Bailey Metal Products; Product: 362 S162-54 (Fy 345MPa) studs min.
- .2 Bailey Metal Products; Product: Bailey Platinum Plus, 6" or 3 5/8" as specified on Drawings.
- .3 Substitutions: Refer to Section 01 25 00.

2.2 Performance / Design Criteria

- .1 Maximum Allowable Deflection: 1:600 of span.
- .2 Wall Assembly:
 - .1 Refer to Drawings.
 - .2 Design to CSA-S136.
 - .3 Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - .4 Design assembly to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

- .3 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with code applicable at place of the Work.
- .4 Design stud system supporting masonry veneer to requirements of CSA-S304, with veneer deflections limited to L/600.
- .5 Conform to requirements of fire rated assemblies tested to CAN/ULC-S101, with a fire resistance rating of as indicated on Drawings.

2.3 Framing Materials

- .1 Framing Materials: Materials: Cold-rolled steel conforming to CSA-S136.
 - .1 Studs: formed to channel shape, punched web, knurled faces; 1.2 mm (18 gauge) thick.
 - .2 Track: Formed cold-rolled steel; channel shaped; same width as studs, tight fit; solid web.

2.4 Accessories

- .1 Bracing, Furring, Bridging: Formed sheet steel, thickness as determined by performance requirements specified.
- .2 Plates, Gussets, Clips: Formed sheet steel, thickness as determined by performance requirements specified.
- .3 Welding Materials: CSA-W59.
- .4 Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, organic zinc-rich.

2.5 Fasteners

- .1 Bolts, Nuts and Washers: ASTM A307, A325M (ASTM A325), hot-dip galvanized to minimum requirements of CSSBI.
- .2 Self-drilling, Self-tapping Screws: Steel, hot dip galvanized to minimum requirements of CSSBI.
- .3 Anchorage Devices: Drilled expansion bolts; hot-dip galvanized to minimum requirements of CSSBI.

2.6 Fabrication

- .1 Fabricate assemblies of formed sections of sizes and profiles required.
- .2 Provide cutouts centred in webs of members to accommodate services and through-the knockout style bridging.
- .3 Fit, reinforce, and brace framing members to suit design requirements.
- .4 Fit and assemble in largest practical sections for delivery to site, ready for installation.
- .5 Do welding as applicable.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that building framing components, substrate surfaces are ready to receive work.
- .3 Verify that rough-in utilities are in proper location.

3.2 Erection Of Stud Work

- .1 Refer to Drawings.
- .2 Install components to manufacturer's written instructions.
- .3 Align floor and ceiling tracks; locate to partition wall layout. Secure in place at maximum 600 mm (24 inches) on centre. Coordinate installation of acoustic sealant with floor ceiling tracks.
- .4 Place studs at 600 mm (24 inches) on centre; not more than 50 mm (2 inches) from abutting walls and at each side of openings. Connect studs to tracks using welding clip and tie, fastener method.
- .5 Construct corners using minimum three studs. Double stud wall openings, door jambs, and window jambs.
- .6 Erect load bearing studs one piece full length. Splicing of studs is not permitted.
- .7 Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.

- .8 Coordinate placement of insulation in multiple stud spaces after erection.
- .9 Install intermediate studs above and below openings to align with wall stud spacing.
- .10 Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- .11 Attach cross studs, furring channels to studs for attachment of fixtures anchored to walls.
- .12 Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- .13 Touch-up field welds and damaged primed galvanized surfaces with primer.
- .14 Complete framing ready to receive other trades.

3.3 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation from True Position: 1/4" or as per manufacturer's tolerances.
- .3 Maximum Variation of any Member from Plane: per manufacturer.

End of Section

Part 1 General

1.1 Section Includes

- .1 Shop fabricated miscellaneous metal items.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-place Concrete: Placement of metal fabrications in concrete.
- .2 Section 05 12 00 - Structural Steel: Structural steel column anchor bolts.
- .3 Section 05 21 00 - Steel Joist Framing: Structural joist bearing plates, including anchorage.
- .4 Section 05 31 23 - Steel Roof Deck: Bearing plates, angles for metal deck bearing, including anchorage.
- .5 Section 05 51 00 - Metal Stairs.
- .6 Section 05 52 00 - Metal Railings.
- .7 Section 09 91 00 - Painting: Paint finish.
- .8 Section 10 21 13 - Plastic toilet compartments.

1.3 Reference Standards

- .1 AAMA 2603-17a - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels..
- .2 AAMA 2604-17a - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
- .3 AAMA 2605-17a - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- .4 ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .5 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .6 ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .7 ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .8 ASTM A501/A501M-14 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- .9 ASTM B177/B177M-11(2017) - Standard Guide for Engineering Chromium Electroplating.
- .10 ASTM B209M-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .11 ASTM B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .12 ASTM B210/B210M-19a - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- .13 ASTM B210/B210M-19a - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- .14 ASTM B211/B211M-19 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
- .15 ASTM B211/B211M-19 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
- .16 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .17 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .18 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .19 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .20 CSA-W47.2-11 (R2015) - Certification of Companies for Fusion Welding of Aluminum.

- .21 CSA-W48-18 - Filler Metals and Allied Materials for Metal Arc Welding.
- .22 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .23 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .24 CSA-W59.2-18 - Welded Aluminum Construction.
- .25 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .26 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - .2 Indicate welded connections using standard welding symbols. Indicate net weld lengths.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.6 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Welders' Certificates: Submit to Section 01 33 00 requirements, certifying welders employed on the Work, verifying qualification within the previous twelve (12) months to CSA-W47.1 (steel) CSA-W47.2 (aluminum) CSA-W55.3.
- .3 Welded Steel Construction: CSA-W59.
- .4 Welded Aluminum Construction: CSA-W59.2.
- .5 Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

Part 2 Products

2.1 Materials - Steel

- .1 Steel Sections and Plates: CSA-G40.20/G40.21, Grade 350W.
- .2 Steel Pipe: ASTM A53/A53M, schedule 40, standard weight.
- .3 Steel Tubing: CSA-G40.20/G40.21 Grade 350W.
- .4 Bolts, Nuts, and Washers: ASTM A307, galvanized to ASTM A153/A153M for galvanized components.
- .5 Welding Materials: Type required for materials being welded.
- .6 Welding Filler Material: CSA-W48.
- .7 Shop and Touch-Up Primer: SPCC-Paint 15.
- .8 Primer: As specified in Section 09 91 00.
- .9 Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic zinc-rich primer.

2.2 Fabrication

- .1 Fit and shop assemble items in largest practical sections, for delivery to site.
- .2 Fabricate items with joints tightly fitted and secured.
- .3 Continuously seal joined members by continuous welds.
- .4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

- .5 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .6 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 Fabrication Tolerances

- .1 Squareness: 3 mm (1/8 inch) maximum difference in diagonal measurements.
- .2 Maximum Offset Between Faces: 1.6 mm (1/16 inch).
- .3 Maximum Misalignment of Adjacent Members: 1.6 mm (1/16 inch).
- .4 Maximum Bow: 3 mm in 1.2 m (1/8 inch in 4 ft).
- .5 Maximum Deviation From Plane: 1.6 mm in 1.2 m (1/16 inch in 4 ft).

2.4 Finishes - Steel

- .1 Prepare surfaces to be primed in accordance with SPCC SP 6.
- .2 Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- .3 Do not prime surfaces in direct contact with concrete or where field welding is required.
- .4 Prime paint items with one (1) coat.
- .5 Structural Steel Members: Galvanize after fabrication appropriate grade for type and size of steel material indicated, with zinc coating thickness ASTM A123/A123M.
- .6 Non-structural Items: Galvanized after fabrication to appropriate grade for type and size of steel material indicated, with zinc coating thickness ASTM A123/A123M.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that field conditions are acceptable and are ready to receive work.
- .3 Verify dimensions, tolerances, and method of attachment with other work.

3.2 Preparation

- .1 Clean and strip primed steel items to bare metal where site welding is required.
- .2 Supply steel items required to be cast into concrete embedded in masonry with setting templates to appropriate sections.

3.3 Installation

- .1 Install items plumb and level, accurately fitted, free from distortion or defects.
- .2 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- .3 Field weld components indicated on Shop Drawings.
- .4 Perform field welding to CSA requirements.
- .5 Obtain approval prior to site cutting or making adjustments not scheduled.
- .6 After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation From Plumb: 6 mm (1/4 inch) per story, non-cumulative.
- .3 Maximum Offset From True Alignment: 6 mm (1/4 inch).
- .4 Maximum Out-of-Position: 6 mm (1/4 inch).

End of Section

Part 1 General

1.1 Section Includes

- .1 Steel stair frame of structural sections, with closed risers.
- .2 Pan to receive concrete fill.
- .3 Integral balusters and handrailing.
- .4 Handrailing on walls.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-place Concrete: Concrete fill in stair pans, landings, mesh reinforcement for landings.
- .2 Section 05 12 00 - Structural Steel 05 50 00 - Metal Fabrications:
 - .1 Bearing plates angles for metal stairs, including anchorage.
 - .2 Placement of metal anchors in concrete.
- .3 Section 05 52 00 - Metal Railings: Handrails and balusters other than specified in this section.
- .4 Section 06 20 00 - Finish Carpentry: Wood handrail.
- .5 Section 09 67 23 - Resinous Flooring: epoxy finish.
- .6 Section 09 91 00 - Painting: Paint finish.

1.3 Reference Standards

- .1 ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .5 ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .6 ASTM A501/A501M-14 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- .7 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .8 ASTM A666-15 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- .9 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .10 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .11 AWS D1.6/D1.6M-2017 - Structural Welding Code - Stainless Steel.
- .12 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .13 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .14 CSA-W47.2-11 (R2015) - Certification of Companies for Fusion Welding of Aluminum.
- .15 CSA-W48-18 - Filler Metals and Allied Materials for Metal Arc Welding.
- .16 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .17 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .18 CSA-W59.2-18 - Welded Aluminum Construction.

- .19 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .20 NAAMM AMP 510-92 - Metal Stairs Manual.
- .21 NAAMM MBG 531-09 - Metal Bar Grating Manual.
- .22 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Provide Shop Drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - .2 Indicate welded connections using standard welding symbols. Indicate net weld lengths.
 - .3 Provide Shop Drawings stamped and signed by the delegated design professional.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Delegated Design Submittals:
 - .1 Submit documentation indicating compliance to design criteria, signed and sealed by the delegated design professional responsible for their preparation.
 - .1 Design Data: Include material data, calculations and details.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work in accordance with requirements of Ontario Building Code.
- .3 Welders' Certificates: Submit to Section 01 33 00, certifying welders employed on the Work, verifying qualification within the previous twelve (12) months to CSA-W47.1, CSA-W47.2, CSA-W55.3, AWS D1.3.D1.3M.
- .4 Delegated Design Professional Qualifications: Professional Structural Engineer experienced in design of this Work and licensed in the province where the project is located.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Delegated Design: Design stairs and connections by a licensed design professional using performance and design criteria as indicated.
- .2 Fabricate stair assembly to support a uniform live load of 4.8 kPa (100 lb/sq ft) and a concentrated load of 15 kPa (300 lb/sq ft) with deflection of stringer or landing framing not to exceed 1/240 of span.
- .3 Railing assembly, wall rails, and attachments to resist lateral forces in accordance with the Ontario Building Code.
- .4 Fabricate stair assembly to NAAMM AMP 510, Class Industrial.
- .5 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.

2.2 Materials

- .1 Refer to Drawings.
- .2 Steel Sections and Plates: CSA-G40.20/G40.21, Grade 350W.
- .3 Tread and Landing Concrete Reinforcement: Mesh type as detailed, galvanized.
- .4 Bolts, Nuts and Washers: ASTM A307, hot dip galvanized.

- .5 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.
- .6 Welding Materials: Type required for materials being welded.
- .7 Shop and Touch-Up Primer: SSPC-Paint 25, zinc oxide alkyd primer.
- .8 Touch-Up Primer for Galvanized Surfaces: SPCC-Paint 20, Type I inorganic zinc rich primer.

2.3 Components

- .1 Refer to Drawings.
- .2 Landings: Concrete in metal pan; smooth surface; non-slip edge.
- .3 Shop Cast Concrete Treads: as detailed, smooth finish.
- .4 Concrete: Type specified in Section 03 30 00.

2.4 Fabrication - General

- .1 Fit and shop assemble components in largest practical sections, for delivery to site.
- .2 Fabricate components with joints tightly fitted and secured.
- .3 Continuously seal joined pieces by intermittent welds and plastic filler.
- .4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- .5 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .6 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- .7 Accurately form components required for anchorage of stairs landings, railings to each other and to building structure.
- .8 Install continuous plastic handrail cover. Heat weld joints and trim smooth.

2.5 Fabrication - Pan Stairs [and Landings]

- .1 Fabricate landings and stairs with closed risers and treads of metal pan construction, ready to receive concrete.
- .2 Form treads, risers with sheet steel stock.
- .3 Secure reinforced tread pans to stringers with clip angles; welded in place.
- .4 Form stringers with rolled steel channels, 300 mm (12 inches) deep.
- .5 Form landings with metal deck.
- .6 Form steel railings with square steel sections, welded to stringers.
- .7 Prime and paint components.

2.6 Finishes

- .1 Prepare surfaces to be primed in accordance with SP 2.
- .2 Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- .3 Do not prime surfaces in direct contact with concrete or where field welding is required.
- .4 Prime paint items with two (2) coats.
- .5 Galvanized to ASTM A123/A123M, zinc coating thickness appropriate grade for type and size of steel material indicated.
- .6 Shop paint in accordance with Section 09 91 10 with field touch-up as required.
- .7 Apply slip resistant coating as per Section 09 67 23.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.

- .2 Verify that field conditions are acceptable and are ready to receive work.

3.2 Preparation

- .1 Clean and strip primed steel items to bare metal where site welding is required.
- .2 Supply items required to be cast into concrete embedded in masonry with setting templates.

3.3 Installation

- .1 Install components plumb and level, accurately fitted, free from distortion or defects to manufacturer's written instructions.
- .2 Provide anchors, hangers, and plates required for connecting stairs to structure.
- .3 Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- .4 Field weld components indicated on Shop Drawings. Perform field welding in accordance with CSA-W59.
- .5 Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- .6 Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- .7 Obtain approval prior to site cutting or creating adjustments not scheduled.
- .8 After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation From Plumb: 6 mm (1/4 inch) per storey, non-cumulative.
- .3 Maximum Offset From True Alignment: 6 mm (1/4 inch).

End of Section

Part 1 General

1.1 Section Includes

- .1 Handrails, balusters, and fittings.
- .2 Plastic covered handrails.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-place Concrete: Placement of anchors in concrete.
- .2 Section 05 50 00 – Metal Fabrications: Attachment angles plates for metal stairs, including anchorage.
- .3 Section 05 51 00 - Metal Stairs: Handrails other than those specified in this section.
- .4 Section 06 20 00 - Finish Carpentry: Wood handrail.
- .5 Section 08 80 00 - Glass and Glazing: Baluster infill.
- .6 Section 09 91 00 - Painting: Paint finish.

1.3 Reference Standards

- .1 ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A269/A269-15a(R2019) - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .4 ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .5 ASTM A501/A501M-14 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- .6 ASTM B177/B177M-11(2017) - Standard Guide for Engineering Chromium Electroplating.
- .7 ASTM B211/B211M-19 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
- .8 ASTM B211/B211M-19 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
- .9 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .10 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .11 ASTM B241/B241M-16 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
- .12 ASTM B483/B483M-13e1 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Pipe for General Purpose Applications.
- .13 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .14 CSA-W59.2-18 - Welded Aluminum Construction.
- .15 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .16 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - .2 Provide Shop Drawings stamped and signed by the delegated design professional.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Delegated Design Submittals:
 - .1 Submit documentation indicating compliance to performance/design criteria, signed and sealed by the delegated design professional responsible for their preparation.
 - .1 Design Data: Include material data, calculations and details.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform welding to CSA-W59.2, CSA-W59.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Delegated Design: Design metal railings, connections and anchors by a licensed design professional using performance and design criteria as indicated.
- .2 Railing assembly, wall rails, and attachments to resist lateral force as per building code at any point without damage or permanent set.
- .3 Fabricate railing assembly, wall rails, and attachments to applicable code requirements.
- .4 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.
- .5 Railing assembly, wall rails, and attachments to resist lateral force in conformance with Ontario Building Code.

2.2 Steel Railing System

- .1 Refer to Drawings.
- .2 Steel Tubing: ASTM A501/A501M, ASTM A500/A500M, Grade B.
- .3 Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40.
- .4 Stainless Steel Tubing: ASTM A269/A269M, Grade TP 304, welded seamless with No. 4 finish.
- .5 Fittings: Elbows, T-shapes, wall brackets, escutcheons.
- .6 Mounting: Prepare backing plate for mounting in wall construction, thickness as indicated brackets and flanges Adjustable. with steel inserts for casting in concrete with steel brackets for embedding into masonry
- .7 Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- .8 Splice Connectors: Steel welding collars.
- .9 Galvanizing: Hot-dip galvanized to appropriate grade for type and size of steel material indicated, zinc coating thickness ASTM A123/A123M.
- .10 Shop and Touch-Up Primer for Steel Components: SPCC-Paint 25, zinc oxide alkyd primer.
- .11 Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, Type I - Inorganic zinc rich primer.

2.3 Fabrication

- .1 Fit and shop assemble components in largest practical sizes for delivery to site.
- .2 Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- .3 Provide anchors, plates, angles required for connecting railings to structure.
- .4 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

- .5 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- .6 Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
- .7 Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
- .8 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- .9 Accurately form components to suit stairs and landings to each other and to building structure.
- .10 Accommodate for expansion and contraction of members and building movement without damage to connections or members.

2.4 Finishes

- .1 Refer to Drawings, and Section 09 91 00 - Painting.
- .2 Apply one (1) coat of bituminous paint to concealed metal surfaces in contact with cementitious or dissimilar materials.
- .3 Shop paint in accordance with Section 09 91 10 with field touch-up as required.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that field conditions are acceptable and are ready to receive work.

3.2 Preparation

- .1 Clean and strip primed steel items to bare metal where site welding is required.
- .2 Supply items required to be cast into concrete embedded in masonry with setting templates, to appropriate sections.

3.3 Installation

- .1 Install railings to manufacturer's instructions.
- .2 Install components plumb and level, accurately fitted, free from distortion or defects.
- .3 Anchor railings to structure with anchors.
- .4 Field weld anchors as indicated on Shop Drawings. Touch-up welds with primer. Grind welds smooth.
- .5 Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- .6 Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation From Plumb: 6 mm (1/4 inch) per storey, non-cumulative.
- .3 Maximum Offset From True Alignment: 6 mm (1/4 inch).
- .4 Maximum Out-of-Position: 6 mm (1/4 inch).

End of Section

Part 1 General

1.1 Section Includes

- .1 Miscellaneous rough carpentry, including:
 - .1 Rooftop equipment curbs and bases.
 - .2 Minor rough framing.
 - .3 Wood blocking.
 - .4 Wood sleepers.
 - .5 Wood shelving.
 - .6 Telephone and electrical panel backboards.
- .2 Fasteners.
- .3 Preservative treatment.
- .4 Fire retardant treatment.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.
- .2 Section 04 20 00 - Unit Masonry: Setting anchors in masonry.
- .3 Section 05 12 00 - Structural Steel: Prefabricated steel structural supports.
- .4 Section 08 11 13 - Metal Doors and Frames: Door openings to receive wood blocking.
- .5 Section 08 51 13 - Aluminum Windows: Window openings to receive wood blocking.

1.3 Reference Standards

- .1 ANSI A135.4-2012 - Basic Hardboard Standard.
- .2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 CAN/CGSB 11.3-M87 (Withdrawn) - Hardboard.
- .6 CANPLY (Canadian Plywood Association) - Canadian Plywood Handbook.
- .7 CAN/CSA-O80 Series-15 - Wood Preservation.
- .8 CAN/ULC-S706.1-2016 - Standard for Wood Fibre Insulating Boards for Buildings.
- .9 CSA-O121-17 - Douglas Fir Plywood.
- .10 CSA-O151-17 - Canadian Softwood Plywood.
- .11 CSA-O153-19 - Poplar Plywood.
- .12 CSA-O437 Series-93 (R2011) (Withdrawn) - Standards on OSB and Waferboard.
- .13 NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber, 2017 Edition.
- .14 NPA A208.1-2016 - Particleboard.
- .15 NPA A208.2-2016 - Medium Density Fibreboard (MDF) for Interior Applications.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide technical data on wood preservative materials.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.7 Quality Assurance

- .1 Perform Work in accordance with the following agencies:
 - .1 Lumber Grading Agency: Certified by NLGA Grading Rules.
 - .2 Plywood Grading Agency: Certified by CANPLY.
 - .3 Wood Based Panel Products: Marked with a recognized, visible grade stamp showing Grade or span rating as required.
- .2 Pressure Preservative Treated Wood: Marked with certification mark authorized by the Canadian Wood Preservers Bureau (CWPB) indicating producer, preservative type, retention and Use Category (UC).

1.8 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Store plywood panels flat and level.
- .3 Keep finish faces inward and cover stacks to protect from bumping and abrasion.
- .4 Protect tongue and groove plywood panel edges and corners.
- .5 Protect panels from sunlight, water or excessive humidity.
- .6 Store materials [off the ground, covered with weatherproof tarps] [indoors in dry, well-ventilated area].

Part 2 Products

2.1 Lumber Materials

- .1 Dimension Lumber: CSA-O141, softwood lumber unless indicated otherwise, S4S, maximum moisture content 19%; graded to NLGA Grading Rules Standard Grading Rules for Lumber. Finger jointed lumber not acceptable.
 - .1 Studs - Non-Structural: Grade 2, species SPF.
 - .2 Utility Shelving: Grade No. 2, species: any species.
 - .3 Blocking: Grade No. 2, species: SPF; exterior wood pressure preservative treated.

2.2 Panel Materials

- .1 Plywood: CSA-O121, CSA-O151 as indicated in schedule below, certified and graded by CANPLY, meeting the requirements of CSA-O325.
 - .1 Telephone and Electrical Panel Back Boards: Plywood, thickness 3/4 inch, S1S.
- .2 OSB: Oriented strands set with waterproof resin binder, meeting the requirements of CSA-O325.

2.3 Fasteners And Anchors

- .1 Screws and Nails: Galvanized steel; type and size suitable for application.
- .2 Anchors: Galvanized steel.
- .3 Galvanized Coating for all locations: Hot dip galvanized to ASTM A153/A153M.
- .4 Galvanized Coating for Treated Wood: Hot dip galvanized to ASTM A153/A153M, Class A or B1 (G185) zinc coating.

2.4 Miscellaneous Accessories

- .1 Adhesives: Waterproof adhesive, approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
- .2 Building Paper:
 - .1 Spun bonded polyolefin building wrap sheeting.
 - .2 Unperforated asphalt saturated felt, No 15.
- .3 Polyethylene: Sheet polyethylene, 10 mil thick.

2.5 Preservative Treatment

- .1 Wood Preservative (Pressure Treatment): CAN/CSA-O80, and in accordance with Table 2 - Use Categories for Specific Products, Uses, and Exposures.
- .2 Wood Preservative (Surface Application): CAN/CSA-O80, copper naphthenate.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that site conditions are ready to receive work and opening dimensions are as indicated on Shop Drawings.

3.2 Installation

- .1 Set members level and plumb, in correct position. Place horizontal members, crown side up.
- .2 Construct curb members of single pieces.
- .3 Place horizontal members, crown side up.
- .4 Space furring at spacing indicated on Drawings.
- .5 Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- .6 Coordinate curb installation with installation of decking and support of deck openings.

3.3 Site Applied Wood Treatment

- .1 Apply preservative treatment to manufacturer's written instructions.
- .2 Brush apply two (2) coats of preservative treatment on wood requiring cutting or drilling after treatment and on wood in contact with cementitious materials.
- .3 Allow preservative to dry prior to erecting members.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Framing Members: 1/4 inch from true position, maximum.
- .3 Surface Flatness of Floor: 1/4 inch in 10 ft maximum, and 1/2 inch in 30 ft maximum.

End of Section

Part 1 General

1.1 Section Includes

- .1 Sheathing.
- .2 Fasteners.

1.2 Related Requirements

- .1 Section 05 41 00 - Structural Metal Stud Framing: Exterior steel stud framing.
- .2 Section 08 11 13 - Metal Doors and Frames: Door openings.
- .3 Section 08 51 13 - Aluminum Windows: Window openings.

1.3 Reference Standards

- .1 ANSI A135.4-2012 - Basic Hardboard Standard.
- .2 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .3 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM C1280-18 - Standard Specification for Application of Gypsum Sheathing.
- .5 CAN/CGSB 11.3-M87 (Withdrawn) - Hardboard.
- .6 CANPLY (Canadian Plywood Association) - Canadian Plywood Handbook.
- .7 CAN/CSA-O80 Series-15 - Wood Preservation.
 - .1 CSA-O80.1-15 - Specification for Treated Wood.
 - .2 CSA-O80.3-15 - Preservative Formulations.
- .8 CAN/ULC-S701.1-2017 - Standard for Thermal Insulation, Polystyrene Boards.
- .9 CAN/ULC-S704.1-2017 - Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .10 CAN/ULC-S706.1-2016 - Standard for Wood Fibre Insulating Boards for Buildings.
- .11 CSA-O121-17 - Douglas Fir Plywood.
- .12 CSA-O151-17 - Canadian Softwood Plywood.
- .13 CSA-O153-19 - Poplar Plywood.
- .14 CSA-O325-16 - Construction Sheathing.
- .15 CSA-O437 Series-93 (R2011) (Withdrawn) - Standards on OSB and Waferboard.
- .16 Gypsum Association GA-253-2018 - Application of Gypsum Sheathing.
- .17 NPA A208.1-2016 - Particleboard.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide technical data on required materials and products.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work in accordance with the following agencies:

- .1 Plywood Grading Agency: Certified by CANPLY.
- .2 Wood Based Panel Products: Marked with a recognized, visible grade stamp showing Grade or span rating as required.
- .3 Pressure Preservative Treated Wood: Marked with certification mark authorized by the Canadian Wood Preservers Bureau (CWPB) indicating producer, preservative type, retention and Use Category (UC).

1.8 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Store plywood panels flat and level.
- .3 Keep finish faces inward and cover stacks to protect from bumping and abrasion.
- .4 Protect tongue and groove plywood panel edges and corners.
- .5 Protect panels from sunlight, water or excessive humidity.
- .6 Store materials off the ground, covered with weatherproof tarps.

Part 2 Products

2.1 Panel Materials

- .1 Plywood: CSA-O121, or as indicated in schedule below, CANPLY certified and graded, meeting the requirements of CSA-O325.
 - .1 Roof Sheathing: Sheathing grade, thickness 5/8", tongue and groove edges.
 - .2 Telephone and Electrical Panel Back Boards: Plywood, thickness 5/8" , S1S.
- .2 OSB: Oriented strands set with waterproof resin binder, meeting the requirements of CSA-O325.
 - .1 Wall Sheathing: 15/32" (12mm) thickness.
 - .2 Ceiling Sheathing (Structural Diaphragm): 15/32" (12mm) thickness.
- .3 Glass-Mat Faced Gypsum Board Sheathing: ASTM C1177/C1177M, glass-mat faced with water-resistant core; nominal width 1220 mm (48 inches), maximum length in place; square edges.
 - .1 Johns Manville; Product: Securock Glass-Mat Roof Board.
 - .2 Canopy Sheathing: 1/2" (12.7mm) thickness.

2.2 Fasteners And Anchors

- .1 Refer to Structural Drawings, details, notes.
- .2 Screws and Nails: Galvanized steel; type and size suitable for application.
- .3 Galvanized Coating for Exterior Work, Interior High Humidity Areas: Hot dip galvanized to ASTM A153/A153M.
- .4 Galvanized Coating for Treated Wood: Hot dip galvanized to ASTM A153/A153M.

2.3 Miscellaneous Accessories

- .1 Refer to Drawings.
- .2 Flexible Flashing: Rubberized-asphalt compound, self-adhesive, bonded to a high-density, polyethylene film, minimum thickness 0.64 mm (25 mil). Compatible primer recommended by membrane manufacturer.
- .3 Adhesives: Waterproof adhesive, approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
- .4 Polyethylene: Sheet polyethylene, thickness as noted on Drawings.

2.4 Preservative Treatment

- .1 Wood Preservative (Pressure Treatment): CAN/CSA-O80, and in accordance with Table 2 - Use Categories for Specific Products, Uses, and Exposures of CSA-O80.1.
- .2 Wood Preservative (Surface Application): CSA-O80.3, copper naphthenate.
- .3 Fire retardant (FRT): CAN/CSA-O80, chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25/50, to CAN/ULC-S102.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that site conditions are ready to receive work and opening dimensions are accurate.

3.2 Wood Panel Installation

- .1 Secure roof sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing.
- .2 Fully engage any/all tongue and groove edges.
- .3 Secure wall sheathing with long dimension as indicated on Drawings to wall studs, with ends over firm bearing and staggered per Drawings.
- .4 Secure subfloor sheathing with longer edge perpendicular to floor framing and with end joints staggered and sheet ends over bearing. Attach with adhesive and approved fasteners.
- .5 Install flooring underlayment after dust and dirt generating activities have ceased and prior to application of finished flooring. Apply perpendicular to subflooring, stagger joints of underlayment.
- .6 Glue and Screw underlayment to subflooring.

3.3 Gypsum Board Installation

- .1 Refer to Section 09 21 16, and related sections.
- .2 Install components to manufacturer's written instructions, ASTM C1280, GA-253.
- .3 Coordinate location of openings and through-wall components with other work.
- .4 Erect gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.
- .5 Use screws when fastening gypsum board to furring or framing.
- .6 Place gypsum soffit board perpendicular to supports, with staggered end joints over supports.
- .7 Treat cut edges and holes in sheathing with sealant.
- .8 Place corner beads at external corners as indicated.
 - .1 Use longest practical length.
 - .2 Place edge trim where gypsum board abuts dissimilar materials as detailed on Drawings.

3.4 Sheathing Paper Installation

- .1 Building Paper: Apply horizontally with minimum 50 mm (2 inches) overlap and 150 mm (6 inches) end laps; fasten with galvanized staples or roofing nails.
- .2 Building Wrap: Install building wrap to manufacturer's written instructions.
 - .1 Tape joints, edges and penetrations with tape.
 - .2 Extend building wrap into openings and seal with tape.

3.5 Flashing

- .1 Install flexible flashing to manufacturer's written instructions.
- .2 Lap seams and junctions with other materials minimum 100 mm (4 inches).
- .3 Lap flashing over sheathing paper at bottom and sides of wall openings; lap sheathing paper over flashing at head of wall openings

3.6 Site Applied Wood Treatment

- .1 Apply preservative treatment to manufacturer's written instructions.
- .2 Brush apply two (2) coats of preservative treatment on wood requiring cutting or drilling after treatment and on wood in contact with cementitious materials.
- .3 Allow preservative to dry prior to erecting members.

End of Section

Part 1 General

1.1 Section Includes

- .1 Board insulation and integral vapour retarder at wall construction, perimeter foundation wall, underside of floor slabs, as indicated on drawings.

1.2 Related Requirements

- .1 Section 03 30 30 - Cast-in-Place Concrete.
- .2 Section 07 21 16 - Blanket Insulation.
- .3 Section 07 27 00 - Air Barriers: Air seal materials to adjacent insulation.

1.3 Reference Standards

- .1 ASTM C208-12(2017)e2 - Standard Specification for Cellulosic Fiber Insulating Board.
- .2 ASTM C552-17e1 - Standard Specification for Cellular Glass Thermal Insulation.
- .3 ASTM C578-19 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- .4 ASTM C591-19a - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- .5 ASTM C612-14(2019) - Standard Specification for Mineral Fiber Block and Board Insulation.
- .6 ASTM C1126-19 - Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
- .7 ASTM C1289-19 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .8 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .9 ASTM E96/E96M-16 - Standard Test Methods for Water Vapor Transmission of Materials.
- .10 CAN/ULC-S102-18 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .11 CAN/ULC-S701.1-2017 - Standard for Thermal Insulation, Polystyrene Boards and Pipe Covering.
- .12 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .13 CAN/ULC-S703-09 (R2015) - Standard for Cellulose Fibre Insulation (CFI) for Buildings.
- .14 CAN/ULC-S704.1-2017 - Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .15 CAN/ULC-S706.1-2016 - Standard for Wood Fibre Insulating Boards for Buildings.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with Section 07 26 00 for installation of vapour retarder and Section 07 27 00 for air seal materials.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on product characteristics, performance criteria, limitations.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Indicate special environmental conditions required for installation and installation techniques.
- .3 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Provide mock-up of materials of this section and wall cladding materials of Sections relevant and as per design.
- .3 Locate where directed by Consultant.
- .4 Approved mock-up may remain as part of the Work.

1.9 Site Conditions

- .1 Ambient Conditions:
 - .1 Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

Part 2 Products

2.1 Manufacturers - Insulation Materials

- .1 IKO; Product: Foil Faced Polyisocyanurate, IKO Enerfoil.
- .2 Dupont; Product: Extruded Polystyrene, Styrofoam Brand SM, Styrofoam Brand Highload.
- .3 Owens Corning; Product: Extruded Polystyrene, Foamular C-300, Foamular 400 High Density.
- .4 Soprema; Product: Polyisocyanurate Insulation, Sopra-Iso.
- .5 Approved equals to the above.
- .6 Substitutions: Refer to Section 01 25 00.

2.2 Description

- .1 System Description: Assembly of materials providing:
 - .1 Continuity of thermal barrier at building enclosure elements, in conjunction with thermal insulating materials in Section 07 21 16.
 - .2 Thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials in Section 07 27 00.

2.3 Insulation Materials

- .1 Extruded Polystyrene Insulation (XPS): CAN/ULC-S701 ASTM C578, cellular type, conforming to the following:
 - .1 Compressive Strength: 207 kPa (30 psi).
 - .2 Thermal Resistance: RSI-0.88 (R-5.0) per 25.4mm (per inch).
 - .3 Water Absorption: 0.1% by volume maximum.
 - .4 Board Thickness: as indicated on drawings and/or as required for specified thermal resistance.
 - .5 Board Edges: Shiplapped.
 - .6 Flame/Smoke Properties: to CAN/ULC-S102, ASTM E84.
 - .7 Products:
 - .1 Styrofoam Brand SM, manufactured by Dupont.
 - .2 Foamular C-300, manufactured by Owens Corning.
 - .3 Approved equal.
- .2 Extruded Polystyrene Insulation (XPS): CAN/ULC-S701 ASTM C578, cellular type, conforming to the following:
 - .1 Compressive Strength: 275kPa (40psi).
 - .2 Thermal Resistance: RSI-0.88 (R-5.0) per 25.4mm (per inch).
 - .3 Water Absorption: 0.1% by volume maximum.

- .4 Board Thickness: as indicated on drawings and/or as required for specified thermal resistance.
- .5 Board Edges: Square.
- .6 Flame/Smoke Properties: to CAN/ULC-S102, ASTM E84.
- .7 Products:
 - .1 Styrofoam Brand Highload 40, manufactured by Dupont.
 - .2 Foamular C-400, manufactured by Owens Corning.
 - .3 Approved equal.
- .3 Polyisocyanurate Insulation: CAN/ULC-S704 ASTM C1289, Type II, Class I, Grade 2 (20psi) or Grade 3 (25psi), conforming to the following:
 - .1 Compressive Strength: 275kPa (40psi).
 - .2 Thermal Resistance: RSI-1.00 (R-5.7) per 25.4mm (per inch).
 - .3 Water Absorption: 0.1% by volume maximum.
 - .4 Board Thickness: as indicated on drawings and/or as required for specified thermal resistance.
 - .5 Board Edges: Square.
 - .6 Flame/Smoke Properties: to CAN/ULC-S102, ASTM E84.
 - .7 Products:
 - .1 Soprema; Product: Sopra-Iso.
 - .2 Approved equal.

2.4 Adhesive Materials

- .1 Adhesive: Type recommended by respective insulation manufacturer for application.

2.5 Accessories

- .1 Sheet Vapour Retarder: Specified in Section 07 26 00.
- .2 Tape: Self-adhering type, 50mm (2 inch) wide.
- .3 Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.
- .3 Verify substrate surface is flat, free of honeycomb fins irregularities materials or substances that may impede adhesive bond.

3.2 Installation - Foundation Perimeter

- .1 Apply adhesive in three (3) continuous beads per board length.
- .2 Install boards on foundation wall.
 - .1 Place boards in a method to maximize contact bedding.
 - .2 Stagger joints.
 - .3 Butt edges and ends tight to adjacent board and to protrusions.
- .3 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

3.3 Installation - Exterior Walls

- .1 Apply adhesive in three (3) continuous beads per board length.
- .2 Install boards on wall surface.

- .3 Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.
- .4 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
- .5 Place polyethylene sheet at perimeter of wall openings, from adhesive vapour retarder bed to window and door frame. Tape seal in place to ensure continuity of vapour retarder and air seal.
- .6 Tape insulation board joints.

3.4 Installation - Under Concrete Slabs

- .1 Refer to Structural Drawings.
- .2 Place insulation under slabs on grade after base for slab has been compacted.
- .3 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
- .4 Prevent insulation from being displaced or damaged while placing slab.

3.5 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Do not permit work to be damaged prior to covering insulation.

End of Section

Part 1 General

1.1 Section Includes

- .1 Batt insulation and vapour retarder in exterior wall and roof construction.
- .2 Blanket roll insulation for filling perimeter window and door shim spaces, and crevices in exterior wall and roof.

1.2 Related Requirements

- .1 Section 07 21 13 - Board Insulation.
- .2 Section 07 21 23 - Loose Fill Insulation.
- .3 Section 07 27 00 - Air Barriers: Air barrier materials to adjacent insulation.
- .4 Section 07 84 00 - Firestopping.
- .5 Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation.
- .6 Section 06 10 53 - Miscellaneous Rough Carpentry.

1.3 Reference Standards

- .1 ASTM C665-17 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .2 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .3 CAN/ULC-S102-18 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .4 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .5 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials, 2006 Edition.
- .6 UL 723-2008 - Tests for Surface Burning Characteristics of Building Materials (10th Edition).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on product characteristics, performance criteria, and limitations.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

Part 2 Products

2.1 Manufacturers

- .1 Rockwool; Product: Safe'N'Sound.
- .2 Other acceptable manufacturers offering functionally and aesthetically equivalent products.
- .3 Substitutions: Refer to Section 01 25 00.

2.2 Description

- .1 System Description: Assembly of materials providing:
 - .1 Continuity of thermal barrier at building enclosure elements, in conjunction with thermal insulating materials in Section 07 21 13.
 - .2 Thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials in Section 07 27 00.

2.3 Materials

- .1 Insulation: CAN/ULC-S702 ASTM C665, preformed glass, mineral fibre, in blanket, roll or batt form; friction fit conforming to the following:
 - .1 Thermal Resistance: Refer to drawings.
 - .2 Batt Size: Refer to drawings.
 - .3 Roll Size: Refer to drawings.
 - .4 Blanket Size: Refer to drawings.
 - .5 Facing: Unfaced.
 - .6 Flame/Smoke Properties: to ASTM E84 CAN/ULC-S102.
- .2 Sheet Vapour Retarder: Refer to drawings.
- .3 Nails and Staples: Steel wire; electroplated, galvanized; type and size to suit application.
- .4 Tape: Polyethylene self-adhering type, mesh reinforced, 50 mm (2 inches) wide.
- .5 Insulation Fasteners: Steel impale spindle and clip on flat metal base, self adhering backing, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 Installation

- .1 Install insulation and air/vapour retarder to manufacturer's written instruction.
- .2 Install in exterior walls and roof spaces without gaps or voids. Do not compress insulation.
- .3 Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- .4 Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
- .5 Secure vapour retarder to manufacturer's written instructions.
- .6 Install with factory applied vapour retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- .7 Staple or nail facing flanges in place. Place fasteners at 150 mm (6 inches) on centre maximum.
- .8 Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

End of Section

Part 1 General

1.1 Section Includes

- .1 Granular insulation in cells of concrete masonry unit walls.

1.2 Related Requirements

- .1 Section 04 26 16 - Reinforced Unit Masonry.
- .2 Section 04 26 16: Masonry wall system.

1.3 Reference Standards

- .1 ASTM C516-19- Standard Specification for Vermiculite Loose Fill Thermal Insulation.
- .2 ASTM C549-18 - Standard Specification for Perlite Loose Fill Insulation.
- .3 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with masonry Section 04 26 16 for placement of insulation materials.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

Part 2 Products

2.1 Manufacturers

- .1 Perlite Institute Inc.; Product: Perlite Loose-Fill.
- .2 Therm-O-Rock East, Inc.; Product: Perlite.
- .3 Approval equals.

2.2 Description

- .1 System Description:
 - .1 Assembly of components includes providing continuity of thermal barrier at building enclosure elements.

2.3 Materials

- .1 Perlite Loose Fill Insulation: ASTM C549, expanded perlite loose fill insulation; flame/smoke contribution of 0/0 to ASTM E84.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.
- .3 Verify spaces are free of mortar to allow free flow of insulation.

3.2 Preparation

- .1 Verify holes and openings have been sealed to prevent escape of insulation.

3.3 Installation

- .1 Install insulation to manufacturer's written instructions.
- .2 Place after masonry wall has sufficiently dried and attained optimum moisture content. Place prior to covering cores with bond beams or lintels.
- .3 Place as wall is erected. Completely fill spaces.

3.4 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Place temporary signs in rooms that face insulated walls warning workers to use caution to prevent loss of insulation if cutting into walls.

End of Section

Part 1 General

1.1 Section Includes

- .1 Air leakage criteria for primary air seal building enclosure materials and assemblies.
- .2 Materials and installation methods supplementing other primary air seal materials and assemblies.
- .3 Air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-place Concrete: Concrete components functioning as an air seal.
- .2 Section 04 20 00 - Unit Masonry.
- .3 Section 04 26 16 - Reinforced Unit Masonry.
- .4 Section 05 31 23 - Steel Roof Decking: Structural roof deck functioning as an air seal.
- .5 Section 07 21 13 - Board Insulation: Insulation and insulation facing directly adjacent to the air seal.
- .6 Section 07 26 00 - Vapour Retarder: Coordinate vapour seal criteria with air barrier requirements.
- .7 Section 07 84 00 - Firestopping: Fire stopping materials.
- .8 Section 07 92 00 - Joint Sealants: Sealant materials and installation techniques.
- .9 Section 08 41 13 - Aluminum Framed Entrances And Storefronts: Aluminum entrances and storefronts, functioning as a primary air seal.
- .10 Section 09 21 16 - Gypsum Board Assemblies: Functioning as a primary air seal.
- .11 Section 09 91 00 - Painting: Air sealing porous materials on inside surfaces of exterior wall.

1.3 Reference Standards

- .1 ASCE/SEI 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- .2 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM C920-18 - Standard Specification for Elastomeric Joint Sealants.
- .4 ASTM C1311-14 - Standard Specification for Solvent Release Sealants.
- .5 ASTM E283/E283M-19 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .6 ASTM E330/E330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .7 NABA (National Air Barrier Association) - Air Barrier Quality Assurance Program (QAP).
- .8 SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 Definitions

- .1 Air Barrier: A continuous network of materials and joints providing air tightness, with adequate strength and stiffness to not deflect excessively under air pressure differences, to which it will be subjected in service. It can be comprised of a single material or a combination of materials to achieve the performance requirements.

1.5 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work of this section with all sections referencing this section.
- .3 Sequencing: Sequence work to permit installation of materials in conjunction with related materials and seals.

1.6 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on material characteristics, performance criteria, and limitations.
- .3 Shop Drawings: Provide Drawings of special joint conditions.

1.7 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements, including preparation, installation requirements and techniques, product storage and handling criteria.

1.8 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Section 01 78 00: Close-out procedures.

1.9 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work to SWRI sealant and caulking guide requirements for materials installation.
- .3 Perform Work in accordance with the NABA Air Barrier Quality Assurance Program.
- .4 Maintain one (1) copy of document on site.
- .5 All Air/Vapour Barrier products shall be applied by a Contractor currently approved by Air/Vapour Barrier manufacturer and with mechanics with a minimum 5 years' experience with the installation of this specified system. Provide written evidence of approval.
- .6 Applicator Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.10 Mock-ups

- .1 Section 01 43 00: Provide mock-up of air barrier system, which is comprised of a variety of materials.
- .2 Locate where directed by Consultant.
- .3 Approved mock-up may remain as part of the Work.

1.11 Site Conditions

- .1 Ambient Conditions:
 - .1 Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.12 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide a three (3) year warranty to include coverage for failure to meet specified requirements.
- .3 Warranty: Include coverage of installed sealant and sheet materials that fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Design Requirements: Perform design work to ASCE/SEI 7.
- .2 Provide an air barrier assembly tested to NABA approved testing protocol to provide air leakage results not to exceed 0.02 L/s•sq m (0.004 cfm/sq ft) when subjected to a pressure differential of 75 Pa (1.5 lb/sq ft).
- .3 Provide continuity of air seal materials and assemblies in conjunction with materials described in Section 03 30 00, 04 27 13, 07 21 13, 07 92 00.

2.2 Materials (walls)

- .1 Air/Vapour Barrier: Henry; Blueskin SA (Self-Adhered).
- .2 Air/Vapour Barrier: Soprema; Sopraseal Stick 1100T (Self-Adhered).
- .3 Air/Vapour Barrier: Henry Air-Bloc 16MR (Trowel/Liquid-Applied).
- .4 Air/Vapour Barrier: Soprema; Sopraseal LM 200T (Trowel/Liquid-Applied).
- .5 Air barrier sealant: As per manufacturer's recommendations.
- .6 Substrate Cleaner: As per manufacturer's recommendations.

2.3 Adhesives

- .1 Only those compatible with materials and manufacturer's recommendations.

2.4 Accessories

- .1 Tape: Polyethylene, self adhering type, mesh reinforced where required, 50 mm wide, compatible with sheet material.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that surfaces and conditions are ready to accept the Work of this section.
- .3 Notify Architect in writing of any discrepancies. Commencement of work or any parts thereof will imply the acceptance of the substrate by the installer.
- .4 Ensure that:
 - .1 Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
 - .2 Concrete surfaces are cured and dry, smooth without large voids, spoiled areas or sharp protrusions.
 - .3 Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.

3.2 Preparation

- .1 Remove loose or foreign matter that might impair adhesion of materials.
- .2 Clean and prime substrate surfaces to receive sealants and/or adhesive to manufacturers written instructions.

3.3 Installation

- .1 Install materials to manufacturer's written instructions.
- .2 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.4 Precautions

- .1 Do not leave membrane exposed for more than manufacturer's recommendations. Install insulation as soon as possible to protect the membrane from damage by other trades.
- .2 Provide support for air/vapour carrier system on back and/or bottom side where it crossed over gaps such as masonry wall cavities, etc. Use flashing to support air/vapour barrier at gaps.

3.5 Job Completion

- .1 The Contractor shall inspect the completed membrane and correct all defects to meet the specification.
- .2 Clean up all debris, excess materials and equipment and remove from site.
- .3 Any drippage or spills of coating sealant, mastic or primers shall be cleaned.
- .4 The Contractor shall restrict construction traffic and equipment movement near the completed air barrier to only essential related trades. For trades continuing to work near the completed air barrier, appropriate protection shall be provided.

3.6 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Provide written inspection report to Consultant.

3.7 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Do not permit adjacent work to damage work of this section.

End of Section

Part 1 General

1.1 Section Includes

- .1 Foamed-insulation-core concealed fastener metal wall panels, with related metal trim and accessories.

1.2 Related Requirements

- .1 Section 05 12 00: Structural Steel: Structural steel building frame.
- .2 Section 05 41 00 - Structural Metal Lightweight Framing: Stud wall framing system.
- .3 Section 07 21 13 - Board Insulation: Rigid insulation.
- .4 Section 07 41 13 - Metal Roof Panels.
- .5 Section 13 34 23 - Fabricated Structures: Building framing system.

1.3 Reference Standards

- .1 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A 755 - 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 A792/A792M-10(2015) - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .4 ASTM A 240 – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- .5 ASTM C 518 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .6 ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
- .7 ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics
- .8 ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.
- .9 ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- .10 ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
- .11 ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics
- .12 ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- .13 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .14 ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .15 ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- .16 ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- .17 NFPA 259 – Test Method for Potential Heat of Building Materials.
- .18 NFPA 285 – Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies.
- .19 NFPA 286 – Fire Test of Evaluating Conditions of Wall and Ceiling Finish to Roof Fire Growth.
- .20 CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .21 CAN/ULC S101 – Fire Endurance Tests of Building Construction and Materials.
- .22 CAN/ULC S134 – Fire Test of Exterior Wall Assemblies.
- .23 CAN/ULC S138 – Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration.
- .24 GS-11 – Green Seal Standard for Paints and Coatings, Edition 3.2, October 26, 2015.

- .25 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .26 ASTM E 119.
- .27 UL 263.

1.4 Administrative Requirements

- .1 Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency and related trade contractors.
 - .1 Coordinate building framing in relation to metal panel system.
 - .2 Coordinate openings and penetrations of metal panel system.

1.5 Action Submittals

- .1 Product Data: Manufacturer's data sheets for specified products.
- .2 Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.
 - .1 Include data indicating compliance with performance requirements.
 - .2 Indicate points of supporting structure that must coordinate with metal panel system installation.
 - .3 Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.
- .3 Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- .4 Samples for Verification:
 - .1 Provide 12-inch- (305 mm) long section of each metal panel profile.
 - .2 Provide color chip verifying color selection.

1.6 Informational Submittals

- .1 Product Test Results: Indicating compliance of products with requirements.
- .2 Qualification Information: For Installer
- .3 Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party Quality Control Program, including IAS AC472 and based upon chapter 17 of the International Building Code (IBC).
- .4 Warranty:
 - .1 Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
 - .2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Maintenance data.
- .3 Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Structural design to CSA-S136.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

- .5 Delegated Design Professional Qualifications: Professional Structural Engineer experienced in design of this Work and licensed in the province where the project is located.
- .6 Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - .1 Product data, including certified independent test data indicating compliance with requirements.
 - .2 Samples of each component.
 - .3 Sample submittal from similar project.
 - .4 Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - .5 Sample warranty.
 - .6 Certificate from an accredited third-party Quality Control Program.
- .7 Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements
- .8 Approved manufacturers must meet separate requirements of Submittals Article.

1.9 Delivery, Storage, And Handling

- .1 Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.
 - .1 Deliver, unload, store, and erect metal panels and accessory items without deforming panels or exposing panels to surface damage from weather or construction operations.
 - .2 Store in accordance with Manufacturer's written instructions.
 - .3 Shield foam insulated metal panels from direct sunlight until all components are installed.

1.10 Warranty

- .1 Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
- .2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
- .3 Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

Part 2 Products

2.1 Manufacturers

- .1 Metl-Span; Product: CF Light Mesa.
- .2 Metl-Span/Nucor; Product: ThermalSafe.
- .3 Other acceptable manufacturers offering functionally and aesthetically equivalent products, with approval.
- .4 Substitutions: Refer to Section 01 25 00.

2.2 Performance / Design Criteria

- .1 General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- .2 Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
 - .1 Wind Loads: Determine loads based on applicable building code, wind speed, importance factor, exposure category, and internal pressure coefficient indicated on drawings.
 - .1 Wind Negative Pressure: Certify capacity of metal panels by testing of proposed assembly.

- .2 Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/120 of the span with no evidence of failure.
- .3 FM Approvals Listing: Comply with FM Approval 4881. Provide metal wall panel assembly listed in FM Approvals' "Approval Guide."
- .4 Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by testing and inspection agency acceptable to authorities having jurisdiction.
 - .1 Surface-Burning Characteristics: The insulating core shall have been tested per ASTM E 84. The core shall have:
 - .1 Standard Panel - Flame spread index: 25 or less.
 - .2 Fire Rated Panel - Flame spread index: 0.
 - .3 Standard Panel - Smoke developed index: 450 or less.
 - .4 Fire Rated Panel - Smoke developed index: 0.
 - .2 Room Test Performance: FM Global 4880: The panel assembly shall not support a self-propagating fire which reaches any limits of the 50' (15.24m) high corner test structure as evidenced by flaming or material damage of the ceiling of the assembly.
 - .3 Fire Propagation: The fire assembly shall meet the requirements of the standard for NFPA 285
 - .4 Fire Growth: The fire assembly shall meet the requirements of the standard for NFPA 286
 - .5 Potential Heat: Determined in accordance with NFPA 259
 - .6 Certifications:
 - .1 Surface Burning Characteristics: The composite panel shall have to be tested per CAN/ULC S102. Meets the National Building Code of Canada requirements.
 - .2 Fire Endurance Tests of Building Construction and Materials: The composite panel shall have to be tested per CAN/ULS S101. Meets 15-minute stay in place requirement
 - .3 Fire Test of Exterior Wall Assemblies. The composite panel shall have to be tested per CAN/ULS S134. Complies with the fire spread and heat flux limitations required by the National Building Code of Canada.
 - .4 Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration: The composite panel shall have to be tested per CAN/ULS S138 Met the Criteria of the Standard.
 - .7 IBC Chapter 26: Panel Performance under the above test methods, shall meet the requirements of IBC, Chapter on foam plastics.
- .5 Air Infiltration, ASTM E 283:
 - .1 Maximum 0.0002 cfm/sq. ft. (0.001 L/s per sq. m) at static air pressure difference of 1.57 lbf/sq. ft. (75 Pa).
 - .2 Maximum 0.0009 cfm/sq. ft. (0.005 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
 - .3 Maximum 0.01 cfm/sq. ft. (0.050 L/s per sq. m) at static-air-pressure difference of 20 lbf/sq. ft. (958 Pa).
- .6 Water Penetration Static Pressure:
 - .1 ASTM E 331: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).
 - .2 ASTM E 331 Modified (2-hour duration): No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).
- .7 Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
- .8 Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.144 btu/sf/hr/deg F at a 75° F (24° C) mean temperature, as required by code, or 0.114 btu/sf/hr/deg F at a 35° F (1.67° C) mean temperature.

2.3 Insulated Metal Wall Panels

- .1 Concealed Fastener, Insulated Metal Wall Panels with foam core: Structural metal panels consisting of exterior metal sheet and interior metal sheet with matching 4 by 1/16 inch (102 by 1.5 mm) o.c. profile. Factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.
 - .1 Basis of Design: Metl-Span, CF Light Mesa.
 - .2 G-90 galvanized coated steel conforming to ASTM A 653 or AZ-50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, pre-painted by the coil-coating process per ASTM A 755/A 755M.
 - .1 Exterior Face Sheet: 24 gauge thickness, with embossed surface.
 - .2 Finish: Full-Strength 70% PVDF Fluoropolymer Coating.
 - .3 Colour: Selected by Owner from product range: Premium I.
 - .4 Interior Face Sheet: 26 gauge thickness, with embossed surface CF Light Mesa profile.
 - .5 Finish: Full-Strength 70% PVDF Fluoropolymer Coating.
 - .6 Colour: White.
 - .3 Panel Width: As recommended by manufacturer for building.
 - .4 Panel Thickness: 3 inch (76 mm).
 - .5 Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
 - .1 Closed Cell Content: 90% or more as determined by ASTM D 6226
 - .2 Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621
 - .3 Shear Strength: As required to meet structural performance requirements and with a minimum of 36 psi as determined by ASTM C 273
 - .4 Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623
 - .5 Minimum Density: 2.0 pcf (32 kg/m³) as determined by ASTM D 1622
 - .6 Thermal Resistance U-Factor: 0.045 maximum.
 - .6 Heat Transfer Coefficient (U-factor): [insert corresponding value] Btu/hr * sq. ft. * deg. F (W/K * sq. m) as determined by ASTM C 1363 at 75 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints.
- .2 Concealed Fastener, Insulated Metal Wall Panels with mineral wool core: Structural metal panels consisting of exterior metal sheet and interior metal sheet with matching 4 by 1/16 inch (102 by 1.5 mm) o.c. profile, in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.
 - .1 Basis of Design: Metl-Span, Thermalsafe, Ultra Light Mesa.
 - .2 G-90 galvanized coated steel conforming to ASTM A 653 or AZ-50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, pre-painted by the coil-coating process per ASTM A 755/A 755M.
 - .1 Exterior Face Sheet: 24 gauge thickness, with embossed surface.
 - .2 Finish: Full-Strength 70% PVDF Fluoropolymer Coating.
 - .3 Colour: Selected by Owner from standard range.
 - .4 Interior Face Sheet: 26 gauge thickness, with embossed surface CF Light Mesa profile.
 - .5 Finish: Full-Strength 70% PVDF Fluoropolymer Coating.
 - .6 Colour: White.
 - .3 Panel Width: As recommended by manufacturer for building.
 - .4 Panel Thickness: 7 inch (177mm).
 - .5 Insulating Core: Mineral wool lamellas.
 - .1 Insulating Properties: R = 3.61 per inch core.
 - .2 Thermal Performance K-Factor: 0.275 Btu.in/hr.ft².dF at 75 dF mean core.

- .6 Heat Transfer Coefficient (U-factor): 0.0383 Btu/hr * sq. ft. * deg. F (W/K * sq. m) as determined by ASTM C 1363 at 75 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints.

2.4 Metal Wall Panel Accessories

- .1 General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- .2 Flashing and Trim: Match material, thickness, and finish of metal panels.
- .3 Panel Clips: ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating, one-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- .4 Panel Fasteners: Self-drilling or Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- .5 Joint Sealers:
 - .1 Sealants: Provide Tape Mastic Sealants, Non-skinning sealants, and Urethane Sealants in accordance with manufacturers standards
 - .2 Vertical Joint Gasket: Manufacturers standard EPDM gasket.

2.5 Fabrication

- .1 General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- .2 Fabricate metal panel joints configured to accept sealant providing weathertight seal.
- .3 Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

Part 3 Execution

3.1 Examination

- .1 Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - .1 Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
 - .2 Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 - .1 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.
 - .2 3/8 inch (9 mm) over any single wall plane.
 - .3 Girt Spacing 8 feet (2438 mm) or more: 1/4 inch (6 mm) out only.
 - .4 Girt Spacing Less Than 8 feet (2438 mm): 1/8 inch (3 mm) out only.
 - .5 CF Architectural girt spacing less than 4 feet (1219 mm): 1/16 inch (1.5 mm) inch out only.
- .2 Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 Installation

- .1 Concealed-Fastener Insulated Metal Panels with foam core: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- .2 Attach panels to metal framing using screws, fasteners, sealants, and adhesives recommended for application by metal panel manufacturer.

- .1 Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
 - .2 Cut panels in field where required using manufacturer's recommended methods.
 - .3 Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 - .4 Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- .3 Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
 - .4 Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal panel assemblies.
 - .1 Seal panel base assembly, openings, panel head joints, and perimeter joints using sealants indicated in manufacturer's instructions.
 - .2 Seal wall panel joints; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings.
 - .3 Prepare joints and apply sealants per requirements of Division 07 Section.

3.3 Accessory Installation

- .1 General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
 - .1 Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 - .2 Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 - .3 Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 Cleaning And Protection

- .1 Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- .2 Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Owner.

End of Section

Part 1 General

1.1 Section Includes

- .1 APP modified bituminous roofing membrane.
- .2 Substrate board (sheathing) over deck surface.

1.2 Related Requirements

- .1 Section 05 31 23 - Steel Roof Decking: Roof deck substrate.
- .2 Section 07 27 00 - Air Barriers: Wall air barrier for roof/wall interface.

1.3 Reference Standards

- .1 ASTM C208-12(2017)e2 - Standard Specification for Cellulosic Fiber Insulating Board.
- .2 ASTM C552-13 - Standard Specification for Cellular Glass Thermal Insulation.
- .3 ASTM C578-19 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- .4 ASTM C728-17a - Standard Specification for Perlite Thermal Insulation Board.
- .5 ASTM C1177/C1177M-17 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .6 ASTM C1278/C1278M-17 - Standard Specification for Fiber-Reinforced Gypsum Panel.
- .7 ASTM C1002-07(2013) - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs to Steel Studs.
- .8 ASTM C1289-19 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .9 ASTM C1396/C1396M-17 - Standard Specification for Gypsum Board.
- .10 ASTM D41/D41M-11(2016) - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- .11 ASTM D312/D312M-16a - Standard Specification for Asphalt Used in Roofing.
- .12 ASTM D2178/D2178M-15a - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- .13 ASTM D2822/D2822M-05(2011)e1 - Standard Specification for Asphalt Roof Cement, Asbestos Containing.
- .14 ASTM D6162/D6162M-16 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- .15 ASTM D6163/D6163M-16 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
- .16 ASTM D6164/D6164M-16 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .17 ASTM D6222/D6222M-16 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .18 ASTM D6223/D6223M-16 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- .19 ASTM D6298-13 - Standard Specification for Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface.
- .20 CAN/CSA-A123.4-04 (R2018) - Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
- .21 CSA-A123.17-05 (R2014) - Asphalt Glass Felt Used in Roofing and Waterproofing.
- .22 CSA-0121-08 (R2013) - Douglas Fir Plywood.
- .23 CSA-0151-09 - Canadian Softwood Plywood.
- .24 CAN/CSA-A123.21-14 (R2019) - Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.
- .25 CAN/ULC-S107-19 - Standard Methods of Fire Tests of Roof Coverings.

- .26 CAN/ULC-S706-09 - Standard for Wood Fibre Insulating Boards for Buildings.
- .27 CAN/ULC-S701.1-2017 - Standard for Thermal Insulation, Polystyrene Boards.
- .28 CAN/ULC-S704.1-2017 - Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .29 CRCA (Canadian Roofing Contractors' Association) - CRCA Roofing Specifications Manual.
- .30 FM (Factory Mutual) - Roof Assembly Classifications.
- .31 Province of Ontario Roofing Contractors Association - Roofing Specifications Manual.
- .32 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with the installation of associated metal flashings, as the work of this section proceeds.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements, including special precautions required for seaming the membrane.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 14001, ISO 9001 certification requirements.
- .2 Install roofing system in compliance with the requirements of:
 - .1 CRCA Roofing Specifications Manual.
 - .2 Alberta Roofing Application Standards Manual (ARCA).
 - .3 British Columbia Roofing Practice Manual (RCABC).
 - .4 NRCA Roofing Manual.
 - .5 Maintain a copy of document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and licensed or approved by the manufacturer.

1.8 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver roofing materials in original, unopened containers, complete with labels indicating manufacturer's name, product brand name, date of manufacture, approval or listing agency markings, usage instructions and safety precautions.
 - .1 Dry and Undamaged.
- .3 Protect membranes and insulation from physical damage and deterioration by sunlight in clean, dry weather protected environment, clear of ground and moisture.
- .4 Stand roll materials on end.

1.9 Site Conditions

- .1 Ambient Conditions:
 - .1 Do not apply roofing membrane during inclement weather or when ambient temperatures are above or below material manufacturer's recommendations.

- .2 Do not apply roofing membrane to damp or frozen deck surface.
- .3 Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.10 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Manufacturer's Warranty: Provide a five (5) year manufacturer's warranty certifying product performance properties, including damage to building resulting from failure to prevent penetration of water, dated from time of Substantial Performance.
- .3 Contractor's Warranty: Provide five (5) year warranty on roofing, dated from time of Substantial Performance.

Part 2 Products

2.1 Membrane Materials

- .1 Manufacturers:
 - .1 IKO; Product: APP Modified Bitumen Roofing Systems.

2.2 Description

- .1 System Description:
 - .1 Assembly of components include two (2) ply membrane system, adhesive-bonded bitumen adhered heat-welded self-adhesive mechanically fastened, with granulated metallic surface, vapour retarder and insulation.
- .2 Regulatory Requirements:
 - .1 Conform to applicable provincial code for wind loads and roof assembly fire hazard requirements.
 - .1 Fire Hazard Classification: CAN/ULC-S107, Class A.

2.3 Membrane Materials

- .1 Membrane:
 - .1 Base Sheet Membrane: IKO Armourplast Classic 5.0.
 - .2 Base Sheet Flashing: IKO Armourplast Classic 5.0.
 - .3 Cap Sheet Membrane: IKO Armourplast Granular APP.
 - .4 Cap Sheet Flashing: IKO Armourplast Granular APP.
 - .5 Perimeter Strip Membrane: Armourplast Classic 5.0.

2.4 Deck Covering Materials

- .1 Glass-Mat Faced Gypsum Board Sheathing: 12.7mm (1/2 inch) ASTM C1177/C1177M, glass-mat faced with water-resistant core; nominal width 1220 mm (48 inches), maximum length in place; square edges.
 - .1 Canadian Gypsum Company or Georgia-Pacific.

2.5 Bitumen Materials

- .1 Adhesive: Membrane and flashing adhesive recommended by manufacturer.

2.6 Miscellaneous Accessories

- .1 Wood Cant Strip: Cut at 45 degree angle from pressure treated lumber.
- .2 Sheathing Adhesive: As recommended by manufacturer.
- .3 Sheathing Joint Tape: Paper Heat resistant type.
- .4 Insulation Joint Tape: Asphalt treated glass fibre reinforced; 150mm (6 inches) wide; self adhering.
- .5 Primers and Sealants: As recommended by membrane manufacturer.
- .6 Flashing:
 - .1 Flexible Flashings: IKO Armourplast Classic 5.0.

- .2 Counterflashing: Prefinished sheet metal, as specified in Section 07 62 00.
- .3 Cap Flashing: Prefinished sheet metal, as specified in Section 07 62 00.
- .7 Miscellaneous Fasteners: Galvanized or non-ferrous type, appropriate for purpose intended and approved by FM system manufacturer; length required for thickness of material being fastened.
- .8 Strip Reglet Devices: Galvanized steel Extruded plastic; surface recess mounted, binder bars, maximum possible length per location, with attachment flanges.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify openings and penetrations are in place, curbs and nailers are in place and drain bodies are securely clamped.
- .3 Verify that surfaces, planes and slopes are as specified and ready to receive work.
- .4 Verify steel deck is supported and secured.
- .5 Verify deck surfaces are dry and free of snow or ice.
 - .1 Verify flutes of metal deck are clean and dry.

3.2 Preparation

- .1 Metal Deck:
 - .1 Install deck sheathing onto the steel deck.
 - .2 Lay with long at right angle to flutes; stagger end joints; provide support at ends.
 - .3 Install sheathing on metal deck using continuous mopping of adhesive on each flute.
 - .4 Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface. Tape joints.

3.3 Vapour Retarder Installation

- .1 Apply primer and vapour retarder in accordance with manufacturer's written instructions for system specified.
 - .1 Allow to dry.
- .2 Install self-adhesive vapour barrier on to substrate, overlapping side and end laps to manufacturer's written recommendations.
- .3 Begin work at bottom of slopes, unroll and align on substrate. Ensure all edges are supported.
- .4 Remove release sheet and adhere membrane, working in sections to avoid wrinkles in membrane.

3.4 Insulation Installation

- .1 Install insulation to manufacturer's written instructions, with fastening meeting FM requirements to resist wind uplift pressure at corners, perimeter, and field of roof.
- .2 Ensure vapour retarder is clean and dry.
- .3 Do not apply more insulation than can be covered with roof membrane on same day.
- .4 Install tapered insulation under area of roofing to provide slopes as indicated on approved Shop Drawings.
- .5 Apply insulation layers with tightly butted, flush joints and fit tight to perimeter blocking and around roof projections.
- .6 Install cover boards to manufacturer's written instructions.
- .7 Stagger joints minimum 150 mm (6 inches) between layers of insulation and between rows. Tape joints of insulation in accordance with insulation manufacturer's instructions.
- .8 Mechanically Fastened Insulation: Mechanically fasten each layer of insulation to deck with fasteners and plates sized to suit insulation type and thickness.

3.5 Roof Membrane Installation

- .1 Install membranes to manufacturer's written instructions, and FM, provincial roofing association requirements.
- .2 Apply membrane; lap and seal edges and ends permanently waterproof.
- .3 Install membranes without wrinkles, air pockets or fishmouths.
- .4 Unroll membranes on substrate, aligning edge of first selvage with drain centre and parallel to roof edge.
- .5 Align membranes, maintaining uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps minimum 300 mm (12 inches).
- .6 Shingle joints on sloped substrate in direction of drainage.
- .7 Extend membrane up vertical surfaces minimum 200 mm (8 inches).
- .8 Cut and seal membranes around roof penetrations, tie-ins and other interfaces using manufacturer's recommended details and securement methods.

3.6 Flashings And Accessories

- .1 Apply flexible sheet base flashings to seal membrane to vertical elements.

3.7 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection testing.
- .2 Provide inspection services in accordance with Province of Ontario warranty requirements.
- .3 Monitor and report unacceptable conditions.
- .4 Correct identified defects or irregularities.

3.8 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- .3 Repair or replace defaced or disfigured finishes caused by Work of this section.

3.9 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Protect membrane from damage and wear during remainder of construction period where traffic must continue over finished roof membrane.
- .3 Protect adjacent building surfaces against damage from roofing work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Sheet metal roofing panels.
- .2 Underlayment.
- .3 Miscellaneous flashing and trims.
- .4 Soffits.
- .5 Downspouts.
- .6 Roof snow and/or ice guards.

1.2 Related Requirements

- .1 Section 05 12 00 - Structural Steel: Structural framing members, purlins and angles supporting roof deck.
- .2 Section 05 31 23 - Steel Roof Decking: Roof deck construction.
- .3 Section 06 15 00 - Wood Decking: Plywood roof deck substrate.
- .4 Section 06 10 00 - Rough Carpentry: Wood blocking and battens for metal roofing substrate profiles.
- .5 Section 07 71 23 - Manufactured Gutters and Downspouts.
- .6 Section 07 92 00 - Joint Sealants.

1.3 Reference Standards

- .1 AA (Aluminum Association) ADM-1 - Aluminum Design Manual, 2020 Edition.
- .2 ASTM A167-99(2009) (Withdrawn) - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .3 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM B209M-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .5 ASTM B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .6 ASTM B370-12(R2019) - Standard Specification for Copper Sheet and Strip for Building Construction.
- .7 ASTM D226/D226M-17 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- .8 ASTM D2178/D2178M-15a - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- .9 CCBDA (Canadian Copper and Brass Development Association) - Copper in Architecture.
- .10 CSA-O437 Series-93 (R2011) (Withdrawn) - Standards on OSB and Waferboard.
- .11 Province of Ontario Roofing Contractors Association - Roofing Specifications Manual.
- .12 SMACNA 1120-2012 - Architectural Sheet Metal Manual, 7th Edition.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other Work having a direct bearing on Work of this section.
 - .2 Coordinate with the Work of Section 07 46 16 for installing flashings.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on characteristics, including dimensions of components and profiles.
- .3 Shop Drawings:
 - .1 Indicate material profile, jointing pattern and details, types and locations of fasteners, flashings, gutters and downspouts, snow guards and all other components related to roof installation.

- .2 Provide Shop Drawings stamped and signed by the Delegated Design Professional.
- .3 Provide Shop Drawings for snow/ice guard loading as per building design.
- .4 Samples:
 - .1 For Initial Selection: Submit samples for each component with exposed factory-applied finish for colour selection.
 - .2 For Verification: Submit samples for each component with exposed factory-applied finish as follows:
 - .1 Metal Roof and Soffit Panels: 12 inches long by actual panel width.
 - .2 Trim, Closures and Other Exposed Accessories: 12 inches long.
 - .3 Snow Guards: 12 inches long.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Operation and Maintenance Data: Provide manufacturer's maintenance data for roofing system.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work to CRCA standard details and requirements. Maintain one (1) copy of document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the Work of this section with minimum five (5) five (5) years documented experience and approved by the manufacturer.

1.9 Mock-ups

- .1 Section 01 43 00: Provide mock-up of sheet metal roofing system.
- .2 Construct full length by two-panel full-width mock-up, including associated support system, insulation, flashings, closures and accessories, and snow guards, as required.
- .3 Locate where directed by Consultant.
- .4 Approved mock-up may remain as part of the Work.

1.10 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Stack roof materials on platforms or pallets, covered with suitable weathertight and ventilated covering.
- .3 Store materials in a manner to prevent twisting, bending, or abrasion.
- .4 Prevent contact with materials which may cause discolouration or staining.

1.11 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide a to include coverage for failure to meet specified requirements,
- .3 Finish Warranty: Include twenty (20) year coverage for degradation of metal finish.

Part 2 Products

2.1 Manufacturers

- .1 Agway Metals Inc.; Product: HF-12F Soffit (Canopy).
- .2 Soprema; Product: Sopravap'r (Self-Adhered).
- .3 Henry; Product: PE200HT (Self-Adhered).

- .4 Other acceptable manufacturers offering functionally and aesthetically equivalent products, with Consultant approval.

2.2 Description

- .1 System Description:
 - .1 Refer to Roof Assembly detailed on Drawings.

2.3 Metal Panel Materials

- .1 Refer to Drawings.
- .2 Galvanized Sheet Steel: Structural quality, smooth finish, 26 ga metal thickness.

2.4 System Components

- .1 Refer to Drawings for roof assembly.
- .2 Metal Roof Panels:
 - .1 Panel Profile: Standing seam.
 - .2 Panel Width: 18 inches.
 - .3 Seam Height: 2 inches.
 - .4 Colour: As selected from manufacturer's standard colour range.
- .3 Underlayment:
 - .1 Self-adhered rubberized asphalt high temperature underlayment.
 - .1 Product: Blueskin PE200HT, manufactured by Henry/Bakor.
 - .2 Product: Sopravap'r, manufactured by Soprema.
- .4 Metal Soffit Panels:
 - .1 HF-12F profile, fluted panels with integral stiffening ribs.
 - .2 Colour: selected by Owner from a standard range.
- .5 Flashing and Trim: Formed from same material, thickness and finish as roof panels, fabricated to details as shown on Drawings.
- .6 Closures: Manufacturer's standard foam and metal to suit roof panel profile.

2.5 Accessories

- .1 Refer to Drawings.
- .2 Miscellaneous Fasteners: Self-tapping screws, bolts, nuts, rivets and other fasteners as required to suit design load requirements and application; exposed fasteners to match panel material, with soft neoprene washers.
- .3 Panel Sealants:
 - .1 Sealant: ASTM C920, polyurethane or silicone, as recommended by manufacturer.
 - .2 Sealant Tape: Pressure-sensitive polyisobutylene compound sealant tape with release-paper backing.
 - .3 Butyl Sealant: ASTM C1311, solvent release butyl rubber.
- .4 Pipe Flashing: Pre-moulded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.6 Fabrication

- .1 Factory form roof panels to field dimensions in continuous lengths, spanning from eave to ridge, true to shape, square, and free from distortion or defects. Provide stiffening ribs into panel profile while forming.
- .2 Form standing seams per manufacturer's requirements for the material specified.
- .3 Form end panels terminating at walls, curbs, ridge/hip junctions with watertight pan folds, height equal to standing seam height.
- .4 Prepare roof panels with fold locks for panel attachment at eaves and valleys without the use of exposed fasteners.
- .5 Fabricate flashing and trim to roofing manual requirements.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting Work.
- .2 Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections.
- .3 Verify deck is dry and free of snow or ice, and decking joints solidly supported and fastened.
- .4 Verify roof openings and sleeves for components and systems penetrating metal roof system are properly positioned relative to seam locations before metal roof installation.

3.2 Installation - Roof Panels

- .1 Install metal roof panels on support clips to manufacturer's written instructions.
- .2 Align panels parallel to roof slope and square to eaves. Install fold lock at drip edge flashings to permit thermal movement of roof panels at eave edge.
- .3 Attach roof panels to supporting substrate with expansion clips in accordance with engineered Drawings, using minimum two (2) fasteners per clip.
- .4 Install notched and formed closures. Seal closures at changes in pitch, ridges and eaves, where required.
- .5 Back paint surfaces in contact with dissimilar materials.
- .6 Penetrations:
 - .1 Provide minimum 8 inch high roof curb where penetrations coincide with panel seams.
 - .2 Install metal crickets where curbs exceed 12 inches.
- .7 Roof Vents: Install continuous ridge vents to manufacturer's written instructions.

3.3 Flashings

- .1 Conform to SMACNA 1120.
- .2 Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- .3 Cleat and seam all joints.
- .4 Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

3.4 Downspouts

- .1 Refer to Drawings.
- .2 Join gutter sections with lapped and sealed joints.
- .3 Provide watertight end closures.
- .4 Join downspout sections with telescoping joints; install securely to wall with fasteners spaced maximum 1500 mm (60 inches) apart.
- .5 Connect downspouts to cast iron downspout boots at perimeter sidewalk level, connected to underground perimeter stormwater management piping.
 - .1 Watts; Product: RD-980 boots.
 - .2 Approved equal.

3.5 Snow Guards

- .1 Refer to Drawings.
- .2 Install snow guards up slope from eaves and valleys where indicated on Drawings. Install using method that will not penetrate roof panels.
- .3 Materials - Snow/Ice Guards:
 - .1 S-5!; Product: X-Gard 2.0.
 - .2 Approved equal.

3.6 Protection

- .1 Section 01 78 23: Protecting installed Work.

- .2 Do not permit traffic over unprotected roof surface.

End of Section

Part 1 General

1.1 Section Includes

- .1 Tested and listed firestopping systems.

1.2 Related Requirements

- .1 Section 05 12 00 - Structural Steel: Building structural substrate surfaces.
- .2 Section 07 27 00 - Air Barriers: Air barrier materials to adjacent insulation.
- .3 Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.3 Reference Standards

- .1 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .2 ASTM E119-19 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- .3 ASTM E814-13a (2017) - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- .4 ASTM E1966-15(2019) - Standard Test Method for Fire-Resistive Joint Systems.
- .5 CAN/ULC-S101-14 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .6 CAN/ULC-S102-18 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .7 CAN/ULC-S102.2-18 - Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.
- .8 CAN/ULC-S115-18 - Standard Method of Fire Tests of Firestop Systems.
- .9 FM (Factory Mutual) - FM 4991-2013 - Approval Standard for Firestop Contractors.
- .10 FCIA (Firestop Contractors International Association) - Manual of Practice.
- .11 NFPA 251 - Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 edition.
- .12 OPL (Omega Point Laboratories).
- .13 UL 263-2011 - Standard for Fire Tests of Building Construction and Materials (14th Edition).
- .14 UL 1479-2015 - Standard for Fire Tests of Through-Penetration Firestops (4th Edition).
- .15 UL 1709-2017 - Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel (5th Edition).
- .16 UL 2079-2015 - Standard for Tests for Fire Resistance of Building Joint Systems (5th Edition).
- .17 ULC-FR-17 - Fire Resistance Directory (2017 Edition).
- .18 WHI (Intertek/Warnock Hershey).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination: Coordinate with other work having a direct bearing on work of this section.
- .3 Sequencing: Coordinate and sequence firestopping installation with all affected trades.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide manufacturer's written data on product characteristics, performance, and limitation criteria.
- .3 System Design Listings: Submit system design listings including illustrations from a qualified nationally recognized testing and inspection agency applicable to each firestop configuration.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

- .2 Installation Data: Manufacturer's written special preparation and installation requirements and tested and listed firestop systems designs.
- .3 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer. Obtain firestop systems for complete project, from a single primary firestop systems manufacturer, to the greatest extent possible.

1.9 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Provide mock-up of applied firestopping assemblies.
- .3 Apply min. 16 sq ft to a representative substrate surface.
- .4 Apply firestop material to a representative penetrated stud wall substrate surface.
- .5 Obtain Consultant's acceptance of mock-up before start of Work.
- .6 Retain and maintain accepted mock-ups during construction in undisturbed condition as a standard for judging completed work.
- .7 Locate where directed by Consultant.
- .8 Approved mock-up may remain as part of the Work.

1.10 Regulatory Requirements

- .1 Conform to applicable code for fire resistance ratings and surface burning characteristics.
- .2 Provide certificate of compliance from authority having jurisdiction indicating approval of materials, tested and listed systems or engineering judgments used.

1.11 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver firestopping products in original, unopened containers with labels intact and legible, identifying product and manufacturer.
- .3 Store and handle firestopping materials to manufacturer's instructions.

1.12 Site Conditions

- .1 Ambient Conditions:
 - .1 Do not apply materials when temperature of substrate material and ambient air is below 15 degrees C (60 degrees F).
 - .2 Maintain this minimum temperature before, during, and for three (3) days after installation of materials.
 - .3 Provide ventilation to manufacturer's instructions in areas to receive solvent cured materials.

Part 2 Products

2.1 Manufacturers

- .1 Acceptable Manufacturers:
 - .1 3M Fire Protection Products.
 - .2 BALCO, Inc.
 - .3 HILTI, Inc.
 - .4 Specified Technologies, Inc
 - .5 Thermal Ceramics, Inc.

- .6 Thermafiber, Inc.
- .7 A/D Fire Protection Systems Inc.
- .8 Tremco Ltd.
- .2 Substitutions: Not permitted..

2.2 Description

- .1 System Description:
- .2 Tested and listed firestopping systems consisting of a material or materials, the wall or floor assembly, and penetrating items or gaps, assembled or placed in spaces, gaps, joints and building perimeters, to restore the fire resistance rating and or smoke resistant properties of a fire resistance rated assembly or smoke resistant assembly.
- .3 Regulatory Requirements:
 - .1 Conform to applicable code for fire resistance ratings and surface burning characteristics.

2.3 Performance / Design Criteria

- .1 Materials, accessories and application procedures listed by ULC-FR, or tested to CAN/ULC-S115 to comply with applicable building code requirements.
- .2 Firestopping Materials: CAN/ULC-S101, to achieve a fire rating as noted on Drawings.
- .3 Surface Burning Characteristics: CAN/ULC-S102 or CAN/ULC-S102.2, as applicable.
- .4 Smoke Resistance: For areas where smoke resistance is required, provide firestop systems with L-ratings of maximum 25.4l/sec/sq m (5.0 cfm/sq ft) opening area.
- .5 Environmental Resistance: Systems to be resistant to environmental conditions they will be exposed to, as apparent at design stage.

2.4 Materials

- .1 Fire Stopping Systems and Materials: Tested and listed by CAN/ULC, and conforming to construction type, penetrant type, annular space requirements and fire rating involved in each separate instance.

2.5 Accessories

- .1 Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- .2 Forming/Packing Material: Permanent type, suitable for application.
- .3 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping are ready to receive the work of this section.
- .3 Verify tested and listed systems selected are applicable to the conditions encountered.
- .4 Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Preparation

- .1 Clean substrate surfaces as recommended in manufacturer's written instructions, of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material and performance of firestop system for fire or smoke resistant situations.
- .2 Remove incompatible materials which may affect bond.
- .3 Install damming or backing materials to arrest liquid material leakage.

3.3 Application

- .1 Apply primer and firestopping materials to manufacturer's written instructions.

- .2 Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping to tested and listed system or engineering judgment.
- .3 Apply firestopping material, thickness sufficient to achieve rating, to uniform density and texture.
- .4 Compress fibred material to achieve a density of 40% of its uncompressed density.
- .5 Place intumescent coating in sufficient coats to achieve rating required.
- .6 Dam Material: Remove dam material after firestopping material has cured.

3.4 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Clean adjacent surfaces of firestopping materials.

3.5 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Protect adjacent surfaces from damage by material installation.

End of Section

Part 1 General

1.1 Section Includes

- .1 Preparing substrate surfaces.
- .2 Sealant and joint backing.
- .3 Structural sealant for glazing assemblies.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-in-Place Concrete: Sealants required in conjunction with cast-in-place concrete.
- .2 Section 04 26 16 - Reinforced unit masonry.
- .3 Section 07 27 00 - Air Barriers: Sealants required in conjunction with air barrier.
- .4 Section 07 84 00 - Firestopping: Sealants required in conjunction with firestopping.
- .5 Section 07 46 16 - Preformed Metal Siding: Sealants required in conjunction with siding.
- .6 Section 08 11 13 - Metal Doors and Frames: Sealants required in conjunction with door frames.
- .7 Section 08 51 13 - Aluminum Windows: Sealants required in conjunction with aluminum windows.
- .8 Section 08 81 00 - Glass and Glazing: Sealants required in conjunction with glazing methods.

1.3 Reference Standards

- .1 ASTM C834-17 - Standard Specification for Latex Sealants.
- .2 ASTM C919-19 - Standard Practice for Use of Sealants in Acoustical Applications.
- .3 ASTM C920-18 - Standard Specification for Elastomeric Joint Sealants.
- .4 ASTM C1184-18e1 - Standard Specification for Structural Silicone Sealants.
- .5 ASTM C1193-16 - Standard Guide for Use of Joint Sealants.
- .6 ASTM C1311-14 - Standard Specification for Solvent Release Sealants.
- .7 ASTM C1330-18 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- .8 ASTM C1401-14 - Standard Guide for Structural Sealant Glazing.
- .9 ASTM C1481-12(2017) - Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS).
- .10 ASTM E330/E330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with all sections referencing this section.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations and colour availability.
- .3 Structural Sealant Joint Design: Provide calculations for structural bite, dead load support, glueline thickness, shear, and other parameters.
- .4 Shop Drawings: Indicate sealant joints and dimensions, materials, structural bite, glueline thickness, joint profile, and support framing.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

- .2 Installation Data: Manufacturer's special installation requirements.
 - .1 Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform work to sealant and EIFS manufacturer's requirements for preparation of surfaces and material installation instructions.
- .3 Perform sealant application work to ASTM C1193 and ASTM C1481.
- .4 Perform structural sealant application work to ASTM C1401.
- .5 Perform acoustical sealant application work to ASTM C919.
- .6 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.9 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Provide mock-up to include sealant joints in conjunction with other aspects of the Work.
- .3 Construct mock-up with specified sealant types and with other components noted.
- .4 Locate where directed by Consultant.
- .5 Approved mock-up may remain as part of the Work.

1.10 Site Conditions

- .1 Ambient Conditions:
 - .1 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.11 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Warranty: Provide a five (5) year warranty for failure to meet specified requirements including coverage for installed sealants and accessories which fail to achieve water tight seal or air tight seal, exhibit loss of adhesion or cohesion, or do not cure.
- .3 Manufacturer's Warranty: Provide manufacturer's twenty (20) year material warranty for installed silicone sealant.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Sealant Design: Design structural sealant to withstand specified loads without breakage, loss, failure of seals, product deterioration, and other defects.
- .2 Design installed sealant to withstand:
 - .1 Loads: Design and size to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of panel:
 - .1 As calculated in accordance with applicable code.
 - .2 As measured in accordance with ASTM E330/E330M.
 - .2 Seismic loads and sway displacement.
 - .3 Movement from ambient temperature range of 49 degrees C (120 degrees F).
 - .4 Movement and deflection of structural support framing.
 - .5 Water and air penetration.

2.2 Sealants

- .1 As specified on Drawings, and congruent with adjacent materials.
- .2 Butyl Sealant (Type F): ASTM C1311, single component, solvent release, non-skinning, non-sagging, black colour.
 - .1 Elongation Capability 7.5%.
 - .2 Service Temperature Range -28 to 82 degrees C.
 - .3 Shore A Hardness Range 10 to 30.
- .3 Acoustic Sealant (Type G): CAN/CGSB 19.21, Acoustic grade, single component, solvent release, non-skinning, non-sagging, Grey colour.
 - .1 Elongation Capability 7.5%.
 - .2 Service Temperature Range -28 to 82 degrees C .
 - .3 Shore A Hardness Range 10 to 30.
 - .4 Product: Acoustical Sealant, manufactured by Tremco Commercial Sealants and Waterproofing.

2.3 Accessories

- .1 Primer: Non-staining type, as 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 Joint Backing: ASTM C1330, round, open cell; polyethylene foam rod, oversized 30% to 50% larger than joint width.
- .4 Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- .5 Masking tape: Non-staining, non-absorbent type compatible with sealant and adjacent surfaces.
- .6 Setting Blocks and Spacers: Compatible with silicone sealant and recommended by sealant manufacturer.
- .7 Colour of Sealants: To be selected by the Architect. Colours of sealant to change where wall colours change (i.e. banding).

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that substrate surfaces and joint openings are clean, dry, and free of frost and ready to receive work.
- .3 Verify that joint backing and release tapes are compatible with sealant and EIFS materials.

3.2 Preparation

- .1 Remove loose materials and foreign matter which might impair adhesion of sealant.
- .2 Clean and prime joints to sealant manufacturer's written instructions.
- .3 Perform preparation to ASTM C1193 for solvent release and latex base sealants.
- .4 Perform preparation to sealant manufacturer's written instructions.
- .5 Protect elements surrounding the work of this section from damage or disfiguration.

3.3 Installation

- .1 Perform installation in accordance with ASTM C1193 for solvent release and latex base sealants and ASTM C919 for acoustical sealants.
- .2 Install sealant to sealant manufacturer's written instructions.
- .3 Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.
- .4 Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- .5 Install bond breaker where joint backing is not used.
- .6 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

- .7 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- .8 Tool joints concave.

3.4 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
- .2 Manufacturer's Services:
 - .1 Section 01 78 00: Prepare and start components.
 - .2 Monitor and report installation procedures and unacceptable conditions.

3.5 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Clean adjacent soiled surfaces.

3.6 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Remove masking tape and excess sealant.
- .3 Protect sealants until cured, remove temporary glass supports.

End of Section

Part 1 General

1.1 Section Includes

- .1 Hollow metal steel frames.
- .2 Pressed steel doors.
- .3 Exterior and interior glazed light frames; glass and glazing.

1.2 Related Requirements

- .1 Section 04 05 10 - Mortar and Masonry Grout: Masonry grout fill of metal frames.
- .2 Section 07 92 00 - Joint Sealants.
- .3 Section 08 14 16 - Flush wood doors.
- .4 Section 08 71 00 - Door Hardware - General: Hardware, silencers, weatherstripping.
- .5 Section 08 80 00 - Glazing.
- .6 Section 09 91 00 - Painting: Field painting of doors.
- .7 Section 13 34 23 - Fabricated Structures.

1.3 Reference Standards

- .1 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM B29-19 - Standard Specification for Refined Lead.
- .3 ASTM B749-14 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
- .4 ASTM C553-13(2019) - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .5 ASTM C578-19 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- .6 ASTM C591-19a - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- .7 ASTM C665-17 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .8 ASTM C1289-19 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .9 ASTM E90-09(2016) - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .10 ASTM E413-16 - Classification for Rating of Sound Insulation.
- .11 CAN/ULC-S104-15 - Standard Method for Fire Tests of Door Assemblies.
- .12 CAN/ULC-S105-16 - Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
- .13 CAN/ULC-S701.1-2017 - Standard for Thermal Insulation, Polystyrene Boards.
- .14 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .15 CAN/ULC-S704.1-2017 - Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .16 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .17 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .18 FM (Factory Mutual).
- .19 CSDMA (Canadian Steel Door Manufacturers Association).
 - .1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2009.
 - .2 Recommended Selection and Usage Guide for Commercial Steel Doors and Frame Products, 2009.
- .20 NFPA 80 - Standard for Fire Doors and Other Opening Protectives, 2019 Edition.

- .21 NFPA 252 - Fire Tests of Door Assemblies, 2017 Edition.
- .22 ULC-FR-17 - Fire Resistance Directory (2017 Edition).
- .23 UL - Fire Resistance Directory.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with frame opening construction, door, and hardware installation.
- .3 Sequencing: Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

1.5 Action Submittals

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

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.
- .3 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Conform to requirements of CSDMA. Maintain one (1) of document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.9 Delivery, Storage, And Handling

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

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Fire Rated Door and Frame Construction: Labelled and listed to NFPA 252 CAN/ULC-S104.
 - .2 Installed Door and Frame Assembly: Conform to NFPA 80 for fire rated class as indicated.

2.2 Materials

- .1 Sheet Steel: Galvanized steel to ASTM A653/A653M, commercial grade (CS), Type B.

- .2 Reinforcement Channel: CSA-G40.20/G40.21, Type 44W, ZF75/ A25 coating designation to ASTM A653/A653M.

2.3 Door Core Materials

- .1 Honeycomb Core: Structural small cell 25.4 mm (1 inch) maximum kraft paper honeycomb; weight 36.3 kg (80 lb) per ream minimum, density 16.5 kg/cu m (1.03 pcf) minimum, sanded to required thickness.
- .2 Polyisocyanurate Core: ASTM C1289, (faced) ASTM C591 (unfaced), rigid modified polyisocyanurate, closed cell board, 32 kg/cu m (2.0 pcf), thermal value minimum per schedules.
- .3 Temperature Rise Rated (TRR): Core composition to provide fire-protection rating and limit temperature rise on unexposed side of door to 250 degrees C (450 degrees F) at 30 or 60 minutes, as determined by governing code requirements, core tested as part of a complete door and frame assembly, to CAN/ULC-S104, and listed by a nationally recognized testing agency having a factory inspection service.

2.4 Adhesives

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

2.5 Primers

- .1 Primer: Rust inhibitive touch-up only.

2.6 Accessories

- .1 Door Silencers: Single stud rubber/neoprene.
- .2 Exterior Top Caps: Rigid polyvinylchloride (PVC) extrusion.
- .3 Frame Thermal Breaks: Rigid polyvinylchloride (PVC) extrusion.
- .4 Removable Glazing Stops: Formed galvanized steel channel, minimum 16 mm (5/8 inch) high, accurately fitted, butted at corners and fastened to frame sections with counter-sunk tamper proof sheet metal screws.
- .5 Bituminous Coating: Fibred asphalt emulsion.
- .6 Weatherstripping: Resilient rubber set in steel frame.
- .7 Weatherstripping: Specified in Section 08 71 00.
- .8 Louvres:
 - .1 Material and Finish: Roll formed aluminum; precoated.
 - .1 Colour: As selected by Owner from a standard range.
- .9 Glass: As specified in Section 08 80 00.

2.7 Fabrication - Doors

- .1 Exterior Doors: Insulated core construction.
- .2 Interior Doors: Laminated core construction.
- .3 Longitudinal Edges: Mechanically inter-locked with no visible edge seams.
- .4 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier.
- .5 Reinforce for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .6 Top and Bottom Channels: Inverted, recessed, welded steel channels.
- .7 Exterior Door: Flush PVC top caps.
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

2.8 Welded Stiffener Construction

- .1 Reinforce doors with vertical stiffeners, welded to each face sheet at 150 mm (6 inches) on center maximum.

- .2 Fill voids between vertical stiffeners with fibreglass batt insulation.

2.9 Fabrication - Frames

- .1 Exterior Frames: 1.6 mm (16 ga) thick base metal thickness.
 - .1 Frames: Welded type construction, thermally broken.
 - .2 Transom Frames, Sidelight and Window Assemblies: Welded type construction, thermally broken.
- .2 Interior Frames: 1.6 mm (16 ga) thick base metal thickness.
 - .1 Door Frames and Window Assemblies: Welded type construction.
 - .2 Transom Frames: Welded type construction.
 - .3 Sidelight Assemblies: Welded type construction.
- .3 Mullions for Double Doors: Fixed, Removable type, of same profiles as jambs.
- .4 Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.
- .5 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier. Provide mortar guard boxes.
- .6 Reinforce frames wider than 1 200 mm (48 inches) with roll formed steel channels fitted tightly into frame head, flush with top.
- .7 Prepare frames for silencers. Provide three (3) single silencers for single doors and mullions of double doors on strike side. Provide two (2) single silencers on frame head at double doors without mullions.
- .8 Configure exterior frames with special profile to receive recessed weatherstripping.
- .9 Each fire rated door or frame shall bear the appropriate factory-applied stamp or seal, certifying its construction.
- .10 Fabricate frames to suit masonry wall coursing with 50 mm head member.

2.10 Finishes

- .1 Factory Finish: or field painted; colour to be determined by the Owner from standard range.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that opening sizes and tolerances are acceptable; check floor area within path of door swing for flatness.
- .3 Verify doors and frames are correct size, swing, rating and opening number.
- .4 Remove temporary shipping spreaders.

3.2 Installation

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

- .13 Install louvers, glazing and door silencers.
- .14 Finish paint as specified in Section 09 91 00.
- .15 Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 Erection Tolerances

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

End of Section

Part 1 General

1.1 Section Includes

- .1 Electric operated overhead sectional door.
- .2 Operating hardware, supports and controls.

1.2 Related Requirements

- .1 Section 05 50 00 - Metal Fabrications: Steel channel opening frame.
- .2 Section 06 10 00 - Rough Carpentry: Rough wood framing for door opening.
- .3 Section 07 92 00 - Joint Sealants: Perimeter sealant and backup materials.
- .4 Section 08 80 00 – Glazing: Glass for door lites.

1.3 Reference Standards

- .1 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM B209M-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .4 ASTM B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .5 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .6 ASTM E330/E330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .7 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .8 CAN/CGSB 11.3-M87 (Withdrawn) - Hardboard.
- .9 CSA-C22.1-18 - Canadian Electrical Code, Part I, Safety Standard for Electrical Installations (24th Edition).
- .10 CSA-C22.2 No. 100-14 (R2019) - Motors and Generators.
- .11 NEMA MG 1-2016 - Motors and Generators.
- .12 UL - Fire Resistance Directory.
- .13 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations and installation details.
- .3 Product Data: Provide component construction, anchorage method and hardware.
- .4 Samples: Submit two (2) panel finish samples, 4 inch in size, illustrating colour and finish.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements, special procedures and perimeter conditions requiring special attention.

1.6 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Operation and Maintenance Data:
 - .1 Include electrical control adjustments.

- .3 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.8 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Correct defective Work within a five (5) year period after Date of Substantial Completion.
- .3 Warranty: Include coverage for electric motor.
- .4 Provide five (5) year manufacturer warranty for electric operating equipment.

Part 2 Products

2.1 Manufacturers

- .1 C.H. I. Overhead Doors; Product: Thermally-Broken Insulated Steel Sandwich Door.
- .2 Richards-Wilcox; Product: Thermatite T200 Series.
- .3 Haas Door; Product: Insulated Steel 2000 Series.
- .4 Door Lifting Equipment: Manaras-Opera.
- .5 Substitutions: Refer to Section 01 25 00.

2.2 Description

- .1 System Description:
 - .1 Panels: Steel, wood-grained textured finish, glazing/lites as shown on drawings.
 - .2 Lift Type: Standard lift operating style with track and hardware.
 - .3 Operation: Electric with Chain hoist as backup.
- .2 Regulatory Requirements:
 - .1 Conform to applicable code for motor and motor control requirements.
 - .2 Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified.

2.3 Performance / Design Criteria

- .1 Loads: Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of wall:
 - .1 As calculated in accordance with applicable code.
 - .2 As measured in accordance with ASTM E330/E330M.

2.4 Materials

- .1 Sheet Steel: ASTM A653/A653M galvanized to ZF180 coating designation, plain surface; pre-coated with silicone polyester finish.
- .2 Insulation: Rigid polyurethane; R-value 17.54, same thickness as core framing members bonded to facing.
- .3 Metal Primer Paint: Zinc chromate type.

2.5 Panel Construction

- .1 Door Nominal Thickness: 50 mm (2 inches) thick.
- .2 Glazing: Section 08 80 00.

- .3 Glazed Lites: As indicated on drawings; set in place with resilient glazing channel.

2.6 Door Components

- .1 Track: Rolled galvanized steel, 3.0 mm (0.120 inch) thick; 75 mm (3 inch) wide, continuous one piece per side; galvanized steel mounting brackets 6 mm (1/4 inch) thick.
- .2 Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- .3 Door Operator(s) & Controls:
 - .1 Manaras-Opera; Product: Rapido RSH Jackshaft Operator. Refer to schedules on Drawings.
- .4 Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables. Manual operation with maximum exertion of 25 lbs, force.
- .5 Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
- .6 Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- .7 Head Weatherstripping: EPDM rubber seal, one piece full length.
- .8 Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

2.7 Finishes

- .1 Exterior Surfaces: Factory precoat, colour as selected by Owner:
 - .1 Fire Services: Red, to match fire apparatus.
 - .2 Paramedics: Blue, to match ambulance service colours.
- .2 Interior Surfaces: Precoat, colour as selected by Owner from standard range.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- .3 Verify that electric power is available and of the correct characteristics.

3.2 Preparation

- .1 Prepare opening to permit correct installation of door unit to perimeter air and vapour barrier seal.
- .2 Apply primer to wood frame.

3.3 Installation

- .1 Install door unit assembly to manufacturer instructions.
- .2 Anchor assembly to wall construction and building framing without distortion or stress.
- .3 Securely brace door tracks suspended from structure. Secure tracks to structural members only.
 - .1 Welding to building structure is not permitted.
 - .2 Bottom of door tracks not to be cast into floor materials.
- .4 Fit and align door assembly including hardware.
- .5 Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
- .6 Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 92 00.
- .7 Install perimeter trim closures.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.

- .2 Maximum Variation from Plumb: 1.5 mm (1/16 inch).
- .3 Maximum Variation from Level: 1.5 mm (1/16 inch).
- .4 Longitudinal or Diagonal Warp: Plus or minus 3 mm (1/8 inch), from 3 m (10 ft) straight edge.
- .5 Maintain dimensional tolerances and alignment with adjacent work.

3.5 Field Quality Control

- .1 Manufacturer's Services:
 - .1 Section 01 78 10: Prepare and start components.
 - .2 Ensure the operation and adjustments to door assembly for specified operation.

3.6 Adjusting

- .1 Adjust door assembly to smooth operation and in full contact with weatherstripping.

3.7 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Clean glass, frames, and doors.
- .3 Remove temporary labels and visible markings.

3.8 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Do not permit construction traffic through overhead door openings after adjustment and cleaning.

End of Section

Part 1 General

1.1 Section Includes

- .1 Aluminum windows.
- .2 Glazing and infill panels.
- .3 Operating hardware.
- .4 Insect screens.
- .5 Sealants.

1.2 Related Requirements

- .1 Section 05 50 00 - Metal Fabrications: Steel lintels.
- .2 Section 06 10 00 - Rough Carpentry: Wood framed openings; perimeter shims.
- .3 Section 07 21 13 - Board Insulation.
- .4 Section 07 21 16 - Blanket Insulation.
- .5 Section 07 27 00 - Air Barriers: Perimeter air seal between window frame and adjacent construction.
- .6 Section 07 92 00 - Joint Sealants: Perimeter sealant and back-up materials.
- .7 Section 08 41 13 - Aluminum Framed Entrances and Storefronts: Operable sash within glazing system.
- .8 Section 08 81 00 – Glass Glazing.

1.3 Reference Standards

- .1 AA (Aluminum Association) DAF 45-2003 (R2009) - Designation System for Aluminum Finishes.
- .2 AAMA CW-10-15 - Care and Handling of Architectural Aluminum from Shop to Site.
- .3 AAMA CW-11-85 - Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing.
- .4 AAMA/WDMA/CSA 101/I.S.2/A440-17 - NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
- .5 AAMA 611-14 - Voluntary Specification for Anodized Architectural Aluminum.
- .6 AAMA 1503-09 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections.
- .7 AAMA 2603-17a - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- .8 AAMA 2605-17a - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- .9 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .10 ASTM B209M-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .11 ASTM B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .12 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .13 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .14 ASTM E283/E283M-19 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .15 ASTM E330/E330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .16 ASTM E331-00(2016) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- .17 ASTM F588-17 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

- .18 CSA-A440S1-19 - Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights.
- .19 CSA-A440.2-19/A440.3-19 - Fenestration Energy Performance/User Guide to CSA-A440.2-14, Fenestration Energy Performance.
- .20 CAN/CSA-A440.4-19 - Window, Door, and Skylight Installation.
- .21 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .22 SMA 1201R-2013 - Specification for Insect Screens for Windows, Sliding Doors, and Swinging Doors.
- .23 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.
- .3 Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work and installation requirements.
- .4 Samples:
 - .1 Submit two (2) samples of frame material for colour selection by Owner.
 - .2 Submit two (2) samples of operating hardware.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.9 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Protect factory finished aluminum surfaces with strippable coating, and wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.10 Site Conditions

- .1 Ambient Conditions:
 - .1 Do not install sealants when ambient temperature is less than 5 degrees C (40 degrees F).
 - .2 Maintain this minimum temperature during and after installation of sealants.

1.11 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Correct defective Work within a five (5) year period after Date of Substantial Completion.
- .3 Provide five (5) year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

- .4 Warranty: Include coverage for degradation of colour finish.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Windows: Conform to CSA-A440S1 CSA 101/I.S.2/A440, Product Designation Class LC-PG25-HS; and labeled by AAMA CSA WDMA.
- .2 Forced Entry Resistance: ASTM F588, tested to performance Grade 30.
- .3 System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall:
- .4 To AAMA/WDMA/CSA 101/I.S.2/A440, Canadian Supplement
 - .1 As calculated in accordance with applicable code.
- .5 Member Deflection: Limit member deflection to flexure limit of glass of the longer dimension with full recovery of glazing materials.
- .6 Assembly: To accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing, deflection of lintel.
- .7 Thermal Transmittance: U-Value per building code requirements, when tested to CSA-A440.2/A440.3.
- .8 Air Infiltration/Exfiltration: Limit air infiltration/exfiltration for operable units to A3 Level 0.5 L/s/sq m (0.10 cfs/sq ft) fixed units, 0.2 L/s/sq m (0.04 cfm/sq ft) of wall area, measured at a reference differential pressure across assembly of 75 Pa (1.57 psf) as measured to ASTM E283.
- .9 Vapour Seal: Limit vapour seal with interior atmospheric pressure of 25 mm (1 inch) sp, 22 degrees C (72 degrees F), 40% RH without seal failure.
- .10 Water Leakage: None, in accordance with AAMA/WDMA/CSA/101/I.S.2/A440, when measured in accordance with ASTM E331.
- .11 System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.
- .12 Air and Vapour Seal: Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound. Position thermal insulation on exterior surface of air barrier and vapour retarder.

2.2 Materials

- .1 Extruded Aluminum: 6063-T5 alloy and temper.
- .2 Steel Sections: Profiled to suit mullion sections.
- .3 Fasteners: Stainless steel.

2.3 Components

- .1 Frames: Aluminum, thermally broken, profile size, as required.
- .2 Reinforced Mullion: Extruded aluminum profile, size as required, with integral reinforcement of shaped steel structural section.
- .3 Sills: Extruded aluminum; sloped for positive wash; fit under sash leg to 13 mm (1/2 inch) beyond wall face; one-piece full width of opening jamb angles to terminate sill end.
- .4 Insect Screens: To meet performance requirements of SMA 1201R, with rolled aluminum frame of rectangular sections, nominal size similar to operable glazed unit; aluminum strands; 14/18 mesh size.
- .5 Operable Sash Weather Stripping: Nylon pile; permanently resilient, profiled to effect weather seal.
- .6 Fasteners: Stainless steel.

2.4 Glass And Glazing Materials

- .1 Glass and Glazing Materials: As specified in Section 08 81 00.
- .2 Refer to schedules on Drawings.

2.5 Sealant Materials

- .1 Sealant and Backing Materials: As specified in Section 07 92 00.

- .2 Sealant and Backing Materials: As specified in Section 07 92 00 of Types described below.

2.6 Hardware

- .1 Hardware: Except as noted, comply with the requirements of BHMA A156.18.
- .2 Sash lock: Lever handle with cam lock. Provide long pole handle.
- .3 Operator: Geared rotary handle fitted to projecting sash arms with limit stops.
- .4 Threshold: Extruded aluminum, thermally broken, sloped to exterior.
- .5 Bottom Rollers: Stainless steel, adjustable.
- .6 Limit Stops: Resilient rubber.
- .7 Insect Screen Hardware: Fit frames with adjustable hardware.

2.7 Fabrication

- .1 Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
- .3 Prepare components to receive anchor devices. Fabricate anchors.
- .4 Arrange fasteners and attachments to ensure concealment from view.
- .5 Prepare components with internal reinforcement for operating hardware.
- .6 Provide internal reinforcement in mullions with galvanized steel members to maintain rigidity.
- .7 Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- .8 Assemble insect screen frame, mitre and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with spring loaded steel pin retainers, four (4) per frame.
- .9 Double weatherstrip operable units.
- .10 Factory glaze window units.

2.8 Finishes

- .1 Clear Anodic Coating: AAMA 611, Class I, AA-M12C22A41; Class II, AA-M12C22A31.
 - .1 Location: Exterior exposed aluminum surfaces.
 - .2 Location: refer to schedules on Drawings.
- .2 Colour Anodic Coating: AAMA 611, Class I, AA-M12C22A44, Class II, AA-M12C22A34.
 - .1 Colour: As selected from a standard range.
 - .2 Location: Exterior exposed aluminum surfaces.
- .3 Operator and Exposed Hardware: Enameled to colour as selected from a standard range.
- .4 Concealed Steel Items: Hot-dip galvanized to ASTM A123/A123M, coating thickness appropriate grade for type and size of steel material indicated.
- .5 Concealed Steel Items: Primed with iron oxide paint.
- .6 Apply one (1) coat of bituminous paint to concealed steel and aluminum surfaces in contact with cementitious or dissimilar materials.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify wall openings and adjoining air and vapour seal materials are ready to receive work of this Section.

3.2 Installation

- .1 Install window frames, glazing and hardware to manufacturer's written instructions.
- .2 Install window assembly to CAN/CSA-A440.4.

- .3 Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- .4 Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- .5 Install sill and sill end angles.
- .6 Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- .7 Coordinate attachment and seal of perimeter air barrier and vapour retarder materials.
- .8 Install operating hardware.
- .9 Install glass and infill panels as specified in Section 08 81 00.
- .10 Install perimeter sealant to method required to achieve performance criteria.

3.3 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Material and Unit Size Tolerances: As specified in AAMA/WDMA/CSA 101/I.S.2/A440.

3.4 Adjusting

- .1 Adjust hardware for smooth operation and secure weathertight closure.

3.5 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Remove protective material from factory finished aluminum surfaces.
- .3 Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- .4 Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

End of Section

Part 1 General

1.1 Section Includes

- .1 Hardware for doors.
- .2 Thresholds.
- .3 Weatherstripping, seals, and door gaskets.

1.2 Related Requirements

- .1 Section 08 11 13 - Metal Doors and Frames.
- .2 Section 08 14 16 - Flush Wood Doors.
- .3 Section 08 33 23 - Overhead Coiling Doors: Lockable coiling doors.
- .4 Section 08 41 13 - Aluminum Framed Entrances and Storefronts: Hardware for same except cylinders.
- .5 Section 10 14 00 - Signage.

1.3 Reference Standards

- .1 CAN/ULC-S104-15 - Standard Method for Fire Tests of Door Assemblies.
- .2 CAN/ULC-S132-16 - Standard for Emergency Exit and Emergency Fire Exit Hardware.
- .3 CSDMA (Canadian Steel Door Manufacturers Association).
- .4 DHI (Door and Hardware Institute Canada) - AHC and EHC certification programs.
- .5 DHI (Door Hardware Institute) - A115 series.
- .6 DHI WDHS-3 (Inactive) - Recommended Locations for Architectural Hardware for Flush Wood Doors (1993).
- .7 BHMA (Builders Hardware Manufacturers Association) - A156 Series Standards.
- .8 NFPA 80 - Standard for Fire Doors and Other Opening Protectives, 2019 Edition.
- .9 NFPA 252 - Fire Tests of Door Assemblies, 2017 Edition.
- .10 UL 10B-2008 - Fire Tests of Door Assemblies (10th Edition).
- .11 UL 305-2012 - Standard for Panic Hardware (6th Edition).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination: Coordinate with other work having a direct bearing on work of this section.
 - .1 Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
 - .2 Coordinate Owner's keying requirements during the course of the Work.
- .3 Sequencing: Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Indicate locations and mounting heights of each type of hardware, schedules, catalogue cuts, electrical characteristics and connection requirements.
 - .2 Submit manufacturer's parts lists and templates.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Operation and Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- .3 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- .4 Record Documentation:
 - .1 Record actual locations of installed cylinders and their master key code.
 - .2 Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.8 Maintenance Material Submittals

- .1 Section 01 78 23: Maintenance and extra material requirements.
- .2 Tools:
 - .1 Provide special wrenches and tools applicable to each different or special hardware component.
 - .2 Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.9 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work to the following requirements:
 - .1 BHMA A156 series.
 - .2 DHI A115 series.
 - .3 DHI WDHS-3.
 - .4 CSDMA.
 - .5 NFPA 80.
 - .6 NFPA 252.
 - .7 CAN/ULC-S132.
 - .8 CAN/ULC-S104.
 - .9 Maintain one (1) copy of each document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.
- .5 Hardware Supplier Personnel: Employ a qualified person to assist in the work of this section.
- .6 Hardware Supplier Personnel: Employ a qualified person to assist in the electronics and controls work of this section.

1.10 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.11 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide five (5) year manufacturer warranty for door closers.

Part 2 Products

2.1 Manufacturers

- .1 Refer to Schedules on Drawings.
- .2 Latch Sets: Schlage, and as indicated on drawings.

- .3 Exit Devices: Von Duprin or approved equal.
- .4 Substitutions: Refer to Section 01 25 00.
- .5 Special: as indicated on drawings.

2.2 Keying

- .1 Refer to Schedules on Drawings.
- .2 Door Locks: Master Keyed and keyed in like groups: refer to Drawings.
- .3 Include construction keying only as required.

2.3 Finishes

- .1 Finishes: Satin Nickel, unless noted otherwise on Drawings.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that doors and frames are ready to receive work and dimensions are as required.
- .3 Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 Installation

- .1 Install hardware to manufacturer's written instructions.
- .2 Use templates provided by hardware item manufacturer.
- .3 Mounting heights for hardware from finished floor to centre line of hardware item:
 - .1 Refer to: Ontario Building Code, to all current revisions at time of construction.

3.3 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing, and adjusting.

3.4 Adjusting

- .1 Adjust hardware for smooth operation.

3.5 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Do not permit adjacent work to damage hardware or finish.

End of Section

Part 1 General

1.1 Section Includes

- .1 Glass and glazing for sections referencing this section for Products and installation.

1.2 Related Requirements

- .1 Section 06 20 00 - Finish Carpentry: Glazed finish carpentry components.
- .2 Section 07 92 00 - Joint Sealants: Sealant and back-up materials.
- .3 Section 08 11 13 - Standard Metal Doors and Frames: Glazed metal doors, sidelights, transoms.
- .4 Section 08 13 13.13 - Standard Hollow Metal Doors: Glazed doors.
- .5 Section 08 13 13.53 - Custom Hollow Metal Doors: Glazed doors.
- .6 Section 08 12 13.13 - Standard Hollow Metal Frames: Glazed sidelights, transoms.
- .7 Section 08 12 13.53 - Custom Hollow Metal Frames: Glazed sidelights, transoms.
- .8 Section 08 14 16 - Flush Wood Doors: Glazed doors.
- .9 Section 08 36 13 - Sectional Doors: Glazed vision panels.
- .10 Section 08 41 13 - Aluminum Framed Entrances: Glazed doors and walls.
- .11 Section 08 51 13 - Aluminum Windows.

1.3 Reference Standards

- .1 AAMA CW-11-85 - Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing.
- .2 ANSI Z97.1-2015 - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- .3 ASTM C542-05(2017) - Standard Specification for Lock-Strip Gaskets.
- .4 ASTM C864-05(2019) - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- .5 ASTM C920-18 - Standard Specification for Elastomeric Joint Sealants.
- .6 ASTM C1036-16 - Standard Specification for Flat Glass.
- .7 ASTM C1048-18 - Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
- .8 ASTM C1172-19 - Standard Specification for Laminated Architectural Flat Glass.
- .9 ASTM C1464-16 - Standard Specification for Bent Glass.
- .10 ASTM C1503-18 - Standard Specification for Silvered Flat Glass Mirror.
- .11 ASTM D2240-15e1 - Standard Test Method for Rubber Property - Durometer Hardness.
- .12 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .13 ASTM E119-19 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- .14 ASTM E283/E283M-19 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .15 ASTM E330/E330M-14 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .16 ASTM E2190-19 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- .17 CAN/CGSB 12.1-2017 - Safety Glazing.
- .18 CAN/CGSB 12.2-M91 (R2017) - Flat, Clear Sheet Glass.
- .19 CAN/CGSB 12.3-M91 (R2017) - Flat, Clear Float Glass.
- .20 CAN/CGSB 12.4-M91 (R2017) - Heat Absorbing Glass.
- .21 CAN/CGSB 12.8-2017 - Insulating Glass Units.
- .22 CAN/CGSB 12.10-M76 (Withdrawn) - Glass, Light and Heat Reflecting.
- .23 CAN/CGSB 12.11-M90 (Withdrawn) - Wired Safety Glass.

- .24 CAN/ULC-S101-14 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .25 CAN/ULC-S104-15 - Standard Method for Fire Tests of Door Assemblies.
- .26 16 CFR 1201-2019 - Safety Standard for Architectural Glazing Materials.
- .27 GANA Glazing Manual (50th Anniversary Edition).
- .28 IGMA (Insulating Glass Manufacturers Alliance).
- .29 NFPA 251 - Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 edition.
- .30 NFPA 252 - Fire Tests of Door Assemblies, 2017 Edition.
- .31 NFPA 257 - Fire Test for Window and Glass Block Assemblies, 2017 Edition.
- .32 UL 263-2011 - Standard for Fire Tests of Building Construction and Materials (14th Edition).
- .33 Ontario Building Code, latest edition.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Pre-Installation Meeting: Convene one (1) week before starting work of this section.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data:
 - .1 Glass Sheets: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - .2 Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colours.
- .3 Samples:

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Certificates: Certify that Products meet or exceed specified requirements.
- .3 Manufacturer's Certificate: Certify that sealed insulated glass, meets or exceeds specified requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.8 Maintenance Material Submittals

- .1 Section 01 78 23: Maintenance and extra material requirements.

1.9 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work in accordance with GANA Glazing Manual for glazing installation methods. Maintain one (1) copy of document on site.
- .3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.10 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Provide mock-up of assembly including glass and air barrier and vapour retarder seal.
- .3 Locate where directed.
- .4 Approved mock-up may remain as part of the Work.

1.11 Site Conditions

- .1 Ambient Conditions:

- .1 Do not install glazing when ambient temperature is less than 10 degrees C.
- .2 Maintain minimum ambient temperature before, during and twenty-four (24) hours after installation of glazing compounds.

1.12 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide a ten (10) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
- .3 Provide a ten (10) year warranty to include coverage for delamination of laminated glass and replacement of same.

Part 2 Products

2.1 Performance Requirements

- .1 Provide glass and glazing materials for continuity of building enclosure vapour retarder and air barrier:
- .2 In conjunction with materials described in Section 07 27 00.
- .3 To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapour retarder seal.
- .4 Loads: Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass.
 - .1 As calculated in accordance with applicable code.
- .5 Limit glass deflection to 1/200 with full recovery of glazing materials, whichever is less.

2.2 Flat Glass Materials

- .1 Sheet Glass: CAN/CGSB 12.2 Clear, minimum 6 mm (1/4 inch) thick.
- .2 Float Glass: CAN/CGSB 12.3 Clear, minimum 6 mm (1/4 inch) thick.
- .3 Safety Glass:
 - .1 Fully Tempered Glass Sheet CAN/CGSB 12.1 tempered, minimum 6 mm (1/4 inch) thick.
- .4 Fire Protective Glass: CAN/ULC-S104, listed and labeled for rating as shown on Drawings.
 - .1 Wired Glass: CAN/CGSB 12.11, polished both sides (transparent), woven stainless steel wire mesh style square of 13 mm (1/2 inch) grid size; minimum 6 mm (1/4 inch) thick.
- .5 Fire Resistive Glass: CAN/ULC-S101, listed and labeled for rating as indicated on Drawings.

2.3 Sealed Insulating Glass Units

- .1 Insulated Glass Units - Low E CAN/CGSB 12.8, triple pane, soft coat Low E; interpane space filled with argon gas; with metal edge seal; total unit thickness of 22 mm (7/8 inch).
 - .1 U-Value: 2.0 maximum.
- .2 Insulated Glass Units - Low E CAN/CGSB 12.8, double pane, soft coat Low E; interpane space filled with argon gas; with metal edge seal; total unit thickness of 19 mm (3/4 inch).
 - .1 U-Value: 2.0 maximum.

2.4 Glazing Accessories

- .1 Lock Strip Gaskets: ASTM C542, ozone-resistant neoprene compound, with lock-strip (zipper) component that friction-fits into position to retain glass pane/unit, reglet type, tensile strength of 14 MPa (2000 psi), Durometer hardness of 75 tested to ASTM D2240, sized to accommodate glass thickness.
- .2 Setting Blocks: ASTM C864, ozone-resistant, preformed dense elastomeric compression compound; length to suit glazing method, glass light weight and area.
- .3 Spacer Shims: ASTM C864, ozone-resistant, neoprene, 50 to 60 Shore A durometer hardness tested to ASTM D2240, minimum 75 mm (3 inch) long x one half the height of the glazing stop x thickness to suit application self adhesive on one face.
- .4 Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; coiled on release paper; size to suit installation.

- .5 Glazing Clips: Manufacturer's standard type.
- .6 Glazing Splines: ASTM C864, Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that openings for glazing are correctly sized and within tolerance.
- .3 Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

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.
- .4 Install sealant in accordance with manufacturer's written instructions.

3.3 Installation - Glazing

- .1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.
- .2 Interior Wet/Dry Method (Tape and Sealant):
 - .1 Cut glazing tape to length and install against permanent stops, projecting 1.5 mm (1/16 inch) above sight line.
 - .2 Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
 - .3 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
 - .4 Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
 - .5 Fill gaps between pane and applied stop with compatible sealant to depth equal to bite on glazing, to uniform and level line.
 - .6 Trim protruding tape edge.

3.4 Field Quality Control

- .1 Section 01 45 00 - Quality control.
- .2 Manufacturer's Services:
 - .1 Monitor and report installation procedures and unacceptable conditions.

3.5 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Remove glazing materials from finish surfaces.
- .3 Remove labels after Work is complete.
- .4 Clean glass and adjacent surfaces.

3.6 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

End of Section

Part 1 General

1.1 Section Includes

- .1 Gypsum board.
- .2 Cementitious backer board.
- .3 Acoustic insulation.
- .4 Light gauge metal stud wall framing.
- .5 Metal channel ceiling framing.

1.2 Related Requirements

- .1 Section 05 41 00 - Structural Metal Lightweight Framing: Load bearing studs for exterior applications.
- .2 Section 06 10 00 - Rough Carpentry: Building wood framing system; wood blocking for support of fixtures and equipment.
- .3 Section 07 21 13 - Board Insulation.
- .4 Section 07 21 16 - Blanket Insulation: Acoustic, Thermal insulation.
- .5 Section 07 84 00 - Firestopping.
- .6 Section 09 22 13 - Metal Furring.
- .7 Section 06 16 00 - Sheathing: Exterior gypsum sheathing.

1.3 Reference Standards

- .1 ANSI A118.9 - Specifications for Test Methods and Specifications for Cementitious Backer Units.
- .2 ASTM C475/C475M-17 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .3 ASTM C514-04(2020) - Standard Specification for Nails for the Application of Gypsum Board.
- .4 ASTM C557-03(2017) - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .5 ASTM C645-18 - Standard Specification for Nonstructural Steel Framing Members.
- .6 ASTM C665-17 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .7 ASTM C754-18 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .8 ASTM C840-19b - Standard Specification for Application and Finishing of Gypsum Board.
- .9 ASTM C1002-18 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .10 ASTM C1047-19 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .11 ASTM C1278/C1278M-17 - Standard Specification for Fiber-Reinforced Gypsum Panel.
- .12 ASTM C1288-17 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.
- .13 ASTM C1325-19 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
- .14 ASTM C1396/C1396M-17 - Standard Specification for Gypsum Board.
- .15 ASTM E90-09(2016) - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .16 CAN/ULC-S101-14 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .17 CAN/ULC-S102-18 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .18 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .19 Gypsum Association GA-214-2017 - Recommended Levels of Gypsum Board Finish.

- .20 Gypsum Association GA-216-2016 - Application and Finishing of Gypsum Panel Products.
- .21 Gypsum Association GA-600-2015 - Gypsum Fire Resistance Design Manual.
- .22 Gypsum Association GA-801-2017 - Handling and Storage of Gypsum Panel Products.
- .23 UL - Fire Resistance Directory.
- .24 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data:
 - .1 Provide data on metal framing gypsum board.
 - .2 Provide data on decorative finish.
 - .3 Provide MSDS on all products within the shaft wall assembly.
- .3 Shop Drawings: Indicate special details associated with fireproofing, acoustic seal for openings, and firestopping seal for openings.
 - .1 Provide Shop Drawings indicating details for anchorage and bracing for seismic restraint, stamped and signed by a Professional Engineer registered or licensed in the province where the project is located.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work in accordance with CSA A82.31. Maintain one (1) copy of document on site.
- .3 Installer Qualifications: Company specializing in performing the work of this section with minimum ten (10) years documented experience and approved by the manufacturer.
- .4 Handling Gypsum Board: Comply with GA-801.

Part 2 Products

2.1 Manufacturers

- .1 CGC; Product: Sheetrock.
- .2 CGC; Product: Sheetrock Firecode X.
- .3 CGC; Product: Securock Glass-Mat.
- .4 Other acceptable manufacturers offering functionally and aesthetically equivalent products.
 - .1 CertainTeed; Product: as applicable.
 - .2 Georgia-Pacific; Product: as applicable.
 - .3 National Gypsum; Product: as applicable.
- .5 Substitutions: Refer to Section 01 25 00.

2.2 Description

- .1 Regulatory Requirements:
 - .1 As indicated on Drawings.
 - .2 Conform to applicable code for seismic requirements.

2.3 Performance / Design Criteria

- .1 Seismic Restraints: Design anchorages, bracing and suspension systems to withstand seismic loads and sway displacement as calculated in accordance with building code for normal facilities, and to ASTM E580/E580M.

2.4 Framing Materials

- .1 Refer to Drawings.
- .2 Studs and Tracks: Specified in Section 09 22 16.
- .3 As per Section 06 10 00 - Rough Carpentry.
- .4 Furring, Framing, and Accessories: ASTM C645.
- .5 Furring, Framing, and Accessories: Specified in Section 09 22 13.
- .6 Fasteners: ASTM C1002.
- .7 Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- .8 Adhesive: ASTM C557.

2.5 Gypsum Board Materials

- .1 Refer to Drawings.
- .2 Gypsum Board: ASTM C1396/C1396M, paper-faced; 1220 mm (48 inches) wide, maximum available length in place; tapered edges, ends square cut.
 - .1 Regular core, 1/2 inch thick.
 - .2 Fire rated core, 5/8 inch thick.
- .3 Gypsum Glass-Mat Board: ASTM C1177/D3273, fiberglass-faced matting; 1220 mm (48 inches) wide, maximum available length in place; tapered edges, ends square cut.
 - .1 Regular core, 1/2 inch thick.

2.6 Accessories

- .1 Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
- .2 Corner Beads: ASTM C1047, metal corner bead.
- .3 Edge Trim: ASTM C1047; Type U casing bead.
- .4 Joint Materials: GA-216, ASTM C475/C475M.
 - .1 Reinforcing tape, adhesive, and water.
 - .2 Joint compound: Asbestos-free dust-controlled.
- .5 Gypsum Board Fasteners: ASTM C1002.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.2 Metal Stud Installation

- .1 Refer to Drawings for framing requirements.
- .2 Install studs to ASTM C475/C475M and/or manufacturer's written instructions.
- .3 Install wall framing requiring seismic restraint to meet requirements of building code.
- .4 Metal Stud Spacing: as indicated on Drawings, if/as applicable.
- .5 Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.

- .6 Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- .7 Blocking: Nail or screw wood blocking to studs, Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame opening, toilet accessories, hardware and as required or indicated..

3.3 Furring For Fire Ratings

- .1 Install furring as required for fire resistance ratings indicated and to GA-600 requirements.

3.4 Ceiling Framing Installation

- .1 Refer to Drawings.
- .2 Install to ASTM C754, GA-216, and/or manufacturer's written instructions.
- .3 Install metal suspension system requiring seismic restraint to meet requirements of Ontario Building code.
- .4 Coordinate location of hangers with other work.
- .5 Install ceiling framing independent of walls, columns, and above ceiling work.
- .6 Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 600 mm (24 inches) past each end of openings.
- .7 Laterally brace entire suspension system.

3.5 Acoustic Accessories Installation

- .1 Install resilient channels at maximum 600 mm (24 inches) on centre. Locate joints over framing members.
- .2 Place acoustic 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 acoustic sealant within partitions in accordance with manufacturer's written instructions.
- .4 Install acoustic sealant at gypsum board perimeter at:
 - .1 Metal Framing: Two (2) beads.
 - .2 Base Layer.
 - .3 Face Layer.
 - .4 Caulk all penetrations of partitions by conduit, pipe, duct work, rough-in boxes, and access doors, etc..

3.6 Gypsum Board Installation

- .1 Install gypsum board to ASTM C840, manufacturer's written instructions.
- .2 Erect single layer standard gypsum board vertical, with ends and edges occurring over firm bearing.
- .3 Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- .4 Use screws when fastening gypsum board to metal furring or framing.
- .5 Adhere gypsum board to masonry walls in accordance with manufacturer's written instruction or as approved by consultant.
- .6 Use screws when fastening gypsum board to wood furring or framing. Staples may only be used when securing the first layer of double layer applications.
- .7 Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum backing board for fire rated partitions and ceilings.
- .8 Double Layer Applications: Secure second layer to first with fasteners. Apply adhesive to manufacturer's written instructions.
- .9 Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
- .10 Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.
- .11 Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.
- .12 Place control joints consistent with lines of building spaces as directed.

- .13 Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated.
- .14 Apply gypsum board to curved walls in accordance with GA-216.

3.7 Joint Treatment

- .1 Finish to ASTM C840.
- .2 Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- .3 Feather coats on to adjoining surfaces so that camber is maximum 0.8 mm (1/32 inch).
- .4 Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.
- .5 Fill and finish joints and corners of cementitious backing board.

3.8 Texture Finish

- .1 Apply specified finish texture to manufacturer's written instructions.

3.9 Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation of Finished Gypsum Board Surface from True Flatness: 3 mm in 3 m (1/8) in any direction.

End of Section

Part 1 General

1.1 Section Includes

- .1 Metal furring and framing.
- .2 Access panels.

1.2 Related Requirements

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 08 11 13 - Hollow Metal Doors and Frames.
- .3 Section 05 41 00 - Structural Metal Lightweight Framing.
- .4 Section 07 27 00 - Air Barriers.
- .5 Section 08 31 13 - Access Doors and Frames: Product requirements for metal access panels integral with furring and lathing.
- .6 Section 09 21 16 - Gypsum Board Assemblies.

1.3 Reference Standards

- .1 ASTM C841-03(2018) - Standard Specification for Installation of Interior Lathing and Furring.
- .2 ASTM C847-18 - Standard Specification for Metal Lath.
- .3 ASTM C933-18 - Standard Specification for Welded Wire Lath.
- .4 ASTM C1002-18 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .5 ASTM C1063-19a - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
- .6 Gypsum Association GA-600-2015 - Gypsum Fire Resistance Design Manual.
- .7 UL - Fire Resistance Directory.
- .8 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.

1.6 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work in accordance with GA-600. Maintain one (1) copy of document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.8 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Approved mock-up may remain as part of the Work.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for fire rated assemblies in conjunction with Section 09 21 16 as follows:
 - .1 As indicated on Drawings.

2.2 Performance / Design Criteria

- .1 Vertical Finish Surface Deflection: Wall and furred space framing to limit deflection to 1:180 under lateral point load of 445 N (100 lbs).
- .2 Horizontal Finish Surface Deflection: Ceiling and soffit framing to limit finish surface to 1:360 deflection under superimposed dead loads and wind uplift.

2.3 Framing Materials

- .1 Furring Channels: Galvanized steel, 18 gauge thickness, 1 1/2" width, 3/4" height, splicing permitted.
 - .1 Agway Metals Inc.; Product: H-75.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that surfaces conditions are ready to receive work.

3.2 Wall And Furred Space Framing

- .1 Install lathing and furring for plaster work to ASTM C1063.
- .2 Erect furring channels horizontally; secure with fasteners on alternate channel flanges at maximum 600 mm (24 inches) on centre.
- .3 Space furring channels maximum per Drawings on centre, not more than 100 mm (4 inches) from floor and ceiling lines, abutting walls.
- .4 Space resilient channels at maximum 600 mm (24 inches) on centre. Place joints over framing members.

3.3 Ceiling And Soffit Framing

- .1 Install furring. Erect after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- .2 Install furring independent of walls, columns, and above ceiling work.
- .3 Securely anchor hangers to structural members or embed in structural slab. Space hangers to achieve deflection limits indicated.
- .4 Space main carrying channels at maximum 1 800 mm (72 inch) centres; not more than 150 mm (6 inches) from wall surfaces. Lap splice securely.
- .5 Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- .6 Place furring channels perpendicular to carrying channels, not more than 50 mm (2 inches) from perimeter walls, and rigidly secure. Lap splice securely.
- .7 Reinforce openings in suspension system which interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 600 mm (24 inches) past each opening.
- .8 Laterally brace suspension system.

3.4 Access Panels

- .1 Coordinate work with installation of metal access panels. Refer to Section 08 31 13.
- .2 Install metal access panels and rigidly secure in place.
- .3 Install frames plumb and level in opening. Secure rigidly in place.

- .4 Position to provide convenient access to concealed work requiring access.

3.5 Lathing

- .1 Apply metal lath taut, with long dimension perpendicular to supports.
- .2 Lap ends minimum 25 mm (1 inch). Secure end laps with tie wire where they occur between supports.
- .3 Lap sides of diamond mesh lath minimum 38 mm (1-1/2 inches). Nest outside ribs of rib lath together.
- .4 Attach metal lath to metal supports using tie wire at maximum 150 mm (6 inches) on centre.
- .5 Continuously reinforce internal angles with corner mesh, except where the metal lath returns 75 mm (3 inches) from corner to form the angle reinforcement; fasten at perimeter edges only.
- .6 Place corner bead at external wall corners; fasten at outer edges of lath only.
- .7 Place base screeds at termination of plaster areas; secure rigidly in place.
- .8 Place 100 mm (4 inch) wide strips of metal lath centred over junctions of dissimilar backing materials. Secure rigidly in place.
- .9 Place lath vertically above each top corner and each side of door and glazed frames to 150 mm (6 inches) above ceiling line.
- .10 Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- .11 Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.6 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation from True Lines and Levels: 3 mm in 3 m (1/8 inch in 10 ft).
- .3 Maximum Variation from True Position: 3 mm (1/8 inch).

End of Section

Part 1 General

1.1 Section Includes

- .1 Formed metal framing of studs and furring, at interior locations.
- .2 Framing accessories.

1.2 Related Requirements

- .1 Section 04 29 00 - Veneer Masonry: Veneer masonry supported by stud wall metal framing.
- .2 Section 04 42 39 - Dimension Stone: Stone veneer supported by stud wall metal framing.
- .3 Section 05 41 00 - Structural Metal Lightweight Framing: Structural load bearing metal stud framing for exterior applications.
- .4 Section 05 50 00 - Metal Fabrications: Metal fabrications attached to stud framing.
- .5 Section 06 10 53 - Miscellaneous Rough Carpentry: Rough wood blocking within stud framing.
- .6 Section 06 16 00 - Sheathing: Exterior gypsum sheathing.
- .7 Section 09 21 20 - Exterior Gypsum Sheathing: Wall sheathing.
- .8 Section 07 26 00 - Vapour Retarders.
- .9 Section 07 27 00 - Air Barriers.
- .10 Section 07 21 16 - Blanket Insulation: Insulation between framing members.
- .11 Section 07 62 00 - Metal Flashing and Trim: Head and sill flashings.
- .12 Section 08 31 13 - Access Doors and Frames.
- .13 Section 09 21 16 - Gypsum Board Assemblies: Gypsum board on metal studs for partitioning.
- .14 Section 09 21 17 - Gypsum Board - Vinyl Faced: Gypsum board on metal studs for partitioning.
- .15 Section 09 21 18 - Gypsum Board - Shaft Wall: Gypsum board and sheathing for shaft walls.
- .16 Section 09 22 13 - Metal Furring And Lathing.

1.3 Reference Standards

- .1 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM C645-18 - Standard Specification for Nonstructural Steel Framing Members.
- .4 ASTM C754-18 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .5 ASTM C1002-18 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .6 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .7 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the placement of components within the stud framing assembly specified in Section 05 41 00.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data:

- .1 Provide data describing standard framing member materials and finish, product criteria, load charts, and limitations.
- .2 Provide MSDS information for all products.
- .3 Shop Drawings:
 - .1 Indicate prefabricated work component details, stud layout, anchorage to structure, etc..
 - .2 Describe method for securing studs to tracks, splicing and for blocking and reinforcement to framing connections.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Perform Work to ASTM C754. Maintain one (1) copy of document on site.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.9 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 Provide 8 ft mock-up, including corner, and interior and exterior finishes specified in other sections.
- .3 Coordinate with installation of associated work of Sections 05 41 00, etc..
- .4 Locate where directed by Consultant.
- .5 Approved mock-up may remain as part of the Work.

Part 2 Products

2.1 Manufacturers

- .1 Bailey Metal Products; Product: Bailey Platinum Plus, 6" or 3 5/8" as specified on Drawings.
- .2 Other acceptable manufacturers offering functionally and aesthetically equivalent products.
- .3 Substitutions: Refer to Section 01 25 00.

2.2 Stud Framing Materials

- .1 Refer to Drawings and Section 05 41 00.
- .2 Framing Assembly Components: ASTM C645.
- .3 Tracks and Headers: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- .4 Ceiling Runners: With extended leg retainer.
- .5 Furring and Bracing Members: Of same material as studs; thickness to suit purpose.
- .6 Fasteners: ASTM C1002, self drilling, self tapping screws.
- .7 Acoustic Sealant: As specified in Section 09 21 16.
- .8 Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic zinc-rich primer.

2.3 Fabrication

- .1 Fabricate assemblies of framed sections to sizes and profiles required.
- .2 Fit, reinforce, and brace framing members to suit design requirements.

- .3 Fit and assemble in largest practical sections for delivery to site, ready for installation.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that rough-in utilities are in proper location.

3.2 Erection

- .1 Align and secure top and bottom runners at 600 mm (24 inches) on centre.
- .2 Place one (1) beads of acoustic sealant between runners and substrate studs and adjacent construction to achieve an acoustic seal.
- .3 Achieve an airtight seal between runners and substrate with acoustic sealant in conjunction with Section 07 27 00.
- .4 Place one (1) beads of acoustic sealant between studs and adjacent vertical surfaces to achieve an air seal.
- .5 Achieve an airtight seal between studs and adjacent vertical surfaces with acoustic sealant in conjunction with Section 07 27 00.
- .6 Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- .7 Install studs vertically as indicated on Drawings.
- .8 Align stud web openings horizontally.
- .9 Secure studs to tracks using fastener method. Do not weld.
- .10 Stud Splicing: Not permissible.
- .11 Fabricate corners using a minimum of three studs.
- .12 Double stud at wall openings, door and window jambs, not more than 50 mm (2 inches) from each side of openings.
- .13 Brace stud framing assembly rigid.
- .14 Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.
- .15 Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.
- .16 Blocking: Install blocking for support of other works as required. Coordinate accordingly.
 - .1 Secure wood blocking to studs.
- .17 Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- .18 Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- .19 Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation From True Position: 1/8 inch in 10 ft.
- .3 Maximum Variation From Plumb: 1/8 inch in 10 ft.

End of Section

Part 1 General

1.1 Section Includes

- .1 Suspended metal grid ceiling system and perimeter trim.
- .2 Acoustic tile.
- .3 Acoustic insulation.

1.2 Related Requirements

- .1 Section 07 21 16 - Blanket Insulation.
- .2 Section 09 21 16 - Gypsum Board Assemblies: Acoustic partition system.

1.3 Reference Standards

- .1 ASTM C635/C635M-17 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- .2 ASTM C636/C636M-19 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .3 ASTM C665-17 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .4 ASTM E580/E580M-20 - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- .5 ASTM E1264-19 - Standard Classification of Acoustical Ceiling Products.
- .6 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .7 AWCCBC (Association of Wall and Ceiling Contractors of British Columbia).
- .8 UL - Fire Resistance Directory.
- .9 ULC-FR-17 - Fire Resistance Directory (2017 Edition).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Sequencing:
 - .1 Sequence work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
 - .2 Install acoustic units after interior wet work is dry.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on metal grid system components and acoustic units.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements, including perimeter conditions requiring special attention.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Maintenance Material Submittals

- .1 Section 01 78 23: Maintenance and extra material requirements.
- .2 Extra Stock Materials: Provide 5% of total acoustic unit area of extra panels/tiles to Owner.

1.9 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Conform to AWCCBC requirements.
- .3 Grid Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Acoustic Unit Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.10 Site Conditions

- .1 Ambient Conditions:
 - .1 Maintain uniform temperature of minimum 16 degrees C (60 degrees F), and maximum humidity of 40% prior to, during, and after acoustic unit installation.

Part 2 Products

2.1 Manufacturers - Suspension System

- .1 CGC.
- .2 Armstrong.
- .3 Approved equal.
- .4 Other acceptable manufacturers offering functionally and aesthetically equivalent products.

2.2 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for combustibility requirements for materials.

2.3 Performance / Design Criteria

- .1 Suspension System: Maximum deflection of 1:360 for acoustic ceiling system including integral mechanical and electrical components.

2.4 Materials

- .1 Non-fire Rated Grid: ASTM C635/C635M, intermediate duty; exposed T; components die cut and interlocking.
- .2 Grid Materials: Commercial quality cold rolled steel with galvanized coating.
- .3 Exposed Grid Surface Width: 24 mm (15/16 inch).
- .4 Grid Finish: Colour White.
- .5 Suspension Wires: Galvanized soft-annealed, mild steel, to suit application thickness.
- .6 Support Channels and Hangers: Galvanized steel; size and type to suit application.
- .7 Accessories: Stabilizer bars, clips, splices and perimeter moldings required for suspended grid system.

2.5 Manufacturers And Products - Acoustic Unit Materials

- .1 CGC; Product: Radar.
 - .1 Product/Item ID: 2410.
 - .2 Tile Size: 24"x48".
 - .3 Thickness: 5/8".
 - .4 Colour: White.
- .2 CGC; Product: Halcyon.
 - .1 Product/Item ID: 98233.
 - .2 Tile Size: 24"x48".
 - .3 Thickness: 1".
 - .4 Colour: White.

- .3 Other acceptable manufacturers offering functionally and aesthetically equivalent products.
- .4 Substitutions: Refer to Section 01 25 00.

2.6 Accessories

- .1 Acoustic Sealant: For perimeter moldings, as specified in Section 07 92 00.
- .2 Gaskets (for perimeter moldings): Closed cell rubber sponge tape.
- .3 Touch-up Paint: Type and colour to match acoustic and grid units.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that layout of hangers will not interfere with other work.

3.2 Installation - Lay-in Grid Suspension System

- .1 Refer to Drawings for required layouts and configuration.
- .2 Install suspension system to manufacturer's written instructions, and as supplemented in this section.
- .3 Install ceiling suspension systems forming a part of a fire resistance rated assembly in accordance with ULC requirements as listed in this Section.
- .4 Install ceiling suspension systems requiring seismic restraint to ASTM E580/E580M.
- .5 Install system capable of supporting imposed loads to a deflection of 1/240 maximum.
- .6 Lay out system to a balanced grid design.
- .7 Locate system on room axis according to reflected plan.
- .8 Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- .9 Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- .10 Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- .11 Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected related carrying channels to span the extra distance.
- .12 Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 150 mm (6 inches) of each corner; or support components independently.
- .13 Do not eccentrically load system or produce rotation of runners.
- .14 Perimeter Molding:
 - .1 Install edge molding at intersection of ceiling and vertical surfaces with continuous gasket.
 - .2 Use longest practical lengths.
 - .3 Overlap corners.
 - .4 Provide molding at junctions with other interruptions.
- .15 Form expansion joints as detailed. Form to accommodate plus or minus 1 inch (25 mm) movement. Maintain visual closure.
- .16 Install light fixture boxes constructed of gypsum board above light fixtures to ULC assembly requirements and light fixture ventilation requirements.

3.3 Installation - Acoustic Units

- .1 Install acoustic units to manufacturer's written instructions.
- .2 Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- .3 Lay directional patterned units. Fit border trim neatly against abutting surfaces.
- .4 Install units after above ceiling work is complete.
- .5 Install acoustic units level, in uniform plane, and free from twist, warp, and dents.

- .6 Cutting Acoustic Units:
 - .1 Cut to fit irregular grid and perimeter edge trim.
 - .2 Cut edges to field cut units.
 - .3 Double cut and field paint exposed edges of tegular units.
- .7 Where round obstructions occur, provide preformed closures to match perimeter molding.
- .8 Lay acoustic insulation for a distance of 1 200 mm (48 inches) either side of acoustic partitions as indicated.
- .9 Install hold-down clips to retain panels tight to grid system within 6 m (20 ft) of an exterior door.
- .10 Install hold-down clips to retain panels tight to grid system in exterior locations.

3.4 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation from Flat and Level Surface: 3 mm in 3 m (1/8 inch in 10 ft).
- .3 Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

End of Section

Part 1 General

1.1 Section Includes

- .1 Fluid applied epoxy flooring and coving, as applicable.
- .2 Fluid applied epoxy floor line painting.
- .3 Fluid applied epoxy floor covering for stairs.

1.2 Related Requirements

- .1 Section 03 30 00 – Cast-In-Place Concrete: Concrete subfloor.
- .2 Section 07 92 00 - Joint Sealants: Joint between base and wall surface.

1.3 Reference Standards

- .1 ASTM C722-18 - Standard Specification for Chemical-Resistant Monolithic Floor Surfacing.
- .2 ASTM C811-98(2008) - Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacing.
- .3 ASTM D570-98(2018) - Standard Test Method for Water Absorption of Plastics.
- .4 ASTM D638-14 - Standard Test Method for Tensile Properties of Plastics.
- .5 ASTM D695-15 - Standard Test Method for Compressive Properties of Rigid Plastics.
- .6 ASTM D905-08(2013) - Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading.
- .7 ASTM D1044-19 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
- .8 ASTM D1360-98(2011) (Withdrawn 2016) - Standard Test Method for Fire Retardancy of Paints (Cabinet Method).
- .9 ASTM E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .10 ASTM E96/E96M-16 - Standard Test Methods for Water Vapor Transmission of Materials.
- .11 CAN/ULC-S102-18 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on specified products, describing physical performance characteristics; sizes, patterns and colours available.
- .3 Samples: Submit two (2) samples, illustrating colour and pattern for each floor material for each colour specified.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements indicating special procedures, perimeter conditions requiring special attention.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.7 Maintenance Material Submittals

- .1 Section 01 78 23: Maintenance and extra material requirements.

1.8 Quality Assurance

- .1 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

- .2 Supervisor Qualifications: Trained by product manufacturer.

1.9 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Store resin materials in a dry, secure area.
- .3 Maintain minimum temperature of 13 degrees C (55 degrees F).
- .4 Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.10 Site Conditions

- .1 Ambient Conditions:
 - .1 Maintain ambient temperature required by manufacturer three (3) days prior to, during, and twenty-four (24) hours after installation of materials.

1.11 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide a three (3) year warranty to include coverage for failure to meet specified requirements.
- .3 Include coverage against flooring delamination from substrate degradation of surface finish.

Part 2 Products

2.1 Manufacturers

- .1 Stonhard.
- .2 Approved equivalents.

2.2 Products

- .1 Stontec EFC.
- .2 Stonkote GS4.
- .3 Stonshield Covebase.
- .4 Stonglaze VSR.

2.3 Colours

- .1 Colours and/or textures to be selected by Owner from a standard range.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify concrete floors have cured a minimum 28 days, are dry to a maximum moisture content of 7%, and exhibit negative alkalinity, carbonization, or dusting.
- .3 Verify floor lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.2 Preparation

- .1 Prepare concrete substrate in accordance with Manufacturer's instructions.
- .2 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- .3 Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- .4 Vacuum clean substrate.

3.3 Installation - Flooring

- .1 Install flooring to manufacturer instructions.

3.4 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Prohibit traffic on floor finish for forty-eight (48) hours after installation.
- .3 Barricade area to protect flooring until cured.

End of Section

Part 1 General

1.1 Section Includes

- .1 Surface preparation.
- .2 Painting.

1.2 Related Requirements

- .1 Section 05 50 00 - Metal Fabrications: Shop primed items.
- .2 Section 08 11 13 - Hollow Metal Doors and Frames.
- .3 Section 09 21 16 - Gypsum Board Assemblies.
- .4 Section 32 17 23.13 – Painted Pavement Markings.

1.3 Reference Standards

- .1 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination: Coordinate with other Work having a direct bearing on Work of this section.
- .3 Scheduling:
 - .1 Schedule painting operations to prevent disruption of and by other trades.
 - .2 Schedule painting operations to prevent disruption of occupants in and about building.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data:
 - .1 Submit Product data on all specified finishing products.
- .3 Samples:
 - .1 Submit two (2) samples, 6 inch in size illustrating range of colours and textures available for each surface finishing product scheduled.
 - .2 Submit two (2) samples, 6 inch in size illustrating selected colours and textures for each colour selected.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements including special surface preparation procedures and substrate conditions requiring special attention.
- .3 Schedule:
 - .1 If requested, submit Work schedule for various stages of Work when painting occupied areas for Consultant's review and Owner's approval.
 - .2 Submit schedule minimum of forty-eight (48) hours in advance of proposed operations.
 - .3 Obtain written authorization from Consultant for changes in Work schedule.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Record Documentation: Upon completion, provide itemized list of products used including the following:
 - .1 Manufacturer's name.
 - .2 Product name, type and use.
 - .3 Colour coding number.

1.8 Maintenance Material Submittals

- .1 Section 01 78 23: Maintenance and extra material requirements.
- .2 Extra Stock Materials: Provide properly packaged maintenance material as follows.
 - .1 4 litres (1 gal) of each coating type and colour to Owner.
 - .2 Label each container with colour, type, texture and room locations in addition to manufacturer's label.

1.9 Quality Assurance

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.
- .2 Installer Qualifications: Company specializing in performing the work of this section with minimum ten (10) years documented experience.
- .3 Conform to MPI Painting Manual requirements for materials, preparation and workmanship.
- .4 Paint Products: Paint manufacturers and paint Products listed under the Approved Product List section of the MPI Painting Manual.
- .5 Special Systems: Where special coating system applications are used, provide manufacturer's certification of all surfaces and conditions for specific paint or coating system application including inspection and approval of their system application at no additional cost to Owner.

1.10 Mock-ups

- .1 Section 01 43 00: Requirements for mock-up.
- .2 If requested, provide 1 m long by 1 m wide field sample panel as specified, illustrating specified coating colour, gloss, texture, and workmanship.
- .3 Locate where directed by Consultant.
- .4 Approved mock-up will be the acceptable standard of finish quality and workmanship for all painting Work.
- .5 Approved mock-up may remain as part of the Work.

1.11 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver products to site in sealed and labeled containers showing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, colour designation, and written instructions for mixing and reducing.
- .3 Store paint materials at minimum ambient temperature of 7 degrees C (45 degrees F) and a maximum of 32 degrees C (90 degrees F), in dry, ventilated area and as required by manufacturer's written instructions.
- .4 Provide adequate fireproof storage lockers and warnings as required by authorities having jurisdiction for storing toxic and volatile/explosive/flammable materials.

1.12 Site Conditions

- .1 Ambient Conditions:
 - .1 Do not perform painting or decorating Work when ambient air and substrate temperatures are below 10 degrees C (50 degrees F) for both interior and exterior work, or as required by paint product manufacturer.
 - .2 Do not perform painting or decorating Work when relative humidity is above 85% or when dew point is less than 3 degrees C (5 degrees F) variance between the air/surface temperature required by paint Product manufacturer.
 - .3 Provide suitable weatherproof covering and sufficient heating facilities to maintain minimum ambient air and substrate temperatures for twenty-four (24) hours before, during and after paint application.
 - .4 Do not perform painting and decorating Work when maximum moisture content of substrate exceeds:
 - .1 Wood: 15%.

- .2 Plaster and Gypsum Wallboard: 12 %.
- .3 Masonry, Concrete, and Concrete Unit Masonry: 12%.
- .4 Concrete Floors: 8%.
- .5 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.
- .6 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .7 Provide minimum lighting level of 323 lux (30 ft candles) is provided on surfaces to be painted or decorated.

1.13 Waste Management And Disposal

- .1 Dispose of waste materials in accordance with Local, and Provincial authorities having jurisdiction.
- .2 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .3 Place non-reusable 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 contaminants entering waterways, sanitary/storm drain systems or into the ground, adhere to the following procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned 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 hazardous waste regulations.
 - .5 Dry out empty paint cans prior to disposal or recycling.
 - .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
- .5 Set aside and protect surplus and uncontaminated finish materials and deliver or arrange collection for verifiable re-use or re-manufacturing.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for flame and smoke rating requirements for finishes, storage, mixing, application and disposal of paint and related waste materials.

2.2 Materials

- .1 Use only materials (primers, paints, coatings, varnishes, stains, lacquers, fillers) listed in the latest edition of the MPI Approved Product List (APL) on this project.
- .2 Ancillary materials such as linseed oil, shellac, thinners, solvents to be of highest quality product and provided by an MPI listed manufacturer, and compatible with paint materials being used.
- .3 Where required, use only materials having a minimum MPI "Environmentally Friendly" based on VOC (EPA Method 24) content levels.
- .4 Where possible, all materials to be lead and mercury free with low VOC content.
- .5 Provide all material for each system from a single manufacturer.
- .6 Fire Hazard: Flame spread and smoke developed ratings in accordance with applicable code.
- .7 Patching Materials: Latex filler.
- .8 Fastener Head Cover Materials: Latex filler.

2.3 Mixing And Tinting

- .1 Coatings: Ready-mixed and pre-tinted; re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .2 Paste, Powder or Catalyzed Paint: Mixed in accordance with manufacturer's written instructions.
- .3 Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
 - .1 Do not exceed paint manufacturer's recommendations for addition of thinner. Do not use kerosene or any such organic solvents to thin water-based paints.
 - .2 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.4 Finish And Colour

- .1 Colours and Finishes: Refer to Finish Schedule on Drawings.

2.5 Manufacturers

- .1 Paint Manufacturers:
 - .1 Benjamin Moore.
 - .2 PPG.
 - .3 Sherwin Williams.
- .2 Transparent Finishes:
 - .1 Sansin or approved equal.
- .3 Stains:
 - .1 Sansin or approved equal.
- .4 Block Fillers:
 - .1 Benjamin Moore.
 - .2 PPG.
 - .3 Sherwin Williams.
- .5 Field Catalyzed Coatings:
 - .1 Carboline-Sanitile.
 - .2 Sherwin Williams.
 - .3 PPG.

2.6 Interior Paint Systems

- .1 Wood - Transparent:
 - .1 Filler coat (for open grained wood only).
 - .2 Two (2) coats of stain.
 - .3 One (1) coat sealer.
 - .4 Two (2) coats of varnish, satin finish.
- .2 Concrete, Concrete Block, Cement Plaster Restored Masonry:
 - .1 One (1) coat of block filler primer sealer [alkyd].
 - .2 Two (2) coats of alkyd, semi-gloss finish.
- .3 Steel - Unprimed:
 - .1 One (1) coat of alkyd primer.
 - .2 Two (2) coats of alkyd enamel, semi-gloss finish.
- .4 Steel - Primed:
 - .1 Touch-up with alkyd primer.
 - .2 Two (2) coats of alkyd enamel, semi-gloss finish.
- .5 Concrete Floors:
 - .1 Refer to Drawings and Section 09 67 23.

- .6 Plaster, Gypsum Board:
 - .1 One (1) coat of alkyd primer sealer.
 - .2 Two (2) coats of latex enamel, selected finish.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that substrate conditions and surfaces are ready to receive work as instructed by the product manufacturer.
- .3 Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- .4 Test shop applied primer for compatibility with subsequent cover materials.
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.

3.2 Preparation

- .1 Prepare surfaces in accordance with MPI requirements.
- .2 Remove and store or mask miscellaneous hardware and surface fittings such as electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to painting. Clean and replace upon completion of painting Work in each area. Remove doors before painting to paint bottom and top edges and re-hung.
- .3 Protect adjacent surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, from painting operations with drop cloths, shields, masking, templates, or other suitable protective means.
- .4 Correct defects and clean surfaces which affect work of this section. Start of finish painting of defective surfaces indicates acceptance of substrate and making good defects will be at no cost to Owner.
- .5 Confirm preparation and primer used with fabricator of steel items.
- .6 Seal with shellac and seal marks which may bleed through surface finishes.
- .7 Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- .8 Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- .9 Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible latex based sealer or primer.
- .10 Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- .11 Concrete Floors: Remove contamination; acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- .12 Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
- .13 Copper Surfaces Scheduled for a Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.
- .14 Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- .15 Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- .16 Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-

- sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- .17 Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
 - .18 Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
 - .19 Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
 - .20 Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
 - .21 Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
 - .22 Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied.
 - .23 Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied.
 - .24 Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
 - .25 Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 Application

- .1 Apply paint or stain in accordance with MPI Painting Manual Premium Grade finish requirements.
- .2 Apply products to adequately prepared surfaces, within moisture limits and acceptable environmental conditions.
- .3 Apply paint finish in areas where dust is no longer being generated or when wind or ventilation conditions will not affect quality of finished surface.
- .4 Apply each coat to uniform finish.
- .5 Tint each coat of paint progressively lighter to enable confirmation of number of coats.
- .6 Unless otherwise approved, apply a minimum of four (4) coats of paint where deep or bright colours are used to achieve satisfactory results.
- .7 Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- .8 Allow applied coat to dry before next coat is applied.
- .9 Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- .10 Continue paint finish behind wall-mounted items such as chalk and tack boards.
- .11 Prime concealed surfaces of interior/ exterior woodwork with primer paint.
- .12 Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25% with mineral spirits.

3.4 Finishing Mechanical And Electrical Equipment

- .1 Refer to mechanical and/or electrical Drawings.
- .2 Unless otherwise specified, paint all unfinished conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and texture to match adjacent surfaces in the following areas:
 - .1 Exposed-to-view exterior and interior areas.
 - .2 High humidity interior areas.

- .3 In unfinished areas leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish; touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Paint inside of ductwork and convector and baseboard heating cabinets where visible behind louvers, grilles and diffusers for a minimum of 460 mm (18 inch) or beyond sight line, whichever is greater, with primer and one (1) coat of matt black (non-reflecting) paint.
- .7 Paint the inside of light valances gloss white.
- .8 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .9 Paint red or band all fire protection piping and sprinkler lines in accordance with mechanical specification requirements. Keep sprinkler heads free of paint.
- .10 Paint yellow or band all natural gas piping in accordance with mechanical specification requirements.
- .11 Backprime and paint face and edges of plywood service panels for telephone and electrical equipment before installation gray, semi-gloss to match adjacent wall surface. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .12 Paint exterior steel electrical light standards. Do not paint outdoor transformers and substation equipment.
- .13 Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings that were removed prior to finishing.

3.5 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Provide inspection by Paint Inspection Agency (inspector) acceptable to the specifying authority for questionable coated areas.
 - .3 Acceptable Surfaces:
 - .1 No visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39 inch).
 - .2 No visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39 inch).
 - .3 No visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 - .4 Uniformity of colour, sheen, texture, and hiding across full surface area.

3.6 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

End of Section

Part 1 General

1.1 Section Includes

- .1 Solid plastic toilet compartments, ceiling hung.

1.2 Related Requirements

- .1 Section 06 10 00 - Rough Carpentry: Framing above ceiling for partition panel support.
- .2 Section 05 50 00 - Metal Fabrications: Placement of concealed supports.

1.3 Reference Standards

- .1 ASTM A167-99(2009) (Withdrawn) - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 CSA-B651-18 - Accessible Design for the Built Environment.
- .3 NEMA LD 3-2005 - High Pressure Decorative Laminates (HPDL).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with placement of support framing and anchors in wall.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on panel construction, hardware, and accessories.
- .3 Shop Drawings: Indicate partition plan, elevation views, dimensions, details of ceiling supports, door swings.
- .4 Samples: Submit two (2) samples of partition panels, 150 mm in size illustrating panel finish, colour, and sheen.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements, including special procedures, perimeter conditions requiring special attention, etc.

1.7 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

Part 2 Products

2.1 Manufacturers

- .1 Bobrick; Product: DuraLineSeries CGL, Model 1088, ceiling-hung, in-swing doors.
- .2 Other acceptable manufacturers offering functionally and aesthetically equivalent products.
- .3 Substitutions: Refer to Section 01 25 00.

2.2 Description

- .1 Regulatory Requirements:
 - .1 Conform to CSA-B651, and applicable code for accessibility requirements for the handicapped.

2.3 Accessories

- .1 Attachments, Screws, and Bolts: Stainless steel; tamper proof type heavy duty extruded aluminum brackets.

- .2 Through Bolts and Nuts: Stainless steel with tamper proof heads.
- .3 Hardware: Per Manufacturer.
 - .1 Pivot hinges, gravity type, adjustable for door close positioning.
 - .2 Nylon bearings.
 - .3 Thumb turn door latch with exterior emergency access feature.
 - .4 Door strike and keeper with rubber bumper.
 - .5 Coat hook with rubber bumper.

2.4 Fabrication

- .1 Fabricate partitions by forming solid phenolic with finished faces and edges. Finish edges convex.
- .2 Bevel corners and edges of cut-outs.
- .3 Doors and Stiles:
 - .1 Thickness: 19mm (3/4 inch).
 - .2 Door Width: 600mm (24 inch), minimum.
 - .3 Height: Nominal 70".
- .4 Panels:
 - .1 Thickness: 13mm (1/2 inch).

2.5 Finishes

- .1 Plastic Laminate - Single Colour: Colour as selected.
- .2 Exposed Steel Surfaces: Chrome plated, Satin finish.
- .3 Aluminum: Anodized, colour clear.
- .4 Non-ferrous Surfaces: Satin chrome plated.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that field measurements are as indicated on Shop Drawings.
- .3 Verify correct spacing of and between plumbing fixtures.
- .4 Verify correct location of built-in framing, anchorage, and bracing.

3.2 Installation

- .1 Install partitions to manufacturer's written instructions.
- .2 Install partitions secure, rigid, plumb, and level.
- .3 Maintain 10 mm to 13 mm space between wall and panels and between wall and end pilasters.
- .4 Attach panel brackets securely to walls using anchor devices.
- .5 Attach panels and pilasters to brackets with tamper proof through bolts and nuts. Locate head rail joints at pilaster centre lines.
- .6 Support pilasters from built-in framing using two (2) adjustable hanging studs providing vertical levelling. Conceal ceiling fastenings with pilaster shoe.
- .7 Equip each door with two (2) hinges, one (1) door latch, one (1) coat hook and bumper, out-swinging door with pull.
- .8 Install door strike and keeper with door bumper on each pilaster in alignment with door latch.
- .9 Field touch-up of scratches or damaged finish will not be permitted.
- .10 Replace damaged or scratched materials with new materials.

3.3 Erection Tolerances

- .1 Section 01 73 00: Tolerances.

3.4 Adjusting

- .1 Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 5 mm.
- .2 Adjust hinges to position doors in partial opening position when unlatched. Return out swinging doors to closed position.
- .3 Adjust adjacent components for consistency of line or plane.

End of Section

Part 1 General

1.1 Section Includes

- .1 Shop fabricated stainless steel countertop.

1.2 Related Requirements

- .1 Section 01 21 00 - Allowances
- .2 Section 05 55 00 – Metal Fabrications: Metal countertop framing.

1.3 Reference Standards

- .1 ASTM A240/A240M-19 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .2 AWS D1.6/D1.6M-2017 - Structural Welding Code - Stainless Steel.
- .3 CSA-O121-17 - Douglas Fir Plywood.
- .4 CSA-O151-17 - Canadian Softwood Plywood.
- .5 CSA-O153-19 - Poplar Plywood.
- .6 CSA-W48-18 - Filler Metals and Allied Materials for Metal Arc Welding.
- .7 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.

1.4 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Develop sketches and drawings in consultation with Owner and Consultant.
 - .2 Indicate profiles, sizes, connection attachments, reinforcing, and accessories. Include erection drawings, elevations, and details where applicable.
 - .3 Indicate welded connections using standard welding symbols. Indicate net weld lengths.

1.5 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.

1.6 Quality Assurance

- .1 Welded Stainless Steel Construction: AWS D1.6/D1.6M.

Part 2 Products

2.1 Performance / Design Criteria

- .1 Reinforce counters and cabinets to support a load of 90 kg (200 lbs) concentrated on 0.093 sq m (1 sq ft) in any area with no indentation showing on surface and with permanent set not exceeding 0.127 mm (0.005 inch).

2.2 Materials

- .1 Stainless Steel Sheet: ASTM A240/A240M, Type 304, 1.6 mm (16 gauge) thickness.
- .2 Plywood: CSA-O151, CSA-O121, CSA-O153,
- .3 Welding Materials: Type required for materials being welded.
- .4 Welding Filler Material: CSA-W48.
- .5 Steel Base: As specified in Section 05 50 00.

2.3 Fabrication

- .1 Fit and shop assemble items in largest practical sections, for delivery to site.
- .2 Bond stainless steel to waterproof plywood.

- .3 Provide front and end overhang of 25 mm (1 inch) over base construction.
- .4 Fabricate units for field assembly. Locate field-made joints only where indicated.
- .5 Make exposed joints butt tight, flush, and hairline. Seal with silicone sealant under joint prior to setting countertop.
- .6 Make exposed joints butt tight, flush, and hairline. Fasten hairline joints using bolts through flanges attached to bottom of counter. Seal seam using silicone sealant between bolt flanges before setting countertop.
- .7 Fabricate units for installation without field-made joints. Weld, grind and polish exposed joints flush and smooth to render joints invisible.
- .8 Edges: No-drip marine edge.
- .9 Backsplash: Fabricate 100 mm (4 inches) high back side splash, bonded to 6 mm (1/4 inch) plywood or MDF, integrally coved to horizontal surface.
- .10 Sink: Fabricate integrally welded double sink, reinforced with sound deadening coating, bottoms pattern creased for drainage.
- .11 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 Fabrication Tolerances

- .1 Squareness: 3 mm (1/8 inch) maximum difference in diagonal measurements.
- .2 Maximum Bow: 3 mm in 1.2 m (1/8 inch in 4 ft).
- .3 Maximum Deviation From Plane: 1.5 mm in 1.2 m (1/16 inch in 4 ft).

2.5 Finishes

- .1 Stainless Steel Finish: Custom ground or No. 4 brush.
- .2 Grind and polish to uniform finish, with no visible welds and free of cross scratches.
- .3 When polishing is complete, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that field conditions are acceptable and are ready to receive work.
- .3 Verify dimensions, tolerances, and method of attachment with other work.

3.2 Installation

- .1 Install cabinet/countertops plumb and level, accurately fitted, free from distortion or defects.
- .2 Install cabinet/countertops to base, using fasteners and method recommended by manufacturer.

End of Section

Part 1 General

1.1 Section Includes

- .1 Pre-engineered, shop fabricated structural steel building Components.

1.2 Related Requirements

- .1 Section 03 30 00 - Cast-In-Place Concrete: Concrete footings, floor slab.
- .2 Section 07 21 13 - Board Insulation: Subgrade insulation at foundation perimeter.
- .3 Section 07 42 13 - Insulated Metal Wall Panels.
- .4 Section 07 61 00 - Sheet Metal Roofing.
- .5 Section 07 92 00 - Joint Sealants.
- .6 Section 08 11 13 - Metal Doors and Frames: Metal doors and frames.
- .7 Section 08 36 13 - Sectional Doors: Overhead doors.
- .8 Section 09 91 00 - Painting: Finish painting of primed steel surfaces.

1.3 Reference Standards

- .1 ASTM A36/A36M-19 - Standard Specification for Carbon Structural Steel.
- .2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A153/A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .5 ASTM F3125/F3125M-19 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .6 ASTM A325-10e1 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .7 ASTM A490M-12 - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
- .8 ASTM A490-12 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
- .9 ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .10 ASTM A501/A501M-14 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- .11 ASTM A529/A529M-19 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
- .12 ASTM A572/A572M-18 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- .13 ASTM A653/A653M-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .14 ASTM C665-17 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .15 ASTM C991-16 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
- .16 ASTM C1107/C1107-20 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non shrink).
- .17 CAN/ULC-S702-14 - Standard for Mineral Fibre Thermal Insulation for Buildings.
- .18 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.
- .19 CSA-W48-18 - Filler Metals and Allied Materials for Metal Arc Welding.

- .20 CSA-W55.3-08 (R2018) - Certification of Companies for Resistance Welding of Steel and Aluminum.
- .21 CSA-W59-18 - Welded Steel Construction (Metal Arc Welding).
- .22 CSA-W59.2-18 - Welded Aluminum Construction.
- .23 CSSBI 30M-07 - Standard for Steel Building Systems.
- .24 MBMA (Metal Building Manufacturers Association) - Metal Building Systems Manual-2012.
- .25 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.
- .26 UL 580-2006 - Standard for Tests for Uplift Resistance of Roof Assemblies (5th Edition).
- .27 ULC (Underwriters' Laboratories of Canada).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination: Coordinate with other work having a direct bearing on work of this section.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on profiles, component dimensions, fasteners.
- .3 Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, method of installation; framing anchor bolt settings, sizes, and locations from datum, and foundation loads; indicate welded connections with appropriate welding symbols; indicate net weld lengths; provide professional seal and signature.
- .4 Samples: Submit two (2) samples of pre-coated metal panels for each colour selected, illustrating colour and texture of finish.

1.6 Closeout Submittals

- .1 Section 01 78 00: Submission procedures.
- .2 Record Documentation: Record actual locations of concealed components and utilities.

1.7 Quality Assurance

- .1 Welders' Certificates: Submit to Section 01 33 00, certifying welders employed on the Work, verifying qualification within the previous twelve (12) months to CSA-W47.1, CSA-W55.3, CSA-W59, CSA-W59.2.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .3 Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.8 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide a five (5) year warranty to include coverage for failure to meet specified requirements.
- .3 Warranty: Include coverage for exterior pre-finished surfaces to cover pre-finished colour coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading. Include coverage for weather tightness of building enclosure elements after installation.

Part 2 Products

2.1 Manufacturers

- .1 Butler Manufacturing.
- .2 Varco Pruden Buildings.
- .3 Steelway Building Systems.
- .4 Robertson Building Systems.

- .5 Substitutions: Refer to Section 01 25 00.

2.2 Description

- .1 System Description:
 - .1 Refer to Drawings.
 - .2 Single span rigid frame double slope and portal frame structures.
 - .3 Bay Spacing: Refer to Drawings.
 - .4 Wall System: Refer to Section 07 42 13, and Drawings.
 - .5 Roof System: Refer to Drawings.
- .2 Regulatory Requirements:
 - .1 Conform to applicable code as required for acquiring permits.
 - .2 Cooperate with regulatory agency or authority and provide data as requested.

2.3 Performance / Design Criteria

- .1 Design to CSSBI 30M.
- .2 Refer to Drawings.
- .3 Provide drainage to exterior for water entering or condensation occurring within wall or roof system.
- .4 Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .5 Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.4 Materials - Framing

- .1 Structural Steel Members: ASTM A529/A529M, A572/A527M, Grade 55.
- .2 Structural Tubing: ASTM A500/A500M, Grade B.
- .3 Plate or Bar Stock: ASTM A529/A529M.
- .4 Anchor Bolts: ASTM A307, galvanized to ASTM A153/A153M.
- .5 Bolts, Nuts, and Washers: ASTM A325M (ASTM A325).
- .6 Welding Materials: Type required for materials being welded.
- .7 Primer: SPCC-Paint 25 zinc oxide.
- .8 Grout: ASTM C1107/C1107 Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 17 MPa (2400 psi) in two (2) days and 48 MPa (7000 psi) in twenty-eight (28) days.

2.5 Materials - Roof System

- .1 Refer to Drawings.
- .2 Refer to Section 07 61 00 - Sheet Metal Roofing.
- .3 Joint Seal Gaskets: Manufacturer's standard type.
- .4 Fasteners: Manufacturer's standard type, finish to match adjacent surfaces when exposed
- .5 Sealant: As specified in Section 07 92 00.
- .6 Trim, Closure Pieces, Caps, Flashings, Rainwater Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.6 Fabrication - Framing

- .1 Refer to Drawings.
- .2 Fabricate members to CSA specifications for plate, bar, tube, or rolled structural shapes.
- .3 Anchor Bolts: Assembled with template for casting into concrete.
- .4 Provide framing for any/all service openings.

2.7 Fabrication - Wall And Roof Systems

- .1 Refer to Drawings.
- .2 Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.
- .3 Fasteners: To maintain load requirements and weather tight installation.
- .4 Snow/Ice Guards: To retain snow and ice from being a hazard near/adjacent to building.

2.8 Fabrication - Gutters And Downspouts

- .1 Fabricate of same material and finish as roofing metal.
- .2 Form gutters and downspouts and scuppers of size and profile as indicated, to collect and remove water. Fabricate with connection pieces.
- .3 Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.
- .4 Fabricate support straps of same material and finish as roofing metal, colour as selected.

2.9 Finishes

- .1 Framing Members: Clean, prepare, and prime to SSPC Manual requirements. Do not prime surfaces to be field welded.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position.

3.2 Erection - Framing

- .1 Erect framing in accordance with CSSBI and MBMA.
- .2 Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.
- .3 Set column base plates with non-shrink grout to achieve full plate bearing.
- .4 Do not field cut or alter structural members without approval.
- .5 After erection, prime welds, abrasions, and surfaces not galvanized or shop primed.

3.3 Erection - Roofing Systems

- .1 Refer to Drawings.
- .2 Install to manufacturer's instructions and CSSBI requirements.
- .3 Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- .4 Fasten cladding system to structural supports, aligned level and plumb.
- .5 Locate end laps over supports. End laps minimum 50 mm (2 inches). Place side laps over bearing.
- .6 Provide expansion joints where indicated.
- .7 Install sealant and gaskets to prevent weather penetration.

3.4 Erection - Gutter And Downspout

- .1 Rigidly support and secure components. Joint lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
- .2 Apply bituminous paint on surfaces in contact with cementitious materials.
- .3 Slope gutters.
- .4 Install downspouts into cast iron roof drain servicing boots to match downspout sizing per building supplier requirements.

3.5 Installation - Accessories

- .1 Seal wall and roof accessories watertight and weather tight with sealant as specified in Section 07 92 00.

3.6 Erection Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Framing Members: 6 mm (1/4 inch) from level; 3 mm (1/8 inch) from plumb.
- .3 Siding and Roofing: 3 mm (1/8 inch) from true position.

End of Section

Part 1 General

1.1 Section Includes

- .1 Subsoil materials.
- .2 Topsoil materials.

1.2 Related Requirements

- .1 Section 00 31 00 - Geotechnical Investigation Report: borehole locations and findings of subsurface materials.
- .2 Section 01 43 00 - Quality Assurance: Testing soil fill materials.
- .3 Section 31 22 13 - Rough Grading.
- .4 Section 31 22 19 - Finish Grading.
- .5 Section 31 23 23 - Backfill.
- .6 Section 32 92 19 - Seeding.
- .7 Section 32 92 23 - Sodding.

1.3 Reference Standards

- .1 Ontario Provincial Standard Specifications (OPSS).
- .2 OPSS 802, construction Specification for Topsoil.
- .3 AASHTO T 180-17 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 inch) Drop.
- .4 ASTM D698-12e2 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- .5 ASTM D1557-12e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- .6 ASTM D2167-15 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- .7 ASTM D2487-17e1 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- .8 ASTM D6938-17a - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Coordinate material sampling and qualification with designated material testing authority.

1.5 Informational Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Materials Source: Submit name of imported materials source.

1.6 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.7 Quality Assurance

- .1 Perform installation and preparation in accordance with OPSS 802.
- .2 Perform work in accordance with site-specific geotechnical report.

Part 2 Products

2.1 Subsoil Materials

- .1 Refer to

2.2 Topsoil Materials

- .1 Topsoil Type S4:
 - .1 Excavated and reused material generated from site stripping and preparation.
 - .2 Graded.
 - .3 Free of roots, rocks larger than 13 mm (1/2 inch), subsoil, debris, large weeds and foreign matter.

2.3 Source Quality Control

- .1 Section 01 43 00: Testing and analysis of soil material.
- .2 Testing and Analysis of Subsoil Material: Perform to ASTM D698, ASTM D1557, AASHTO T 180, ASTM D2167.
- .3 Testing and Analysis of Topsoil Material: Perform to ASTM D698, ASTM D1557, AASHTO T 180, ASTM D2167.
- .4 If tests indicate materials do not meet specified requirements, change material and retest.
- .5 Provide materials of each type from same source throughout the Work.

Part 3 Execution

3.1 Soil Removal

- .1 Stockpile excavated material in area designated on site and remove excess material not being used, from site.
- .2 Remove excavated material from site.
 - .1 Per applicable legislation and authorities having jurisdiction.

3.2 Stockpiling

- .1 Stockpile materials on site at locations designated by Consultant.
- .2 Stockpile in sufficient quantities to meet Project schedule and requirements.
- .3 Separate differing materials with dividers or stockpile apart to prevent mixing.
- .4 Prevent intermixing of soil types or contamination.
- .5 Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- .6 Install and maintain erosion and sedimentation controls on and around soil stockpiles.

3.3 Stockpile Cleanup

- .1 Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.
- .2 Leave unused materials in a neat, compact stockpile.
 - .1 With erosion and sedimentation controls in place.
- .3 If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

End of Section

Part 1 General

1.1 Section Includes

- .1 Removal of surface debris.
- .2 Removal of paving, curbs.
- .3 Removal of trees, shrubs, and other plant life.
- .4 Removal of underground storage tanks.
- .5 Topsoil excavation.

1.2 Related Requirements

- .1 Division 02.
- .2 OPSS MUNI 201.
- .3 Section 31 23 16 - Excavation.
- .4 Section 31 23 23 - Backfill.
- .5 Section 02 41 16 - Structure Demolition.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code for environmental requirements, disposal of debris burning debris on site and use of herbicides.
 - .2 Coordinate clearing Work with utility companies.

Part 3 Execution

3.1 Preparation

- .1 Verify that existing plant life designated to remain is tagged or identified.
- .2 Identify a waste area / salvage area for placing removed materials.

3.2 Protection

- .1 Locate, identify, protect utilities that remain, from damage.
- .2 Protect trees, plant growth, and features designated to remain, as final landscaping.
- .3 Protect bench marks, survey control points and existing structures from damage or displacement.

3.3 Clearing

- .1 Clear areas required for access to site and execution of Work.
- .2 Remove trees and shrubs indicated, within marked areas. Remove stumps, surface rock, main root ball and root system to a depth of requirements.
- .3 Clear undergrowth and deadwood, without disturbing subsoil.

3.4 Removal

- .1 Remove debris, rock, and extracted plant life from site.
- .2 Remove paving, curbs.
- .3 Partially remove paving, curbs, as indicated. Neatly saw cut edges at right angle to surface.
- .4 Excavate and remove underground storage tanks, retaining straps, associated plumbing piping, foundation pad.

3.5 Topsoil Excavation

- .1 Do not excavate wet topsoil.

- .2 Stockpile in area designated on site to depth not exceeding 2.5 m (8 ft) and protect from erosion.
- .3 Remove excess topsoil not intended for reuse, from site.
- .4 Remove topsoil from site.

End of Section

Part 1 General

1.1 Section Includes

- .1 Removal of topsoil and/or subsoil.
- .2 Cutting, grading, rough contouring the site for site structures, building pads, etc..

1.2 Related Requirements

- .1 Section 01 43 00 - Quality Assurance: Testing fill compaction.
- .2 Section 02 41 16 - Structure Demolition.
- .3 Section 31 05 13 - Soil Materials.
- .4 Section 31 05 16- Aggregate Materials.
- .5 Section 31 10 00 - Site Clearing.
- .6 Section 31 22 19 - Finish Grading: Finish grading with topsoil to contours.
- .7 Section 31 23 16 - Excavating: Building excavation.
- .8 Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.
- .9 Section 31 23 16.26 - Rock Removal.
- .10 Section 31 23 23.13 - Backfilling: General building area backfilling.

1.3 Reference Standards

- .1 AASHTO T 180-17 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 inch) Drop.
- .2 ASTM C136/A136M-19 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698-12e2 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- .4 ASTM D1556/D1556M-15e1 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- .5 ASTM D1557-12e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- .6 ASTM D2167-15 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- .7 ASTM D2419-14 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- .8 ASTM D2434-19 - Standard Test Method for Permeability of Granular Soils (Constant Head).
- .9 OPSS MUNI 206 - Grading.

1.4 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.5 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Record Documentation: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 Quality Assurance

- .1 Perform Work in accordance with:
 - .1 Geotechnical report recommendations and standards.
 - .2 Applicable standards, permits, etc.
 - .3 Maintain one (1) copy of document on site.

Part 2 Products

2.1 Materials

- .1 As specified in geotechnical report.
- .2 Topsoil: Type S1 as specified in Section 31 05 13.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 Preparation

- .1 Identify required lines, levels, contours, and datum.
- .2 Stake and flag locations of known utilities.
- .3 Locate, identify and protect utilities that remain, from damage.
- .4 Notify utility company to remove and relocate utilities.
- .5 Protect above and below grade utilities that remain.
- .6 Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- .7 Protect bench marks, and all features to remain from excavating equipment and vehicular traffic.

3.3 Subsoil Excavation

- .1 Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.
- .2 Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- .3 When excavating through roots, perform work by hand and cut roots with sharp axe.
- .4 Remove subsoil from site.
- .5 Stockpile in area designated on site to depth not exceeding 2.5 m and protect from erosion. Remove from site, subsoil not being reused.
- .6 Benching Slopes: as per authority requirements applicable to the Work.
- .7 Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 Filling

- .1 Place material in accordance with geotechnical requirements.
- .2 Fill areas to contours and elevations with unfrozen materials.
- .3 Place fill material on continuous layers and compact in accordance with geotechnical requirements.
- .4 Maintain optimum moisture content of fill materials to attain required compaction density.
- .5 Slope grade away from building minimum 1.5:100, unless noted otherwise.
- .6 Make grade changes gradual. Blend slope into level areas.
- .7 Remove surplus fill materials from site.

3.5 Tolerances

- .1 Top Surface of Subgrade: Plus or minus 30 mm from required elevation.

3.6 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Testing to geotechnical engineer's requirements and standards.
 - .3 If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
 - .4 Frequency of Tests: per geotechnical engineer.

End of Section

Part 1 General

1.1 Section Includes

- .1 Final grade topsoil for finish landscaping.

1.2 Related Requirements

- .1 Section 01 43 00 - Quality Assurance: Testing fill compaction.
- .2 Section 31 05 13 - Soil Materials.
- .3 Section 31 22 13 - Rough Grading: Site contouring.
- .4 Section 31 23 16.13 - Trenching: Backfilling trenches.
- .5 Section 31 23 23.13 - Backfilling: Backfilling at building areas.
- .6 Section 32 92 19 - Seeding: Finish ground cover.
- .7 Section 32 93 00 - Trees, Shrubs And Ground Cover Planting: Topsoil fill for trees, plants and ground cover.

Part 2 Products

2.1 Material

- .1 Topsoil: Fill Type S2 as specified in Section 31 05 13.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify building and trench backfilling have been inspected.
- .3 Verify substrate base has been contoured and compacted.

3.2 Substrate Preparation

- .1 Eliminate uneven areas and low spots.
- .2 Remove debris, roots, branches, stones, in excess of 25 mm in size. Remove subsoil contaminated with petroleum products.
- .3 Scarify surface to depth of 75 mm where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 Placing Topsoil

- .1 Place topsoil in areas where sodding or seeding is required, nominal thickness as scheduled. Place topsoil during dry weather.
- .2 Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- .3 Remove roots, weeds, rocks, and foreign material while spreading.
- .4 Manually spread topsoil close to plant life, buildings to prevent damage.
- .5 Lightly compact or roll placed topsoil.
- .6 Remove surplus subsoil and topsoil from site.
- .7 Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Top of Topsoil: Plus or minus 1/2 inch.

3.5 Protection

- .1 Section 01 78 23: Protecting installed work.

- .2 Protect landscaping and other features remaining as final work.
- .3 Protect all features to remain.

End of Section

Part 1 General

1.1 Section Includes

- .1 Excavating for building foundations.
- .2 Excavating for slabs-on-grade, paving, landscaping, et al.
- .3 Excavating for site structures.

1.2 Related Requirements

- .1 Document 00 30 00 - Subsurface Investigation Report: Geotechnical report; bore hole locations and findings of subsurface materials.
- .2 Section 13 47 13 - Site Grounding - Cathodic Protection.
- .3 Section 31 05 13 - Soils for Earthwork.
- .4 Section 31 10 00 - Site Clearing.
- .5 Section 31 22 13 - Rough Grading.
- .6 Section 31 23 16 - Excavating: Excavating for piling.
- .7 Section 31 23 23.13 - Backfilling.
- .8 Section 31 22 19 - Finish Grading.

Part 2 Products - Not Used

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 Preparation

- .1 Identify required lines, levels, contours, and datum locations.
- .2 Locate, identify, and protect utilities that remain from damage.
- .3 Notify utility company to remove and relocate utilities.
- .4 Protect plant life, lawns, rock outcroppings and other features remaining as a portion of final landscaping.
- .5 Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 Excavating

- .1 Excavate subsoil to accommodate building foundations, slabs-on-grade, paving, site structures, and construction operations.
- .2 Coordinate special requirements for piling, as applicable.
- .3 Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 23.13.
- .4 Do not interfere with 45 degree bearing splay of foundations.
- .5 Grade top perimeter of excavating to prevent surface water from draining into excavation.
- .6 Hand trim excavation. Remove loose matter.
- .7 Remove lumped subsoil, boulders, and rock up to 0.25 cu m (1/3 cu yd) measured by volume. Larger material will be removed under Section 31 23 16.26.
- .8 Notify Consultant of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- .9 Correct areas over excavated as specified in Section 31 23 23.13.

- .10 Stockpile excavated material in area designated on site as specified in Section 31 05 13; remove excess or unsuitable material from site, without approval.

3.4 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Provide for visual inspection of bearing surfaces.

3.5 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- .3 Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

End of Section

Part 1 General

1.1 Section Includes

- .1 Building perimeter site structure backfilling to subgrade elevations.
- .2 Site filling and backfilling.
- .3 Fill under slabs-on-grade, paving, flatworks.
- .4 Fill for over-excavation.
- .5 Consolidation and compaction as scheduled.
- .6 Sheet vapour retarder and ballast cover in crawl space.

1.2 Related Requirements

- .1 Document 00 30 00 - Subsurface Investigation Report: Geotechnical report; bore hole locations and findings of subsurface materials.
- .2 Section 01 29 00 - Payment Procedures: Requirements applicable to unit prices for the work of this section.
- .3 Section 01 43 00 - Quality Assurance: Compaction testing.
- .4 Section 31 05 13 - Soils for Earthwork.
- .5 Section 31 22 13 - Rough Grading: Filling of topsoil material to finish grade elevation.
- .6 Section 31 23 16 - Excavating.
- .7 Section 03 30 00 - Cast-in-place Concrete: Concrete materials.

1.3 Reference Standards

- .1 AASHTO T 180-17 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 inch) Drop.
- .2 ASTM D698-12e2 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- .3 ASTM D1556/D1556M-15e1 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- .4 ASTM D1557-12e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- .5 ASTM D2167-15 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- .6 OPSS MUNI 401 - Trenching, Backfilling, Compacting.
- .7 OPSS MUNI 902 - Excavating and Backfilling - Structures.

1.4 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.5 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

Part 2 Products

2.1 Fill Materials

- .1 As specified in geotechnical report and/or Drawings.

2.2 Accessories

- .1 As indicated in geotechnical report and/or on Drawings.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- .3 Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.
- .4 Verify structural ability of unsupported walls to support imposed loads by the fill.

3.2 Preparation

- .1 Compact subgrade to density requirements for subsequent backfill materials.
- .2 Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type A1 fill and compact to density equal to or greater than requirements for subsequent fill material.
- .3 Scarify and proof roll subgrade surface to a depth of 150mm to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 Backfilling

- .1 Backfill areas to contours and elevations with unfrozen materials.
- .2 Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- .3 Employ a placement method that does not disturb or damage other work.
- .4 Maintain optimum moisture content of backfill materials to attain required compaction density.
- .5 Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
- .6 Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- .7 Slope grade away from building minimum 50 mm in 3 m (2 inches in 10 ft), unless noted otherwise.
- .8 Make gradual grade changes. Blend slope into level areas.
- .9 Remove surplus backfill materials from site.

3.4 Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Top Surface of Backfilling Under Paved Areas: Plus or minus 25 mm (1 inch) from required elevations.
- .3 Top Surface of General Backfilling: Plus or minus 25 mm (1 inch) from required elevations.

3.5 Field Quality Control

- .1 Inspection and Testing:
 - .1 Section 01 45 00: Field inspection, testing.
 - .2 Compaction testing will be performed to geotechnical report requirements.
 - .3 If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
 - .4 Frequency of Tests: as required by geotechnical engineer.

3.6 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Reshape and re-compact fills subjected to vehicular traffic.

End of Section

Part 1 General

1.1 Section Includes

- .1 Painted pavement markings.
- .2 Reflective glass beads in paint.

1.2 Related Requirements

- .1 Section 00 31 00 - Available Project Information: Geotechnical Report.
- .2 Section 32 01 11 – Pavement Surface Cleaning:
- .3 Section 32 01 12 – Removal of Pavement Markings:

1.3 Reference Standards

- .1 AASHTO M 247-13(2018) - Standard Specification for Glass Beads Used in Traffic Paints.
- .2 AASHTO M 248-91 (2012) - Standard Specification for Ready-Mixed White and Yellow Traffic Paints.
- .3 MPI (Master Painters Institute) – Architectural Painting Specifications Manual and Maintenance Repainting Manual.
- .4 Ontario Provincial Standard Specifications (OPSS).

1.4 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate with installation of surrounding surfaces, signage and supports.

1.5 Action Submittals

- .1 Section 01 33 00: Submission procedures.
- .2 Submit cured material samples of paint for Consultant/Owner's review.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.

1.8 Quality Assurance

- .1 Products of This Section: Manufactured to ISO 9000, ISO 14000 certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .3 Applicator Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.9 Site Conditions

- .1 Ambient Conditions:
 - .1 Apply paint only when ambient temperature is above 10 degrees C (50 degrees F) and no rain is forecast, unless approved otherwise by Consultant.

1.10 Warranty

- .1 Section 01 78 00: Warranties.
- .2 Provide a three (3) year warranty to include coverage for failure to meet specified requirements.

Part 2 Products

2.1 Manufacturers

- .1 Refer to OPSS.MUNI 710.

2.2 Description

- .1 Regulatory Requirements:
 - .1 Conform to applicable code and regulations for pavement marking requirements.

2.3 Materials

- .1 Paint: Alkyd traffic paint, to AASHTO M 248 MPI #97, latex MPI #32, alkyd.
 - .1 Colours: White, Yellow.
 - .1 Colour to be determined by Owner.
 - .2 Thinner: Petroleum spirits, low flash.
 - .3 Glass beads: Overlay type to AASHTO M 247.

2.4 Equipment Requirements

- .1 Paint Applicator:
 - .1 Pressure distributor.
 - .2 Capable of applying paint in single and dashed lines.
 - .3 Ensure uniform application.
 - .4 Equip with positive shut-off.
- .2 Apply reflective glass beads as an overlay on freshly applied paint.

Part 3 Execution

3.1 Preparation

- .1 Assure pavement surface free of surface water, snow, frost, ice, dust, oil, and other foreign materials.
- .2 Provide adequate warning signs and traffic devices to prevent fresh-paint tracking by traffic.

3.2 Application

- .1 Lay out pavement markings prior to applying paint, to approval of Consultant.
- .2 Apply traffic paint evenly at rate of 3 sq m/L (120 sq ft/gal).
- .3 Do not thin paint unless approved by Consultant.
- .4 Symbols and letters to conform to dimensions indicated.
- .5 Paint lines of uniform colour and density with clean edges.
- .6 Thoroughly clean distributor tank before refilling with paint of different colour.
- .7 Apply glass beads at a rate of 200 g/sq m (7.5 oz/sq ft) on:
 - .1 Painted area on cross walks, road centrelines.
 - .2 Other areas designated.
 - .3 Immediately after application of paint.

3.3 Tolerances

- .1 Section 01 73 00: Tolerances.
- .2 Painted Markings:
 - .1 Maximum Variation from Required Line Width Dimensions: Plus or minus 6 mm (1/4 inch).
 - .2 Maximum Variation from Required Length Dimensions: Plus or minus 13 mm (1/2 inch).
 - .3 Remove Incorrect Markings: Refer to Section 32 01 12.

3.4 Cleaning

- .1 Section 01 74 10: Cleaning installed work.
- .2 Remove all debris, rubbish, and excess material.

3.5 Protection

- .1 Section 01 78 23: Protecting installed work.
- .2 Protect pavement markings from any disfigurement, until dry.

End of Section

Part 1 General

1.1 Section Includes

- .1 Preparation of subsoil.
- .2 Placing topsoil.
- .3 Seeding, mulching and fertilizing.
- .4 Maintenance.

1.2 Related Requirements

- .1 Section 31 05 13 - Soil Materials: Topsoil material.
- .2 Section 31 22 19 - Finish Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.
- .3 Section 31 23 16.13 - Trenching: Rough grading over cut.
- .4 Section 31 23 23.13 - Backfilling: Rough grading of site.
- .5 Section 32 84 00 - Landscape Irrigation.
- .6 Section 32 92 23 - Sodding.
- .7 Section 32 93 00 - Trees, Shrubs And Ground Cover Planting.
- .8 OPSD 802, 803.
- .9 Municipal Servicing Standards, October 2018.

1.3 Definitions

- .1 Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.5 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Maintenance Contracts:
 - .1 Provide service and maintenance of seeded areas for three (3) months from Date of Substantial Completion.
 - .1 If Substantial Performance date is in winter months, provide service and maintenance commencing April 1st of following year.
 - .2 Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two (2) cuttings.
 - .3 Reseed/overseed areas planted after September 30th of any given year.
- .3 Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 Quality Assurance

- .1 Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- .2 Seed mix to meet Municipal Standards.

1.7 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

- .3 Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Comply with regulatory agencies for fertilizer composition.
 - .2 Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

2.2 Seed Suppliers

- .1 Suppliers:
 - .1 Local supplier with Owner's approval.
- .2 Substitutions: Refer to Section 01 25 00.

2.3 Seed Mixture

- .1 Seed Mixture: Per Municipal Standard.
- .2 Seed Mixture:
 - .1 Nu Blue Kentucky Bluegrass, 25%.
 - .2 Baron Kentucky Bluegrass, 25%.
 - .3 Herald Creeping Red Fescue, 15%.
 - .4 Wilma Chewing Fescue, 10%.
 - .5 Pinnacle Turf Type Per Rye, 25%.

2.4 Soil Materials

- .1 Topsoil: As specified in Section 31 05 13, Type OPSS 802.
- .2 Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
- .3 Topsoil: Excavated from site and free of weeds.
 - .1 And other deleterious materials/debris. Acceptance subject to approval of Consultant.

2.5 Accessories

- .1 Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.
- .2 Mulching Material: Hemlock species wood cellulose fibre, chip form, free of growth or germination inhibiting ingredients.
- .3 Fertilizer: Type recommended for soil and grass, with 50% of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated in analysis.
- .4 Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- .5 Erosion Fabric: Jute matting, open weave.
- .6 Herbicide: not used.
- .7 Stakes: Softwood lumber, chisel pointed.
- .8 String: Inorganic fibre.
- .9 Edging: not used.

2.6 Source Quality Control

- .1 Section 01 43 00: Manufacturer quality control.
- .2 Provide mix formulation for hydroseeding.
- .3 Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that prepared soil base is ready to receive the work of this section.

3.2 Preparation Of Subsoil

- .1 Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- .2 Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- .3 Scarify subsoil to a depth of 75 mm (3 inches) where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 Placing Topsoil

- .1 Spread topsoil to a minimum depth of 200 mm (8 inches) over area to be seeded. Rake until smooth.
- .2 Place topsoil during dry weather and on dry unfrozen subgrade.
- .3 Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- .4 Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- .5 Install edging at periphery of seeded areas in straight lines to consistent depth.
- .6 Coordinate with installation of underground sprinkler system piping and watering heads.

3.4 Fertilizing

- .1 Apply fertilizer at rate by supplier to enhance topsoil conditions and, recommended by manufacturer.
- .2 Apply after smooth raking of topsoil and prior to roller compaction.
- .3 Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- .4 Mix thoroughly into upper 50 mm (2 inches) of topsoil.
- .5 Lightly water to aid the dissipation of fertilizer.

3.5 Seeding

- .1 Apply seed at a rate of recommended by supplier evenly in two intersecting directions. Rake in lightly.
- .2 Do not seed areas in excess of that which can be mulched on same day.
- .3 Planting Season: April to September.
- .4 Do not sow immediately following rain, when ground is too dry, or during windy periods.
- .5 Roll seeded area with roller not exceeding 50 kg (112 lbs).
- .6 Immediately following seeding and compacting, apply mulch to a thickness of 3 mm (1/8 inch). Maintain clear of shrubs and trees.
- .7 Apply water with a fine spray immediately after each area has been mulched. Saturate to 100 mm (4 inches) of soil.

3.6 Hydroseeding

- .1 Confirm acceptance of method with consultant, prior to execution.
- .2 Apply seeded slurry with a hydraulic seeder at a rate of recommended by supplier evenly in two intersecting directions.
- .3 Do not hydro-seed area in excess of that which can be mulched on same day.
- .4 Immediately following seeding, apply mulch to a thickness of 3 mm (1/8 inches). Maintain clear of shrubs and trees.
- .5 Apply water with a fine spray immediately after each area has been mulched. Saturate to 100 mm (4 inches) of soil.

3.7 Seed Protection

- .1 Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 48 inches.
- .2 Cover seeded slopes where grade is 1:3 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
 - .1 Refer to geotechnical report recommendations.
- .3 Lay fabric smoothly on surface, bury top end of each section in 150 mm (6 inch) deep excavated topsoil trench. Provide 300 mm (12 inch) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- .4 Secure outside edges and overlaps at 36 inch intervals with stakes.
- .5 Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- .6 At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 150 mm (6 inches).

3.8 Maintenance

- .1 Mow grass at regular intervals to maintain at a maximum height of 65 mm (2-1/2 inches). Do not cut more than 1/3 of grass blade at any one mowing.
- .2 Neatly trim edges and hand clip where necessary.
- .3 Immediately remove clippings after mowing and trimming.
- .4 Water to prevent grass and soil from drying out.
- .5 Roll surface to remove minor depressions or irregularities.
- .6 Control growth of weeds. Apply herbicides in accordance with manufacturer's written instructions. Remedy damage resulting from improper use of herbicides.
- .7 Immediately reseed areas which show bare spots.
- .8 Protect seeded areas with warning signs during maintenance period.
- .9 Reseed/overseed in spring of following year if initial planting after September 30th of any given year.

End of Section

Part 1 General

1.1 Section Includes

- .1 Preparation of subsoil.
- .2 Fertilizing.
- .3 Sod installation.
- .4 Maintenance.

1.2 Related Requirements

- .1 Section 31 05 13 - Soil Materials: Topsoil material.
- .2 Section 31 22 19 - Finish Grading.
- .3 Section 31 23 23.13 - Backfilling: Rough grading of site.
- .4 Section 32 92 19 - Seeding.

1.3 Reference Standards

- .1 ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

1.4 Definitions

- .1 Refer to Municipal Standards.
- .2 Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 Administrative Requirements

- .1 Section 01 31 00: Project management and coordination procedures.
- .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
- .3 Sequencing: Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.6 Informational Submittals

- .1 Section 01 33 00: Submission procedures.

1.7 Closeout Submittals

- .1 Section 01 78 00: Close-out procedures.
- .2 Maintenance Contracts:
 - .1 Provide service and maintenance of sodded areas for three (3) months from Date of Substantial Performance.
 - .2 Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.
- .3 Operation Data: Submit for continuing Owner maintenance.
- .4 Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.8 Quality Assurance

- .1 Sod: Minimum age of eighteen (18) months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
- .2 Submit sod certification for grass species and location of sod source.
- .3 Sod Producer: Company specializing in sod production and harvesting with minimum five (5) years experience, and certified by the Province of Ontario.

- .4 Installer: Company approved by the sod producer.

1.9 Delivery, Storage, And Handling

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver sod in rolls, unless otherwise approved. Protect exposed roots from dehydration.
- .3 Do not deliver more sod than can be laid within twenty-four (24) hours.

Part 2 Products

2.1 Description

- .1 Regulatory Requirements:
 - .1 Comply with regulatory agencies for fertilizer composition.

2.2 Materials

- .1 Sod: as per Municipal Standards.
- .2 Sod: ASPA Field grown grade; cultivated grass sod; type indicated below; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 10 weeds per 100 sq m (1000 sq ft).
- .3 Topsoil: As specified in Section 31 05 13 Type 4.
- .4 Fertilizer: Type recommended for soil and grass, with 50% of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated in analysis.
- .5 Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

2.3 Accessories

- .1 Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

2.4 Harvesting Sod

- .1 Machine cut sod and load on pallets to ASPA Guidelines.
- .2 Cut sod in area not exceeding 1 sq m (1 sq yd), with minimum 13 mm (1/2 inch) and maximum 25 mm (1 inch) topsoil base.

2.5 Source Quality Control

- .1 Section 01 43 00: Manufacturer quality control.
- .2 Provide mix formulation for seed.
 - .1 Seed mix to meet Municipal Standards.
- .3 Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

Part 3 Execution

3.1 Examination

- .1 Section 01 71 00: Verify existing conditions before starting work.
- .2 Verify that prepared soil base is ready to receive the work of this section.

3.2 Preparation Of Subsoil

- .1 Prepare subsoil and eliminate uneven areas and low spots.
- .2 Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- .3 Remove foreign materials and undesirable plants and their roots. Do not bury foreign material beneath areas to be sodded.
- .4 Remove contaminated subsoil.
- .5 Scarify subsoil to a depth of 100 mm (4 inches) where topsoil is to be placed.

- .6 Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.3 Placing Topsoil

- .1 Spread topsoil to a minimum depth of 50 mm (2 inches) over area to be sodded.
- .2 Place topsoil during dry weather and on dry unfrozen subgrade.
- .3 Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- .4 Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- .5 Install edging at periphery of sodded areas in straight lines to consistent depth.

3.4 Fertilizing

- .1 Apply fertilizer at rate recommended by manufacturer.
- .2 Apply after smooth raking of topsoil and prior to installation of sod.
- .3 Apply fertilizer no more than forty-eight (48) hours before laying sod.
- .4 Mix thoroughly into upper 50 mm (2 inches) of topsoil.
- .5 Lightly water to aid the dissipation of fertilizer.

3.5 Laying Sod

- .1 Moisten prepared surface immediately prior to laying sod.
- .2 Lay sod immediately after delivery to site to prevent deterioration.
- .3 Lay sod tight with no open joints visible, and no overlapping; stagger end joints 300 mm minimum. Do not stretch or overlap sod pieces.
- .4 Lay smooth. Align with adjoining grass areas.
- .5 Place top elevation of sod 13 mm (1/2 inch) below adjoining paving, edging, curbs.
- .6 On slopes 1:2 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 600 mm (2 ft) on centre. Drive pegs flush with soil portion of sod.
- .7 Water sodded areas immediately after installation. Saturate sod to 100 mm (4 inches) of soil.
- .8 After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding authority standards.

3.6 Maintenance

- .1 Mow grass at regular intervals to maintain at a maximum height of 65 mm (2-1/2 inches). Do not cut more than 1/3 of grass blade at any one mowing.
- .2 Neatly trim edges and hand clip where necessary.
- .3 Immediately remove clippings after mowing and trimming.
- .4 Water to prevent grass and soil from drying out.
- .5 Roll surface to remove minor depressions or irregularities.
- .6 Control growth of weeds. Apply herbicides in accordance with manufacturer's written instructions. Remedy damage resulting from improper use of herbicides.
- .7 Immediately replace sod to areas which show deterioration or bare spots.
- .8 Protect sodded areas with warning signs during maintenance period.

End of Section

Attachments



Our ref: 11231078

8 April 2022

Bill Balfour, Fire Chief
Township of Cavan-Monaghan Fire Department
 988 County Road 10
 Millbrook, Ontario L0A 1G0

Re: Addendum #1 – Geotechnical Investigation
Proposed New Fire Hall Building
988 County Road 10, Millbrook, Ontario

This letter presents a summary of groundwater measurements collected at the above captioned site and should be considered Addendum No. 1 to the GHD report entitled “Geotechnical Investigation Proposed New Fire Hall Building – 988 County Road 10, Millbrook, Ontario” (the Report) dated March 17, 2022, under GHD’s project no. 11231078.

The geotechnical investigation included the advancement of ten boreholes to depths ranging from 3.7 to 9.5 metres below ground surface (mbgs) and included the installation of three (3) monitoring wells within the advanced boreholes. Details of the monitoring wells are presented in the Report. A summary of the groundwater measurements that have been completed to date is provided in the following table:

Summary of Groundwater Readings

Location	Ground Elevation* (m)	Borehole Depth (mbgs)	Seepage Depth (mbgs) / Seepage Elevation (m)	Water Levels (mbgs) / Groundwater Elevations (m)			
				Aug. 19 or 20, 2021 (Open Borehole)	Aug. 26, 2021 (Monitoring Well)	Nov. 22, 2021 (Monitoring Well)	Apr. 7, 2022 (Monitoring Well)
MW1-21	256.53	8.1	Not observed	Dry	Dry	2.3 / 254.2	2.9 / 253.6
BH2-21	255.96	9.5	6.1 / 249.9	9.0 / 247.0	Monitoring well not installed		
MW3-21	257.42	9.3	6.7 / 250.7	8.5 / 248.9	3.5 / 253.9	1.9 / 255.5	2.7 / 254.7
BH4-21	257.72	7.6	4.3 / 253.4	4.6 / 253.1	Monitoring well not installed		
BH5-21	257.41	6.4	Not observed	Dry	Monitoring well not installed		
MW6-21	257.62	8.4	Not observed	Dry	Dry	5.3 / 252.3	4.7 / 252.9
BH7-21	254.49	4.9	Not observed	Dry	Monitoring well not installed		
BH8-21	254.46	3.7	Not observed	Dry	Monitoring well not installed		
BH9-21	257.21	5.0	Not observed	Dry	Monitoring well not installed		
BH10-21	255.06	4.7	Not observed	Dry	Monitoring well not installed		

Notes:

m = metres; mbgs = metres below ground surface

(*) Ground elevations surveyed by Elliott and Parr (Peterborough) Ltd. and provided to GHD on October 21, 2021. The elevations provided are for the purposes of evaluating groundwater elevation and flow direction and should not be relied upon as a legal survey or topographic elevation survey.

Based upon the field work completed on April 7, 2022, the water levels ranged from 2.7 to 4.7 mbgs (252.9 to 254.7 m).

The conclusions and recommendations presented in our Report have not changed. We trust that this brief report meets with your immediate requirements. Should you have any questions, please contact our office.

Sincerely,

GHD Limited



**Leandro Ramos, P.Eng.
Geotechnical Engineer**



**Robert Neck, P.Geo. (Limited)
Associate, Project Director**



Geotechnical Investigation

Proposed New Fire Hall Building – 988 County Road 10, Millbrook, Ontario

Township of Cavan-Monaghan

March 17, 2022

→ The Power of Commitment



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Appendices

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1. Introduction

GHD Limited (GHD) has been retained by the Township of Cavan-Monaghan (the Client) to conduct a geotechnical investigation in support of the proposed new fire hall building to be located to the north of the existing Township office, at 988 County Road 10, Millbrook, Ontario (herein referred to as “the Site”). The Site will be municipally serviced for water and sewer services. The surrounding area is also municipally serviced. The Site location map is presented as Figure 1 in this report.

A preliminary site plan, prepared by Greenview Environmental Management, was provided to GHD showing the proposed development layout including the location of the proposed building, a retaining wall along the south end of the proposed building and associated asphalt paved parking and access areas. It is GHD’s understanding that the proposed new fire hall will consist of a 1- to 2-storey slab-on-grade building with a proposed Finished Floor Elevation (FFE) of 254.5 m. It is understood that the existing Site grade will be lowered on the order of approximately 2 to 3 m.

The purpose of the geotechnical investigation was to assess the subsurface soil and groundwater conditions within the proposed development area, and to provide geotechnical engineering recommendations relevant to the proposed development. The geotechnical investigation was completed in general accordance with our proposal PG-5249-1 dated August 3, 2021.

The factual data, interpretations and preliminary recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. This report should be read in conjunction with the Statement of Limitations appended to this report. The reader’s attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2. GHD’s Scope of Work

GHD’s scope of work was carried out from August to September 2021 and involved the following tasks:

- Pre-Planning activities:
 - Preparation of a Site-specific health and safety plan (HASP).
 - Completion of underground utility locate clearances (public and private).
- Field activities:
 - Advancement of ten (10) boreholes identified as BH/MW1-21 through BH/MW10-21 as shown on Figure 2 to depths ranging between 3.7 to 9.5 metres below ground surface (mbgs) across the Site. Monitoring wells were installed in three (3) of the borehole locations to facilitate groundwater monitoring and testing.
 - Standard Penetration Testing (SPT) and associated split spoon soil sampling in accordance with ASTM D1586.
 - Recorded depth and dimensions of footings exposed by test pit TP1-21 along the north wall of the existing Township office. Test pit TP1-21 was excavated and backfilled by a subcontractor retained by the Township of Cavan-Monaghan.
- Completion of geotechnical laboratory testing on selected soil samples.
- Completion of analytical laboratory testing on selected soils samples for corrosivity potential.
- Completion of analytical laboratory testing on selected soil samples for preliminary evaluation of soil quality for characterization and handling purposes.
- Preparation of this geotechnical investigation report (factual data, analysis and recommendations).

3. Methodology

3.1 Safety Planning

Upon project initiation, a Site-specific Health and Safety Plan (HASP) was prepared for implementation during the field investigation program. The HASP presents the visually observed Site conditions to identify potential physical hazards to field personnel. Required personal protective equipment was also listed in the HASP. It is mandatory for all GHD personnel involved in the field program, to read the HASP and have a copy of the HASP available at the Site during the investigative work. Health and Safety requirements in the HASP were implemented during the field investigation program.

In addition to the abovementioned safety measures, GHD's safety protocol related to COVID-19 issues was implemented and preventive measures were reinforced. GHD and sub-contractor maintained the required physical distancing throughout the field investigation.

3.2 Utility Clearance

GHD completed a pre-drilling Site visit to review the Site conditions and access restrictions. Based on the limits of approach, the boreholes were positioned appropriately to avoid potential obstructions. The test holes were placed in the field based on the proposed development plan.

Prior to initiating the subsurface investigation activities, applicable utility companies (gas, hydro, network cables, water, waste water, etc.) were contacted, to demarcate the location of their respective underground utilities to ensure that service lines would not be damaged during the investigative works.

GHD also retained a specialist private services locator (Utility Marx) to locate any underground private utilities that could potentially be present at the Site. The proposed boreholes were positioned at appropriate locations to avoid existing service lines.

3.3 Field Investigation

The test hole program associated with the geotechnical investigation was conducted on August 19th and 20th, 2021. Drilling consisted of advancing ten (10) exploratory boreholes. Monitoring wells were installed in three (3) of the borehole locations. One (1) test pit was excavated by the Township of Cavan-Monaghan to expose the existing Township's office footing conditions along the north wall. The test hole locations are presented on Figure 2.

GHD's safety protocol related to COVID-19 issues was implemented and preventive measures were applied for bringing samples into the lab. The sample bags were decontaminated before carrying out the sample review and laboratory testing.

3.3.1 Test Hole Advancement and Sample Collection

The test holes were located as shown in Figure 2. The drilling work was carried out by a track-mounted drilling rig, supplied and operated by Landshark Drilling under the full-time supervision of a GHD experienced technical representative. The boreholes were advanced to depths ranging between approximately 3.7 to 9.5 mbgs.

The boreholes were advanced using continuous solid stem augers and soil samples were collected using a 50 millimetre (mm) outside diameter split spoon sampler in general accordance with the specifications of the Standard Penetration Test Method (ASTM D1586). The relative density or consistency of the subsurface soil layers were measured using the SPT method, by counting the number of blows ('N') required to drive a conventional split barrel soil sampler 300 mm.

Groundwater level observations and measurements were made in the boreholes as drilling proceeded and upon completion of drilling. The observed conditions and measured groundwater levels are provided on the respective logs of the drilled boreholes.

Monitoring wells were installed in boreholes MW1-21, MW3-21 and MW6-21. The monitoring wells consist of a 50 mm diameter polyvinyl chloride (PVC) slotted well screen and completed to the ground surface using a riser pipe. A silica sand pack was placed in the annular space between the PVC screen and riser pipe to approximately 0.3 m above the top of the screen. A bentonite seal was installed in the remaining borehole annulus above the sand pack. Installation details for each monitoring well is provided on the respective borehole logs (Appendix A).

The boreholes not instrumented as monitoring wells were backfilled with bentonite pellets and levelled at the top with auger cuttings in accordance with the Ontario Regulation (O. Reg.) 903. Installed monitoring wells will need to be abandoned in accordance with O. Reg. 903, once they are no longer required.

The GHD technical representative logged the soil samples encountered in the test holes and examined the samples as they were obtained. The recovered samples were transferred to the GHD Peterborough laboratory, where they were reviewed by a senior geotechnical engineer. The detailed results of the examination are recorded on the test hole logs presented in Appendix A.

Groundwater levels were obtained from the monitoring wells on August 26th, 2021. Groundwater levels are presented on individual borehole logs.

The depth and dimensions of the footings exposed by test pit TP1-21 along the north wall of the existing Township office were recorded on August 26th, 2021. Test pit TP1-21 was excavated and backfilled by a subcontractor retained by the Township of Cavan-Monaghan. A graphical representation of the soils and footing foundation dimensions encountered in test pit TP1-21 is presented in Appendix B.

3.3.2 Test Hole Locations and Ground Surface Elevations

UTM coordinates and ground surface elevations for each borehole location was survey by Elliott and Parr (Peterborough) Ltd. and provided to GHD on November 8, 2021. The location of each test hole is referenced to UTM (Zone 17). The following table presents a summary of investigated depths, surface elevations, and UTM coordinates for the borehole locations:

Table 3.1 Summary of Boreholes

Borehole ID	Location – UTM Coordinates System		Borehole Depth (mbgs)	Ground Elevation (m)
	Northing	Easting		
MW1-21	4893439.731	703487.085	8.1	256.53
BH2-21	4893451.792	703517.006	9.5	255.96
MW3-21	4893422.771	703511.095	9.3	257.42
BH4-21	4893396.066	703506.544	7.6	257.72
BH5-21	4893404.046	703531.574	6.4	257.41
MW6-21	4893384.294	703478.04	8.4	257.62
BH7-21	4893433.947	703453.05	4.9	254.49
BH8-21	4893462.307	703532.362	3.7	254.46
BH9-21	4893400.005	703474.662	5.0	257.21
BH10-21	4893429.393	703553.946	4.7	255.06

It should be noted that the provided coordinates and elevations are approximate, and should not be used for construction purposes.

3.4 Geotechnical Laboratory Testing

All geotechnical laboratory testing was completed in accordance with the latest editions of the ASTM standards. Geotechnical laboratory testing consisted of moisture content tests on recovered soil samples, as well as grain size distribution analysis (sieve and hydrometer) on five (5) selected soil samples.

The collected soil samples were classified/described in general accordance with the ASTM D2487 - Standard Practice for Classification of Soils for engineering purposes (Unified Soil Classification System-USCS).

The results of the moisture content, and grain size distribution analysis are recorded at their corresponding depths on the individual borehole logs provided in Appendix A. The laboratory grain size distribution analyses are discussed in Section 5, and the detailed laboratory test results are provided in Appendix C.

3.5 Soil Sample Chemical Analysis

Four (4) soil samples were submitted to Caduceon Environmental Laboratories (CEL) for chemical analysis of Ontario Regulation (O.Reg.) 153 parameters including volatile organic compounds (VOCs), petroleum hydrocarbons fractions F1 – F4 (PHCs), and metals and inorganics including sodium adsorption ratio (SAR) and electrical conductivity (EC). The soil sample analyses were completed to provide preliminary analytical data for management of potential excess soil that may be generated during construction activities. Two (2) soil samples were also submitted to CEL for chemical testing of a suite of characteristics that indicate corrosivity potential including pH, resistivity, redox potential, chloride content and sulphate content. CEL's Certificates of Analysis are included in Appendix D.

4. Site Location and Description

The investigated site is located immediately north of the Township of Cavan-Monaghan office and is bounded by County Road 10 to the east. Surrounding properties immediately to the west and north are presently being developed into a residential subdivision and are serviced by municipal water and sewer.

The Site topography was observed to be hilly with the ground elevation generally dropping to the northeast. Differential elevation of up to 3.3 m was recorded between boreholes.

5. Regional Geology and Subsurface Conditions

5.1 Regional Geology

According to the Quaternary Geology of Ontario Map 2556 ("Quaternary Geology of Ontario-Southern Sheet", prepared by the Ministry of Northern Development and Mines (MNDM), published in 1991), the quaternary deposits in the area of the Site consist of glaciofluvial ice-contact deposits; gravel and sand minor till including esker, kame, end moraine, ice-marginal delta and subaqueous fan deposits or till deposits comprised of undifferentiated, predominantly sandy silt matrix, commonly rich in clasts and often high in total matrix carbonated content.

According to the Paleozoic Geology of Southern Ontario map, the bedrock in the area consists of limestone, nodular to clack laminated of the Lindsay Formation, Simcoe Group of the Middle Ordovician era. The bedrock in this area is expected to be over 70 m below the existing grade.

5.2 Subsurface Conditions

Details of the subsurface conditions encountered in the ten (10) boreholes advanced at Site during the GHD investigation are summarized in the following sections of the report. Detailed stratigraphy is shown on the detailed borehole logs presented in Appendix A. It should be noted that the subsurface conditions are only confirmed at the borehole locations and may vary between and beyond the borehole locations. The boundaries between the various strata, as shown on the test hole logs are based on non-continuous sampling and drilling resistance noted and observed at the time of drilling. These boundaries represent an inferred transition between the various strata, rather than precise planes of geological change.

5.2.1 Topsoil

A layer of surficial topsoil was encountered in eight (8) of the boreholes. This topsoil layer ranged from 100 to 300 mm in thickness and averaged about 230 mm. This soil was observed to be in a damp, loose state, with a silty, highly organic content. As such, it is expected to be devoid of any structural engineering properties.

5.2.2 Asphalt

A surficial layer of asphalt was encountered in borehole BH4-21. The asphalt was approximately 125 mm thick.

5.2.3 Fill

A layer of fill was encountered at the surface in borehole MW6-21 and immediately beneath the topsoil and asphalt layer in all boreholes with the exception of MW3-21 and BH8-21. The fill extended to depths ranging from 0.5 to 2.6 mbgs in the boreholes in which it was encountered. The fill was generally brown in colour and consisted of re-worked till soils comprised of sandy silt or silty sand containing trace to some amounts of gravel, clay and cobbles. SPT N values obtained from within the fill layers ranged from 7 blows to 30 blows / 300 mm indicating a loose to compact in-situ state of relative density.

Samples of this material were visually described to be in a generally moist condition. Measured moisture contents ranged from 2 percent to 12 percent by weight.

5.2.4 Silty Sand / Sandy Silt Till

Native till was encountered in each of the boreholes below the topsoil or fill layers and extended to the full depth of the investigation. These soils generally consisted of silty sand or sandy silt with varying amounts of clay, gravel, cobbles and boulders. SPT N values obtained from within the till layer ranged from 6 blows / 300 mm to over 50 blows / 50 mm indicating a loose to very dense in-situ state of relative density.

Samples of this material were visually described to be in a generally moist, occasionally wet condition. Measured moisture contents ranged from 7 percent to 32 percent by weight.

5.2.5 Groundwater

Groundwater observations and measurements were obtained from the open boreholes during and upon completion of drilling each borehole. Groundwater accumulation was observed in three of the boreholes upon completion of drilling at depths ranging from 4.6 to 9.0 mbgs. The remaining boreholes were observed to be free of groundwater following completion of drilling. Groundwater level monitoring was conducted in the installed monitoring wells on August 26th, 2021. The recorded groundwater level measurements are presented in Table 5.1.

Table 5.1 Summary of Groundwater Readings

Location	Ground Elevation* (m)	Borehole Depth (mbgs)	Seepage Depth (mbgs) / Seepage Elevation (m)	Water Levels (mbgs) / Groundwater Elevations (m)		
				August 19 th or 20 th / 21 (Open Borehole)	August 26 th / 21 (Monitoring Well)	November 22 nd / 21 (Monitoring Well)
MW1-21	256.53	8.1	Not observed	Dry	Dry	2.3 / 254.2
BH2-21	255.96	9.5	6.1 / 249.86	9.0 / 246.96	Monitoring well not installed	
MW3-21	257.42	9.3	6.7 / 250.72	8.5 / 248.92	3.5 / 253.92	1.9 / 255.5
BH4-21	257.72	7.6	4.3 / 253.42	4.6 / 253.12	Monitoring well not installed	
BH5-21	257.41	6.4	Not observed	Dry	Monitoring well not installed	
MW6-21	257.62	8.4	Not observed	Dry	Dry	5.3 / 252.3
BH7-21	254.49	4.9	Not observed	Dry	Monitoring well not installed	
BH8-21	254.46	3.7	Not observed	Dry	Monitoring well not installed	
BH9-21	257.21	5.0	Not observed	Dry	Monitoring well not installed	
BH10-21	255.06	4.7	Not observed	Dry	Monitoring well not installed	

Notes:

m = metres; mbgs = metres below ground surface

(*) Ground elevations surveyed by Elliott and Parr (Peterborough) Ltd. and provided to GHD on October 21, 2021. The elevations provided are for the purposes of evaluating groundwater elevation and flow direction and should not be relied upon as a legal survey or topographic elevation survey.

It should be noted that groundwater levels are transient and tend to fluctuate with the seasons, periods of precipitation and temperature.

5.2.6 Existing Footing

As requested, the depth and dimensions of footings were exposed by excavating a test pit (TP1-21) along the north wall of the existing Township office on August 26th, 2021. The test pit location is illustrated on Figure 2. A graphical representation of the soils and footing foundation dimensions encountered in test pit TP1-21 is presented in Appendix B.

The Township Office building was observed to be founded on the compact to very dense native till at depths of about 1.44 m below the asphalt surface (Approx. 256.4 m elevation).

5.2.7 Geotechnical Laboratory Test Results

A total of five (5) soil samples collected from native soils at select depths were tested for grain size distribution analysis. The laboratory test results are summarized in the following tables, and detailed test results are presented in Appendix C.

Table 5.2 Summary of Laboratory Results

Location	Depth (m)	Grain Size Distribution				Observed Soil Unit
		%Gravel	%Sand	%Silt	%Clay	
MW1-21	3.0 – 3.7	11	32	42	15	ML – Sandy Silt
BH4-21	3.0 – 3.7	6	36	43	15	ML – Sandy Silt
BH5-21	1.5 – 2.1	8	33	43	15	ML – Sandy Silt
MW6-21	6.1 – 6.7	13	40	35	12	SM – Silty Sand
BH8-21	2.3 – 2.9	10	38	38	14	ML – Sandy Silt

Soil description based on Unified Soil Classification System (ASTM D 2487)

5.2.8 Soil Samples Chemical Analysis

Four (4) selected soil samples collected from the boreholes were submitted to CEL in Richmond Hill, Ontario. CEL is an accredited laboratory with the Standards Council of Canada for chemical analysis of the following Ontario Regulation 153/04 parameters including VOCs, PHCs (F1 to F4 fractions), and a suite of metals and inorganics. No evidence of odour or staining was noted during the drilling in any of the samples. The CEL report is provided in Appendix D. A summary of the parameters tested are provided below:

Table 5.3 Summary of Chemical Testing Parameters

Borehole No. / Sample No.	Sample Depth (mbgs)	Sampled Elevation (m)	Analyzed Parameters
BH2-21 / SS1	0 – 0.6	255.96 – 255.36	Metals and Inorganics, PHC (F1-F4), VOCs
MW3-21 / SS4	2.3 – 2.9	255.12 – 254.52	
MW6-21 / SS1	0 – 0.6	257.62 – 257.02	
BH7-21 / SS2	0.8 – 1.4	253.69 – 253.09	

Two (2) soil samples were submitted for analysis of parameters used to assess the potential corrosivity of the Site soils to steel and concrete. The CEL report is provided in Appendix D and summarized below:

Table 5.4 Summary of Chemical Testing for Potential Corrosivity Parameters

Borehole No. / Sample No.	BH5-21 / SS6 4.6 – 5.0 mbgs	MW3-21 / SS6 3.8 – 4.1 mbgs
pH	7.39	7.38
Resistivity (ohm-cm)	10300	9070
REDOX Potential (mV)	204	219
Chlorides (ug/g)	9	41
Soluble Sulphate (ug/g)	<10	10
Sulfide	0.7	0.7

6. Discussion and Recommendations

A preliminary site plan, prepared by Greenview Environmental Management, was provided to GHD showing the proposed development layout including the location of the proposed building, a retaining wall along the south end of the proposed building and associated asphalt paved parking and access areas. It is GHD's understanding that the proposed new fire hall will consist of a 1- to 2-storey slab on grade building with a proposed Finished Floor Elevation (FFE) of 254.5 m. It is understood that the existing Site grade will be lowered on the order of approximately 2 to 3 m.

Based upon the above comments and on the borehole information, and assuming them to be representative of the subsoil conditions across the Site, the following comments and recommendations are offered.

6.1 Site Preparation, Grading and Backfill

Based on the subsurface conditions encountered in the boreholes, the Site is generally underlain by a surficial layer of topsoil, over fill (re-worked till), underlain by native soils generally consisting of sandy silt till.

Any topsoil, asphalt, vegetation, disturbed earth, fill, organic and organic-bearing material should be removed from the footprint of the proposed building area and from within pavement areas prior to site grading activities. Care will be required during excavation to separate materials containing significant amounts of topsoil / organics or rootlets from the clean excavated material.

It is understood that the site grades within the proposed building and asphalt pavement areas will be lowered by approximately 2 to 3 m from existing site grades. As such, the subgrade soils for proposed building foundations and asphalt pavement are expected to consist of compact to very dense native sandy silt till. The subgrade soils exposed after site grading should be visually inspected, compacted if required, and proof rolled using large axially loaded equipment. Any loose, or unacceptable areas should be sub-excavated and removed as directed by the Engineer and replaced with suitable fill materials compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD). Clean earth fill used to raise grades in the proposed buildings and pavement areas should be placed in thin layers (200 mm thick or less) and compacted by a heavy appropriate roller to 98 percent SPMDD. Installation of engineered fill, where required, must be continuously monitored on a full-time basis by qualified geotechnical personnel.

The native soils encountered at the Site are generally suitable for reuse as trench backfill during installation of buried services or pavement subgrade backfill, provided it is free of organic material and at a moisture content that will permit adequate compaction (may require prior processing such as aeration to lower the moisture content). A final review and approval to reuse any soils should be made at the time of construction.

Installation of engineered fill, where required, must be continuously monitored on a full-time basis by qualified geotechnical personnel.

6.2 Foundation Design

The common practice for the Serviceability Limit State (SLS) design of most structure and building foundations is to limit the total and differential foundation settlements to 25 mm and 15 mm, respectively. However, other serviceability criteria for the proposed buildings may be determined by the structural engineer considering tolerable settlement that would not restrict the use or operation of the facilities.

It is expected that structural loading for the proposed firehall building may be supported on spread and continuous strip footing placed on the compact to very dense native sandy silt till. Such footings can be generally designed for a geotechnical reaction at Serviceability Limit State (SLS) of 200 kPa and a factored ($\phi=0.5$) geotechnical resistance at Ultimate Limit State (ULS) of 300 kPa. The depths at which these bearing pressures are available for installation of shallow spread/strip conventional footings at the borehole locations located within the proposed firehall building area are shown in the table below, subject to on site verification during construction.

Table 6.1 Minimum Depth (mbgs) / Elevation for Footings

Borehole ID	Minimum Foundation Depth (mbgs)	Maximum Foundation Elevation (m)
MW1-21	1.5	255.03
BH2-21	1.5	254.46
MW3-21	0.8	256.62
BH4-21	2.3	255.42
BH5-21	2.3	255.11
MW6-21	2.3	255.32

Exterior foundations or footings in unheated areas must be provided with a minimum soil cover of at least 1.4 m, or equivalent insulation. Footings for heated structures, such as perimeter foundation of the proposed building structure, must be provided with a minimum of 1.2 m of earth cover or equivalent insulation.

The foundation subgrade should be inspected and evaluated by the geotechnical engineer prior to placing concrete to verify that the foundations are founded on the competent subgrade capable of supporting the recommended design pressure.

Any new foundations located within 1.5 m of the existing Township Office building should be stepped at a slope not steeper than ten (10) Horizontal to seven (7) Vertical from the underside of the existing Township Office footing elevation. Foundation for the new Fire Hall building will be located outside the zone of influence from the existing Township Office foundation based on concept plan drawing provided to GHD.

6.3 Depth of Frost Penetration

It is recommended that all exterior foundations or footings in unheated areas have a minimum soil cover of at least 1.4 m, or equivalent insulation. Footings for heated structures, such as perimeter foundation of the proposed building structure, must be provided with a minimum of 1.2 m of earth cover or equivalent insulation.

During winter construction exposed surfaces to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.

6.4 Slab-On-Grade Construction

The floor of the proposed firehall building should be supported on compacted fill materials or on native soils. It is recommended that any unsuitable materials that may be present below the proposed floor slab for the proposed building be removed and that grades after sub-excavation be inspected and heavily proof rolled. Any area observed to be soft should be sub-excavated and replaced with engineered fill. The grade should then be raised with an acceptable earth fill material placed in thin lifts (not more than 200 mm thick) and thoroughly compacted to a minimum of 98 percent of the material's SPMDD. A qualified geotechnical engineer should review the condition of the subgrade beneath the proposed slab.

A minimum of 200 mm thick layer of 20 mm clear crushed stone should be placed between the prepared subgrade and the floor slab to act as moisture barrier. For the structural design of the concrete slab-on-grade, a combined modulus of subgrade / granular base reaction coefficient (k) of 35 MPa/m can be used.

Perimeter drainage of the structure is recommended where there is pavement adjacent to the building face or finished floor level of the structure is not at least 200 mm above the prevailing exterior grade level. Surface drainage should be directed away from the building.

6.5 Seismic Site Classification

The latest Ontario Building Code (OBC) requires the assignment of a Seismic Site Class for calculations of earthquake design forces and the structural design based on a two percent probability of exceedance in 50 years. According to the latest OBC, the Seismic Site Class is a function of soil profile, and is based on the average properties of the subsoil strata to a depth of 30 m below the ground surface. The OBC provides the following three (3) methods to obtain the average properties for the top 30 m of the subsoil strata:

- Average shear wave velocity.
- Average Standard Penetration Test (SPT) values (uncorrected for overburden).
- Average undrained shear strength.

For design purposes, based on the criteria listed in Table 4.1.8.4.A. of the OBC, the results obtained from standard penetration resistance of the underlying subsurface conditions, estimated undrained shear strength, and the results of the Multichannel Analysis of Surface Waves (MASW) investigation completed by GHD entitle "MASW Investigation, Proposed New Fire Hall Building - 988 County Road 10, Millbrook, Ontario", a Seismic Site Class 'C' can be used for the design of the proposed building.

6.6 Site Servicing

The native soils encountered at the Site at the expected servicing depths are considered suitable to support underground service lines. The suitability of the subgrade to provide adequate support for buried services must be verified and confirmed on site by qualified geotechnical personnel experienced in such works.

The subgrade soils used to support the service pipes, should be visually inspected. Wet, loose, or otherwise unsuitable fill should be sub-excavated and replaced with bedding materials or clean fills compacted to minimum of 95 percent SPMDD.

The bedding for trenched (open cut) services should consist of well graded materials. The bedding should have a minimum thickness of 150 mm below the pipe and 300 mm above and adjacent to the pipe and should comply with the Ontario Building Code on the building interior and applicable OPSD standard on the exterior.

Where wet conditions are encountered, the use of 'clear stone' bedding (such as 19 mm clear stone, OPSS 1004) may be considered, only in conjunction with a suitable geotextile filter. Without proper filtering, there may be entry of fines from the existing native soils and trench backfill into the bedding. This loss of fine soil particles could result in loss of support to the pipes and possible surface settlements.

6.7 Pavement Design

Based on the results of this investigation, GHD recommends the following procedures be implemented to prepare the proposed asphalt paved access way and parking areas for its construction:

1. Remove all topsoil, organics, organic-bearing materials and other deleterious materials from the planned pavement areas to a minimum depth to allow for the new pavement structure at which point an assessment of the exposed soils by a qualified geotechnical professional will deem whether further removal and/or placement of suitable geotextile material or other treatment is required.
2. Inspect and proof roll the subgrade for the purpose of detecting possible zones of overly wet or soft subgrade. Any deleterious areas thus delineated should be replaced with approved granular material compacted to a minimum of 98 percent of its SPMDD.
3. Contour the subgrade surface to prevent ponding of water during the construction and to promote rapid drainage of the sub-base and base course materials.

4. To maximize drainage potential, 150 mm diameter perforated pipe subdrains should be installed below any curb lines. The pipe should be encased in filter fabric and surrounded by clear stone aggregate. It is recommended that the subdrains discharge to a suitable, frost-free outlet.
5. Construct transitions between varying depths of granular base materials at a rate of 1:25 minimum.

The subgrade materials in the proposed pavement areas will consist of silty sand and sandy silt till soils. The frost susceptibility of these soils is assessed as being generally moderate to high. In this regard, and based on the expected heavy duty truck traffic, the following minimum flexible pavement structures are recommended for the construction of the new access and parking areas.

Table 6.2 Asphalt Pavement Structure

Profile	Material	Thickness (mm)	In Conformance with OPSS Form
Asphalt Surface	H.L.3	40	1150
Asphalt Base	H.L.8	60	
Granular Base	Granular "A"	150	1010
Granular Subbase	Granular "B"	450	

The following steps are recommended for optimum construction of paved areas:

1. The Granular "A" and "B" courses should be compacted to a minimum 100 percent of their respective SPMD's.
2. All asphaltic concrete courses should be placed, spread and compacted conforming to OPSS 310 or equivalent. All asphaltic concrete should be compacted to a minimum 92.0 percent of their respective laboratory Maximum Relative Densities (MRD's).
3. Adequate drainage should be provided to ensure satisfactory pavement performance.

It is recommended that all fill material be placed in uniform lifts not exceeding 200 mm in thickness before compaction. It is suggested that all granular material used as fill should have an in-situ moisture content within 2 percent of their optimum moisture content. All granular materials should be compacted to 100 percent SPMD. Granular materials should consist of Granular "A" and "B" conforming to the requirements of OPSS 1010 or equivalent.

The performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible. It is noted that the above recommended pavement structures are for the end use of the project. The most severe loading conditions on pavement areas and the subgrade may occur during construction. As such, during construction of the project, the recommended granular depths may not be sufficient to support loadings encountered. Consequently, special provisions such as restricted lanes, half-loads during paving, etc. may be required, especially if construction is carried out during unfavourable weather.

6.8 Retaining Wall

If applicable, footings for the proposed retaining wall along the south end of the site may be deigned using the bearing pressures and founding elevations provided in Section 6.2 of this report.

The recommended value for the coefficient for sliding friction for poured concrete on the undisturbed compact to very dense native till is 0.4.

The excavated area behind the retaining wall should be backfilled with free draining Granular "B", Type 1 backfill as per OPSS 1010, placed in lifts no thicker than 200 mm before compaction, and compacted to a minimum of 98 percent of its SPMD using light compaction equipment. It is recommended that perimeter drains be provided behind the retaining wall. The subdrains would serve to drain seepage water that infiltrates the backfill, intersect the groundwater and any seepage related to surficial-related water, and help relieve hydrostatic pressures due to high groundwater levels. The drains should consist of a perforated pipe, at least 150 mm in diameter, surrounded by crushed clear stone and suitable filter protection. The drain should discharge to a positive sump or other permanent frost free outlet.

Any new foundations located within 1.5 m of the existing Township Office building should be stepped at a slope not steeper than ten (10) Horizontal to seven (7) Vertical from the underside of the existing Township Office footing elevation. Foundations for the proposed retaining wall will be located outside the zone of influence from the existing Township Office foundation based on concept plan drawing provided to GHD.

GHD can perform a global stability check of the retaining wall system once design details are available.

6.9 Lateral Earth Pressure

Structures subject to unbalanced earth pressures such as foundation walls, shoring system, retaining walls and other similar structures should be designed to resist the lateral earth pressures. The following table below summarizes the recommended soil parameters to be used for lateral earth pressure calculations.

Table 6.3 Soil Parameters and Earth Pressure Coefficients

Soil	ϕ	γ (kN/m ³)	K_a	K_o	K_p
OPSS Granular A or B compacted	34	20	0.28	0.44	3.54
Earth Fill	28	19	0.36	0.53	2.77
Compact to Very Dense Silty Sand / Sandy Silt Till	34	21	0.28	0.44	3.54

Surcharge and hydrostatic pressures should be considered as appropriate. The above earth pressure coefficients apply to horizontal surfaces behind the walls/supports only.

If movement sensitive services exist close to the shoring, the lateral pressure should be computed using the coefficient of earth pressure at rest, K_o .

It is noted that large deformations will be required for the full mobilization of soil passive earth pressure.

6.10 Excavation and Temporary Shoring

The Occupational Health and Safety Act (OHSA) regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with the OHSA requirements. OHSA specifies maximum slope of the excavations for four (4) broad soil types as summarized in the following table:

Soil Type	Base of Slope	Maximum Slope Inclination
1	Within 1.2 metres of bottom	1 horizontal to 1 vertical
2	Within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
3	From bottom of excavation	1 horizontal to 1 vertical
4	From bottom of excavation	3 horizontal to 1 vertical

The fill and native soils underlying the Site are considered Type 3 soils and Type 2 soils, respectively, above groundwater level, and Type 4 if affected by surface water or groundwater seepage. If the above recommended excavation side slopes cannot be maintained due to lack of space or any other reason, the excavation side slopes must be supported by an engineered shoring system. The shoring system should be designed in accordance with Canadian Engineering Foundation Manual (4th Edition) and the OHSA Regulations for Construction Projects.

It is anticipated that excavation for foundation and utility installations can be made with conventional equipment. The presence of various cobbles and large boulders should be expected with the native till soils.

Temporary shoring will be required for any excavations within 1.5 m of the existing Township Office building extending below a theoretical slope steeper than ten (10) Horizontal to seven (7) Vertical from the underside of the existing Township Office footing elevation. Excavations further than 1.5 m away from the existing Township Office building can be completed using the safe excavation slopes listed above.

An examination of the slopes should be carried out by qualified soils personnel before any worker enters the excavation. The exposed fill material and native soil should be protected against erosion from water run-off or rain.

6.11 Temporary Dewatering Requirements

Groundwater accumulation was observed in three (3) of the boreholes upon completion of drilling at depths ranging from 4.6 to 9.0 mbgs. Groundwater measurements obtained on August 26th and November 22nd, 2021 from the monitoring well installed in borehole MW1-21, MW3-21 and MW6-21 yielded a water level ranging from 1.9 mbgs to 5.3 mbgs (Elev. 255.5 m to 252.3 m). Monitoring wells installed in borehole MW1-21 and MW6-21 were dry on August 26th, 2021. In the long term, seasonal fluctuations of the groundwater level may occur. Some groundwater seepage may be encountered seasonally within the fill after heavy precipitation and/or during spring thaw or from sand seams typically encountered within the native till soils.

Based on the groundwater conditions observed, and the anticipated excavation depths for the proposed development, it is expected that groundwater seepage into open excavations will be encountered in some locations. Any groundwater or surficial water infiltration into open excavations above the groundwater table is expected to be controlled by pumping from a sump to an acceptable outlet.

If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000 L/day is required during the construction stage, the Environmental Activity Sector Registry (EASR) must be completed. The EASR streamlines the process and water pumping may begin once the EASR registration is completed, the fee paid and supporting document prepared. If water taking in excess of 400,000 litres/day is required, a Permit to Take Water (PTTW) must be obtained in advance. PTTW applications may take up to 90 working days for the Ministry of the Environment, Conservation and Parks (MECP) to review and approve. The actual rate of groundwater taking performed during construction will be a function of the final design, time of year, and the contractor's schedule, equipment, and techniques.

6.12 Excess Soils Generated During Construction – Handling Options

The analytical results of the soil samples tested at CEL met the Table 1 Full Depth Background Site Condition Standard (SCS) for residential / parkland / institutional (RPI) and industrial / commercial / community (ICC) property uses. Table 1 SCS are commonly used to assess off Site disposal requirements for small quantities of excess soil from the future construction project. The Certificates of Analysis are presented in Appendix D. The Certificates of Analysis are presented in Appendix D.

Once the Site development plans are known, disposal options for any excess soils generated at the Site can be assessed. Regulation 406/19 is presently being enacted and any disposal of excess soil from the Site needs to be undertaken in accordance with this Regulation. As the Regulation is being phased in, an assessment of disposal options will need to be made once the construction timeframe is known.

Based on the current chemical analytical results, the following handling options for excess soils generated during the construction of the proposed new firehall facility are as follows:

1. The soils may remain on-site, under the guidance of a Qualified Person (QP) as defined by the MECP;

2. Moved to a Table 2 or 3 RPI or ICC property under the guidance of a QP as defined by the MECP, and in accordance with Regulation 406/19. Note that materials transported to other properties are subject to the receiving site's QP acceptance and municipal bylaws. Additional testing may will be required; or

Note that the chemical analytical results from this study were preliminary only. The number of samples, or the analytical parameters tested, may not be sufficient to meet the requirements of the intended receiving site. Additional testing may be required depending on the handling option and/or receiving site(s) selected.

6.13 Corrosion Potential of Soils

Two (2) soil samples (MW3-21 SS6 and BH5-21 SS6) were submitted for analysis of parameters used to assess the potential corrosivity of the Site soils to steel and concrete. The Certificates of Analysis for the additional samples tested are presented in Appendix D.

The analytical results were compared to Canadian Standards Association (CSA) Standard, CAN/CSA-A23.1-14 Table 3 ("Additional requirements for concrete subjected to sulphate attack") to assess the potential severity of sulphate attack on concrete during its service life. The sulphate concentrations measured in the soil samples tested is less or equal to 0.001 percent, which are below the exposure class of "S-3" (Moderate – 0.1 – 0.2 percent).

Therefore, based on the soil sample tested, when the designer is selecting the exposure class for the structure, the effects of sulphates from within the soil may not need to be considered for the below grade concrete structures.

The American Water Works Association (AWWA) publication 'Polyethylene Encasement for Ductile-Iron Pipe Systems' ANSI/AWWA C105/A21.5-10 dated October 1, 2010 assigns points based on the results of the tested parameters. Soil that has a total point score of 10 or more is considered to be potentially corrosive to ductile iron pipe.

The assigned points for the samples tested ranged from 3 to 5.5, therefore the Site soils are not considered to be potentially corrosive to cast iron pipe.

6.14 Construction Monitoring

The foundation installations and any Engineered Fill placement must be closely monitored and inspected by qualified personnel to ensure consistency with the design bearing. The on-site review of the condition of the foundation soil as the foundations are constructed is an integral part of the geotechnical design function and is required by Section 4.2.2.2 of the Ontario Building Code 2012.

Qualified Geotechnical personnel should inspect and test all stages of the proposed development. Specifically, they should ensure that the materials and conditions comply with this geotechnical assessment report. In addition, qualified geotechnical personnel should provide material testing services prior to and during backfilling and/or grade raising operation. Should soil conditions be encountered that vary from those described in this report, our office should be informed immediately such that the proper measures are undertaken.

7. Limitations of the Investigation

This report is intended solely for the Township of Cavan-Monaghan and their designers and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevation and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily

exercised by members of geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a geotechnical study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

By issuing this report, GHD is the geotechnical engineer of record. It is recommended that GHD be retained during construction of all foundations and during earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during our study. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test locations only. The subsurface conditions confirmed at the test locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on site (e.g., excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

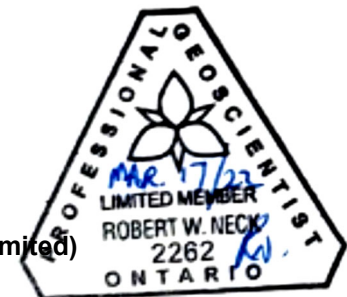
All of Which is Respectfully Submitted,


GHD


Leandro Ramos, P.Eng.



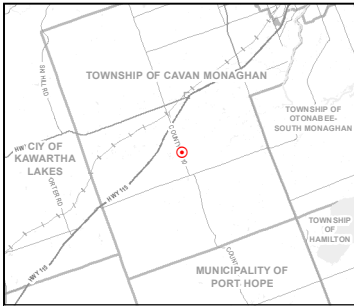

Robert Neck, P.Geo.(Limited)



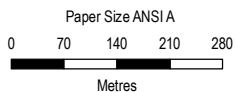

Andy Fawcett, P. Eng.



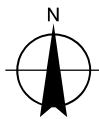
Figures



Data Disclaimer
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Map Projection: Transverse Mercator
 Horizontal Datum: North American 1983
 Grid: NAD 1983 UTM Zone 17N



TOWNSHIP OF CAVAN-MONAGHAN
 988 COUNTY ROAD 10, CAVAN, ON
 PT LOT 12, CON 6, GEO. TOWNSHIP OF CAVAN
 COUNTY OF PETERBOROUGH

**GEO TECHNICAL INVESTIGATION
 SITE LOCATION PLAN**

Project No. 11231708
 Revision No.
 Date Sep 2021

FIGURE 1



TOWNSHIP OF CAVAN-MONAGHAN
 988 COUNTY ROAD 10, CAVAN, ON
 PT LOT 12, CON 6, GEO. TOWNSHIP OF CAVAN
 COUNTY OF PETERBOROUGH

Project No. 11231708
 Revision No. -
 Date Sep 2021

**GEOTECHNICAL INVESTIGATION
 TEST HOLE LOCATION PLAN**

FIGURE 2

Appendices

Appendix A

Borehole Logs



BOREHOLE No.: MW1-21
ELEVATION: 256.53 m

BOREHOLE REPORT

Page: 1 of 1

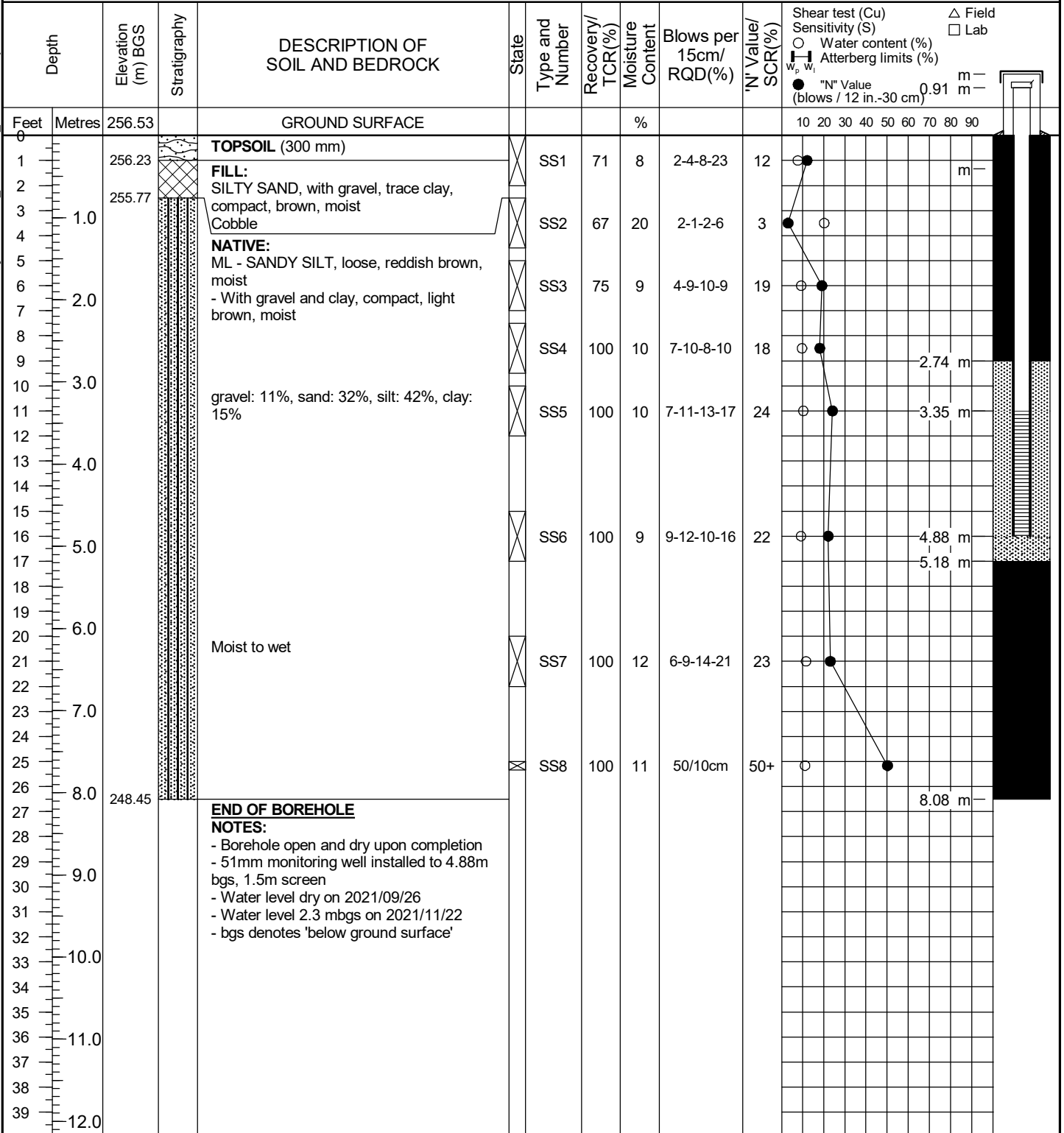
CLIENT: Township of Cavan Monaghan
PROJECT: Geotechnical Investigation, Millbrook Firehall
LOCATION: 988 County Road 10, Millbrook
DESCRIBED BY: Jamie McEachern **CHECKED BY:** Leandro Ramos
DATE (START): 19 August 2021 **DATE (FINISH):** 19 August 2021

LEGEND

- ☒ SS - SPLIT SPOON
- ▨ ST - SHELBY TUBE
- ⊓ AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4893439.731 **EASTING:** 703487.085

File: \\GHDNET\GHD\CA\PETERBOROUGH\PROJECTS\66211231078\WORKSHARE\DESIGN\GINT\11231078-DWG-21-09-10_BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 2/12/21





BOREHOLE No.: BH2-21
ELEVATION: 255.96 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Township of Cavan Monaghan

PROJECT: Geotechnical Investigation, Millbrook Firehall

LOCATION: 988 County Road 10, Millbrook

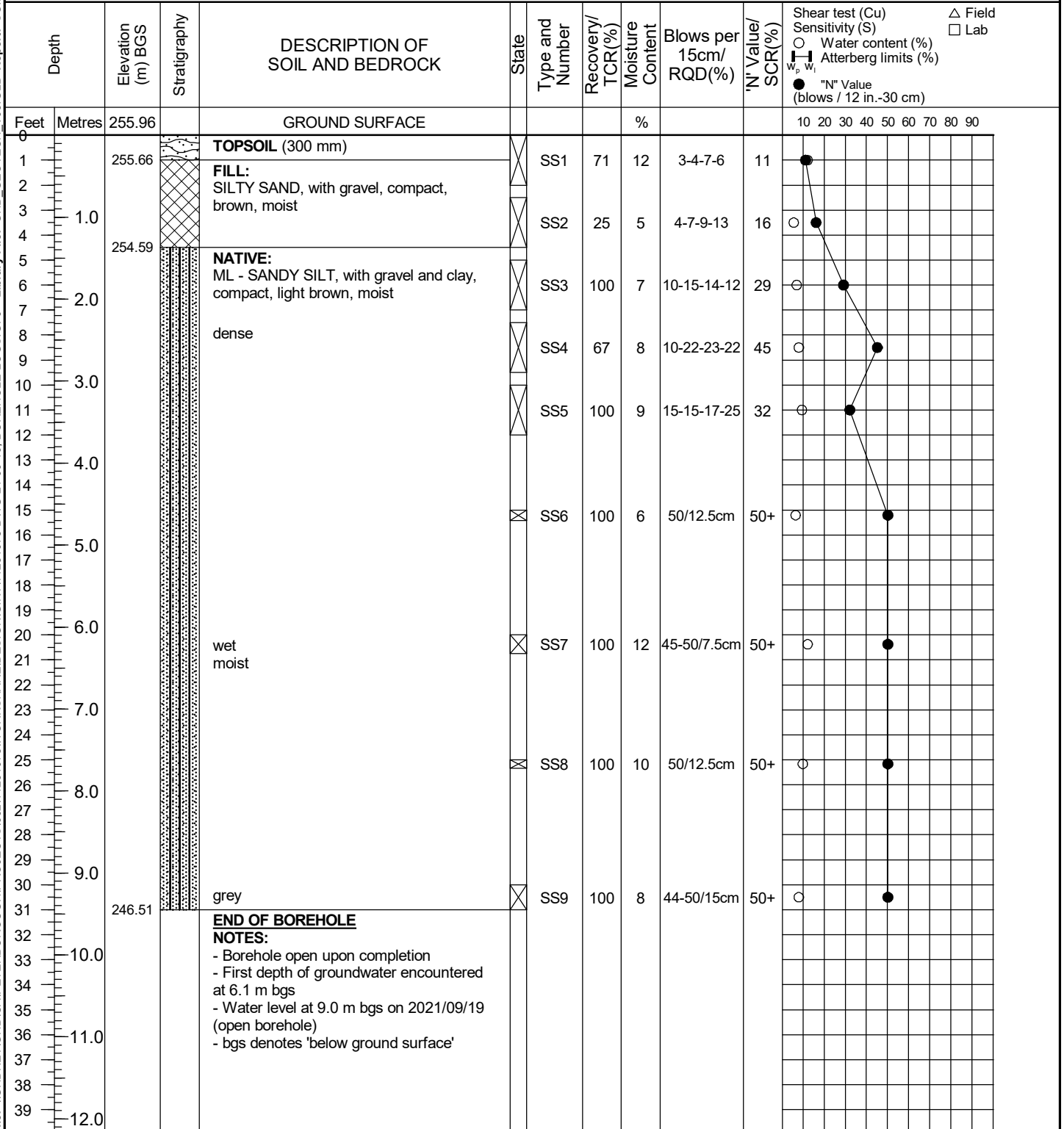
DESCRIBED BY: Jamie McEachern CHECKED BY: Leandro Ramos

DATE (START): 19 August 2021 DATE (FINISH): 19 August 2021

LEGEND

- ☒ SS - SPLIT SPOON
- ▨ ST - SHELBY TUBE
- ⊞ AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4893451.792 EASTING: 703517.006



File: \\GHDNET\GHD\CA\PETERBOROUGH\PROJECTS\66211231078\WORKSHARE\DESIGN\GINT\11231078-DWG-21-09-10_BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 2/12/21



BOREHOLE No.: MW3-21
ELEVATION: 257.42 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Township of Cavan Monaghan

PROJECT: Geotechnical Investigation, Millbrook Firehall

LOCATION: 988 County Road 10, Millbrook

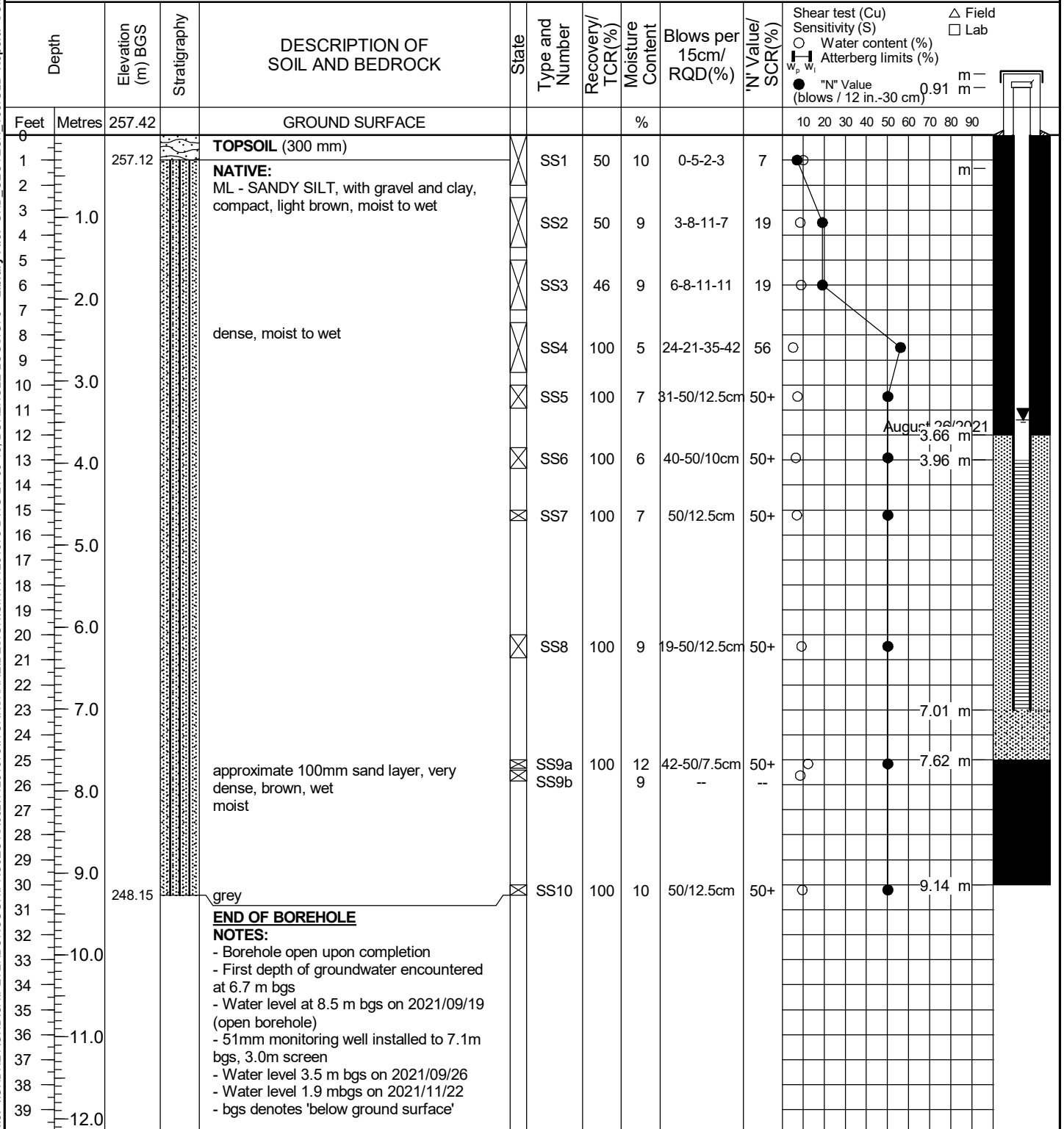
DESCRIBED BY: Jamie McEachern CHECKED BY: Leandro Ramos

DATE (START): 19 August 2021 DATE (FINISH): 19 August 2021

LEGEND

- ☒ SS - SPLIT SPOON
- ▨ ST - SHELBY TUBE
- ⊓ AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4893422.771 EASTING: 703511.095



END OF BOREHOLE
NOTES:
 - Borehole open upon completion
 - First depth of groundwater encountered at 6.7 m bgs
 - Water level at 8.5 m bgs on 2021/09/19 (open borehole)
 - 51mm monitoring well installed to 7.1m bgs, 3.0m screen
 - Water level 3.5 m bgs on 2021/09/26
 - Water level 1.9 mbgs on 2021/11/22
 - bgs denotes 'below ground surface'

File: \\GHDNET\GHD\CA\PETERBOROUGH\PROJECTS\66211231078\WORKSHARE\DESIGN\GINT\11231078-DWG-21-09-10_BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 21/12/21



BOREHOLE No.: MW6-21
ELEVATION: 257.62 m

BOREHOLE REPORT

Page: 1 of 1

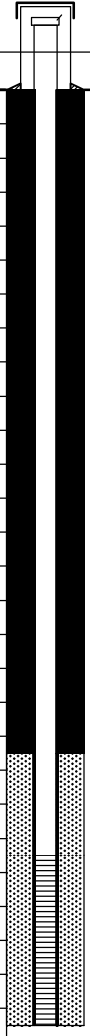
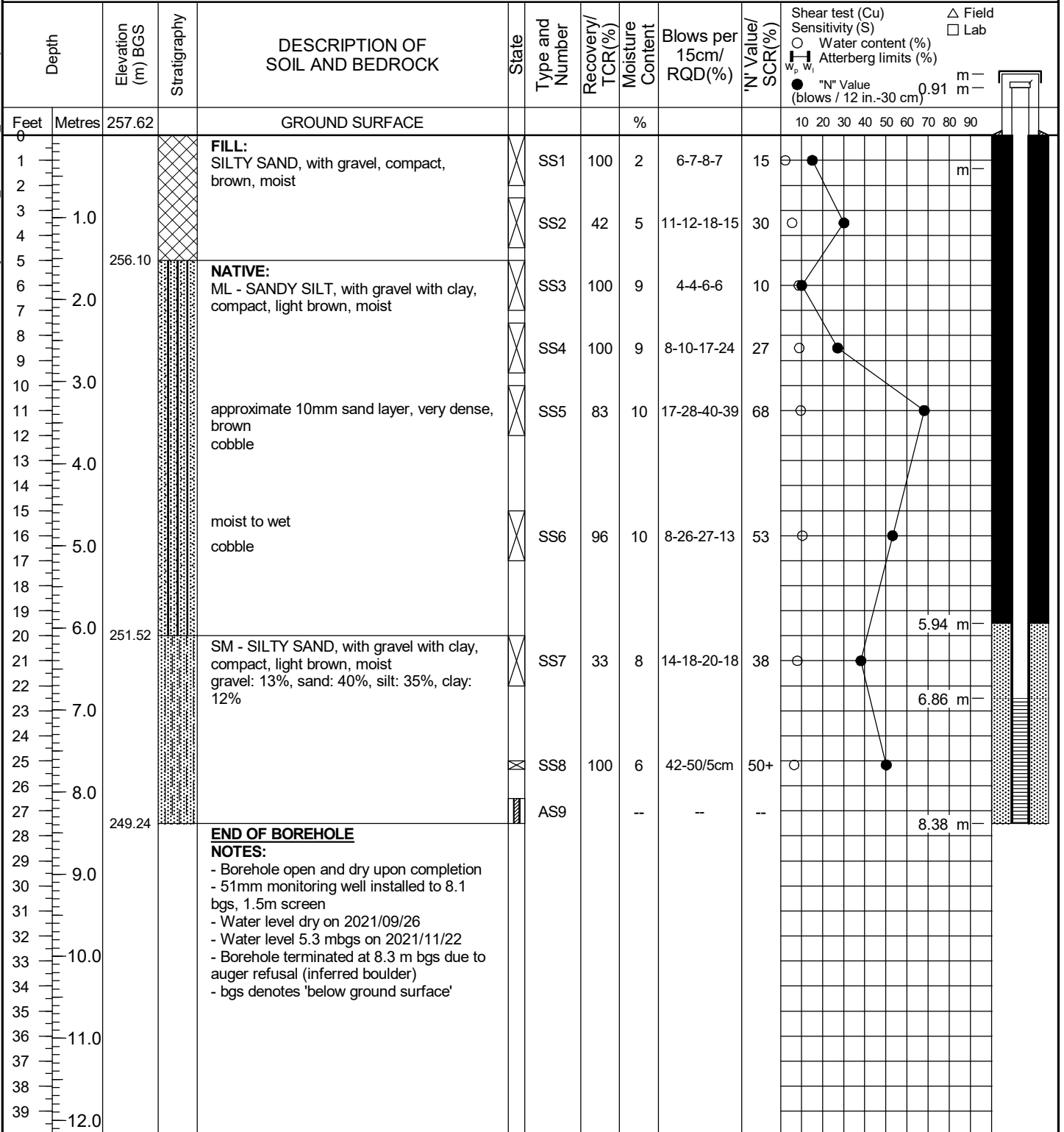
CLIENT: Township of Cavan Monaghan
PROJECT: Geotechnical Investigation, Millbrook Firehall
LOCATION: 988 County Road 10, Millbrook
DESCRIBED BY: Jamie McEachern **CHECKED BY:** Leandro Ramos
DATE (START): 20 August 2021 **DATE (FINISH):** 20 August 2021

LEGEND

- ☒ SS - SPLIT SPOON
- ▨ ST - SHELBY TUBE
- ⊓ AU - AUGER PROBE
- ▼ - WATER LEVEL

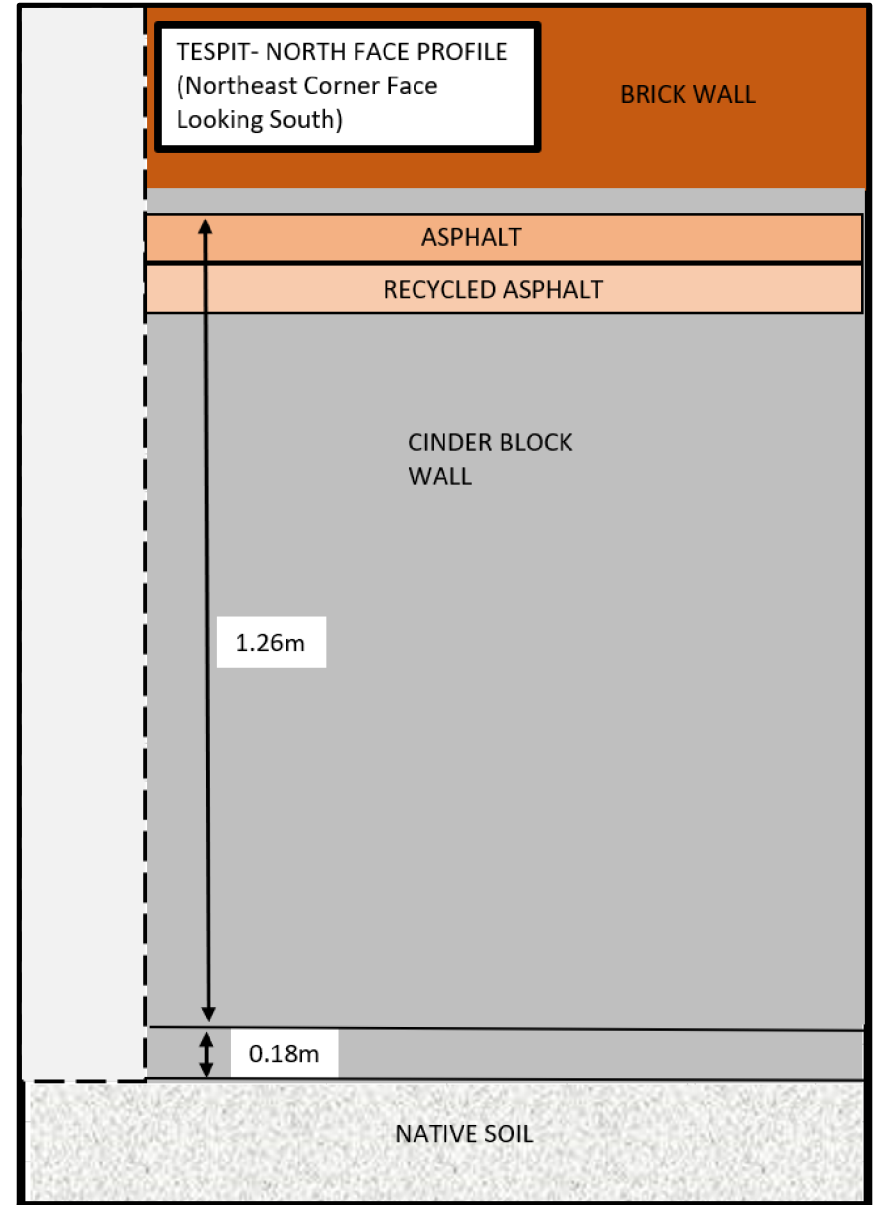
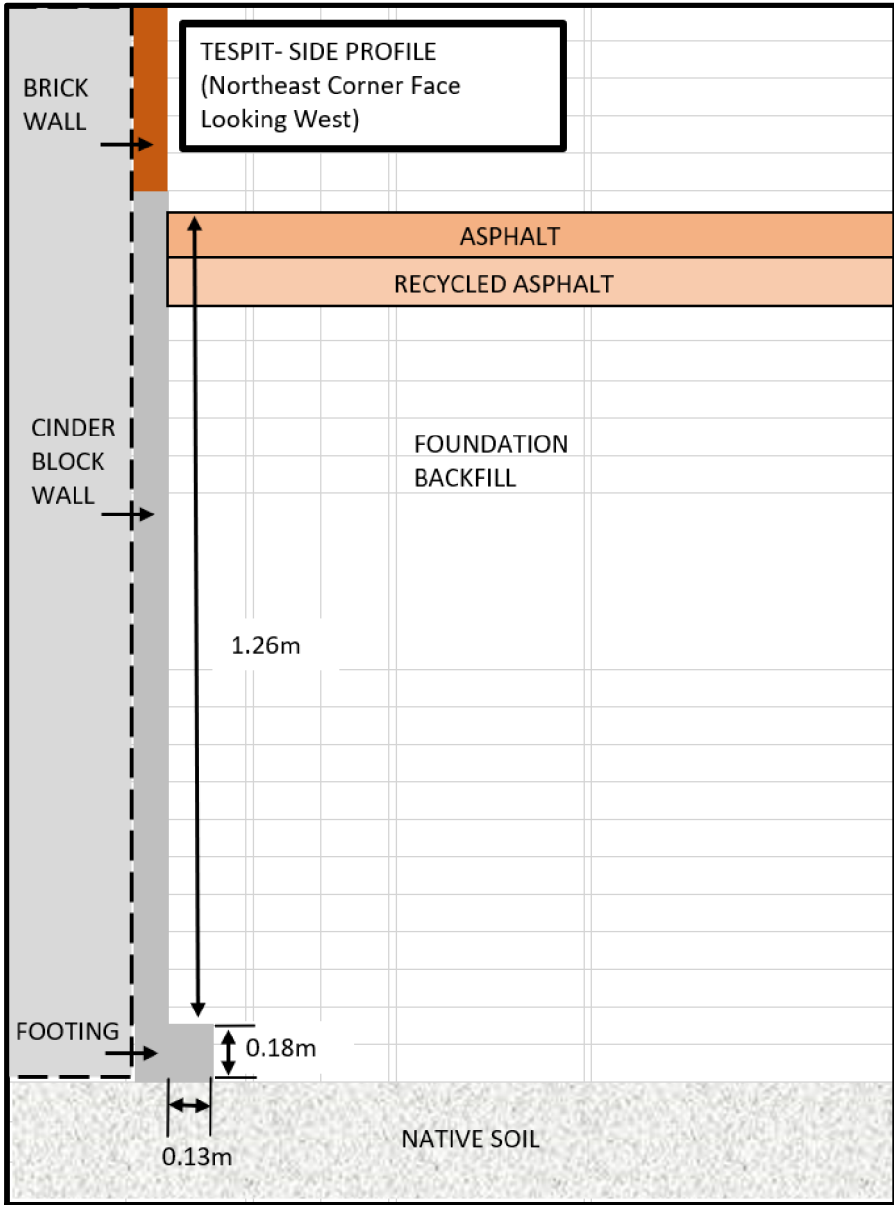
NORTHING: 4893384.294 **EASTING:** 703478.04

File: \\GHDNET\GHD\CA\PROJECTS\66211231078\WORKSHARE\DESIGN\GINT\11231078-DWG-21-09-10_BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 21/12/21



Appendix B

Foundation Section



Paper Size ANSIA
0 25 50 75 100
Miles

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere



TOWNSHIP OF CAVAN-MONAGHAN
988 COUNTY ROAD 10, CAVAN, ON
PT LOT 12, CON 6, GEO. TOWNSHIP OF CAVAN
COUNTY OF PETERBOROUGH

GEOTECHNICAL INVESTIGATION
EXISTING BUILDING FOUNDATIONS

Project No. 11231708
Revision No.
Date Sep 2021

FIGURE 3

Appendix C

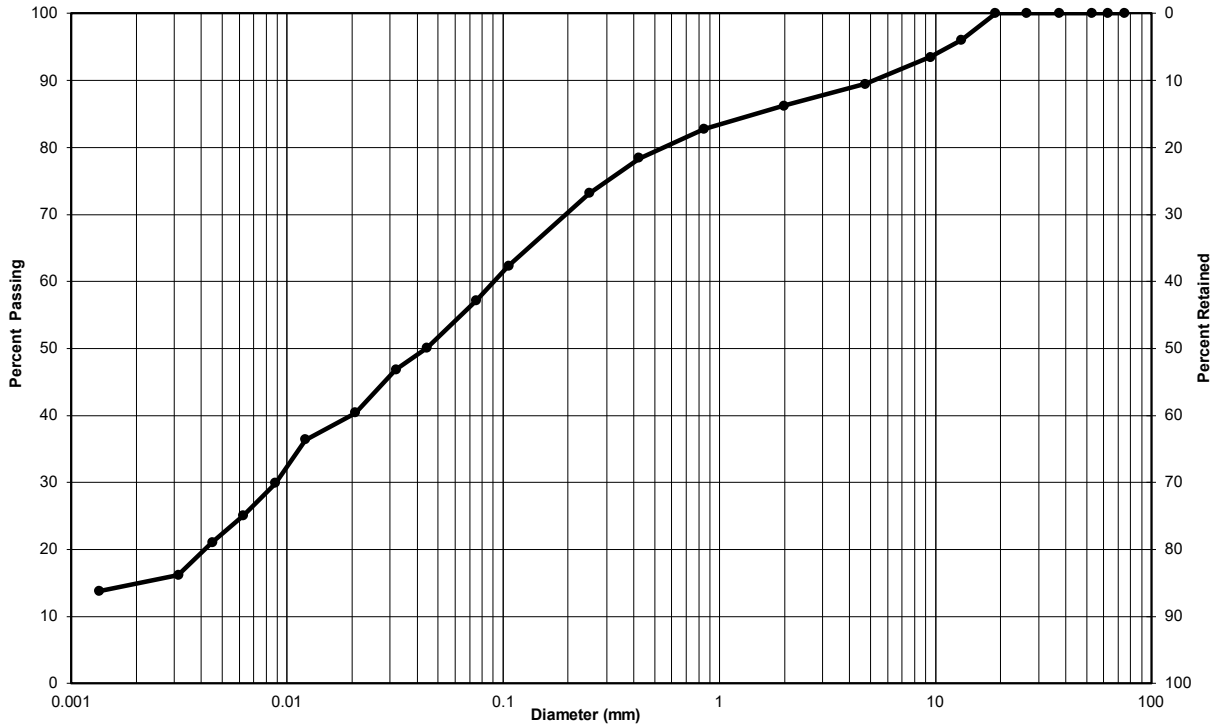
Geotechnical Laboratory Testing Results



**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client:	Cavan Monaghan	Lab No.:	SS-21-71
Project/Site:	Millbrook Firehall	Project No.:	11231078

Borehole no.:	MW1-21	Sample no.:	SS5
Depth:	3.0 to 3.7m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silt	11	32	57
Silt-size particles (%):	42		
Clay-size particles (%) (<0.002mm):	15		

Remarks:

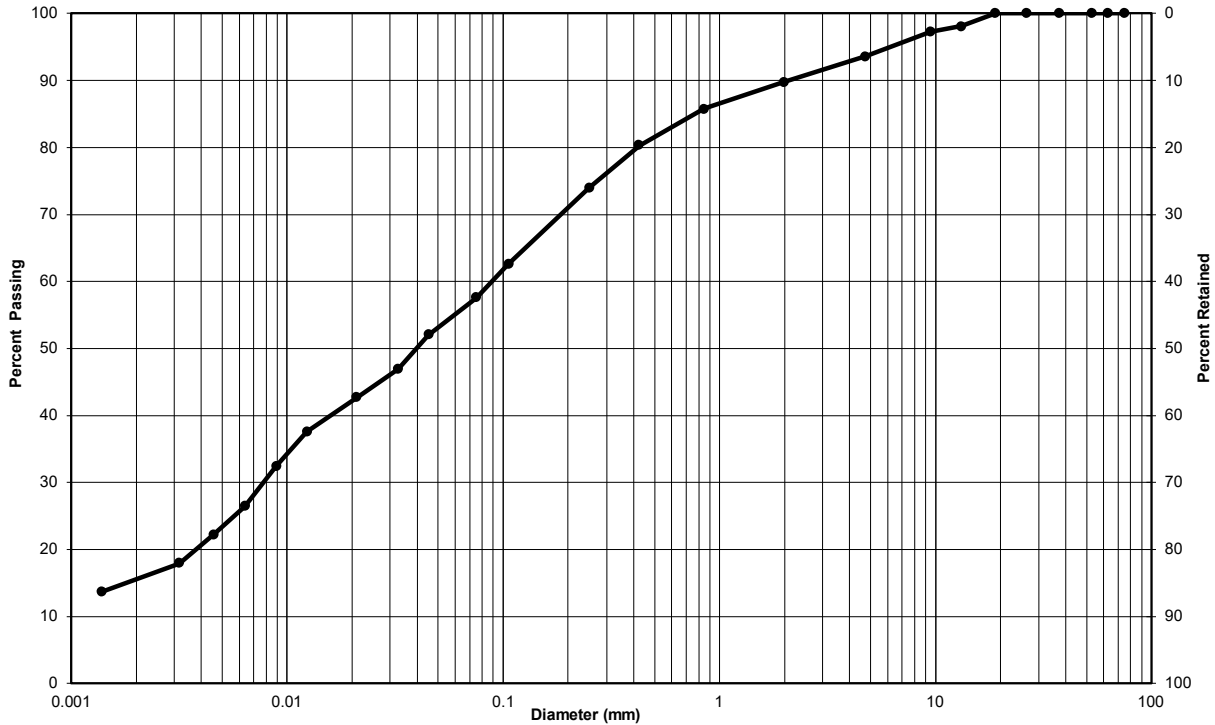
Performed by:	Jade Gorman	Date:	August 26, 2021
Verified by:	Joe Sullivan	Date:	September 7, 2021



**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client:	Cavan Monaghan	Lab No.:	SS-21-71
Project/Site:	Millbrook Firehall	Project No.:	11231078

Borehole no.:	BH4-21	Sample no.:	SS5
Depth:	3.0 to 3.7m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silt	6	36	58
Silt-size particles (%):	43		
Clay-size particles (%) (<0.002mm):	15		

Remarks:

Performed by:	Jade Gorman	Date:	August 26, 2021
Verified by:	Joe Sullivan	Date:	September 7, 2021



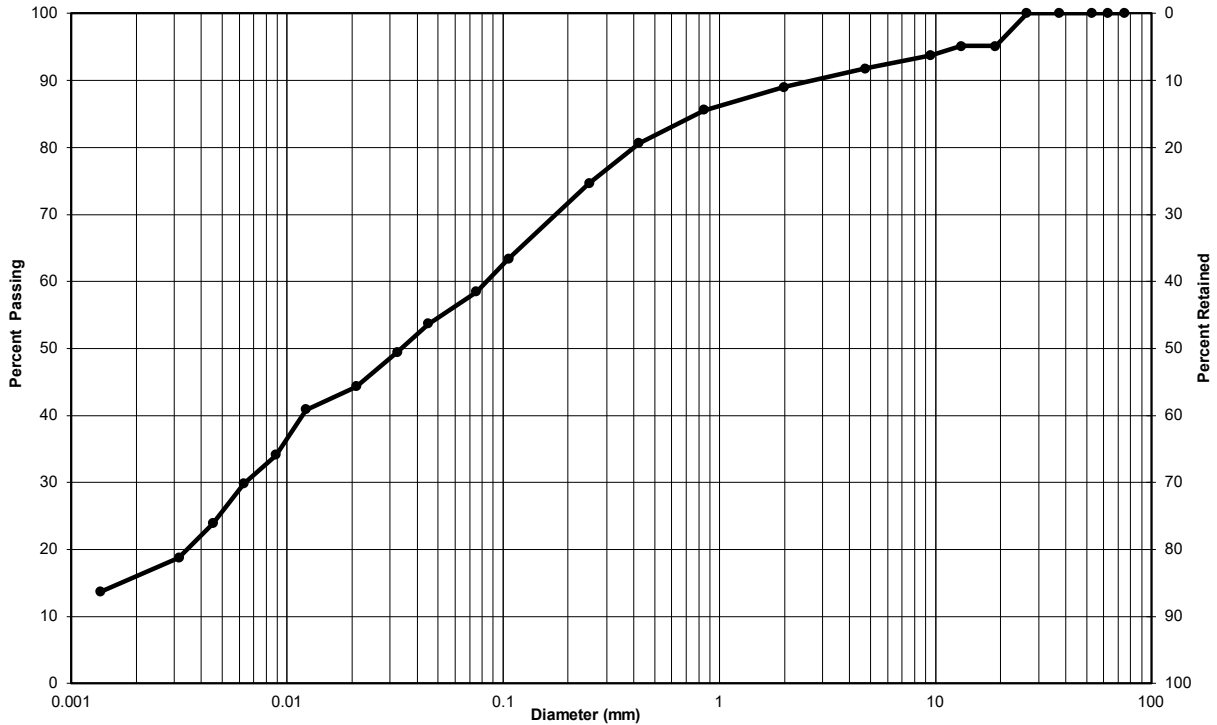
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: Cavan Monaghan **Lab No.:** SS-21-71

Project/Site: Millbrook Firehall **Project No.:** 11231078

Borehole no.: BH5-21 **Sample no.:** SS3

Depth: 1.5 to 2.1m **Enclosure:** _____



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silt	8	33	58
Silt-size particles (%):	43		
Clay-size particles (%) (<0.002mm):	15		

Remarks:

Performed by: Jade Gorman **Date:** August 26, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 7, 2021



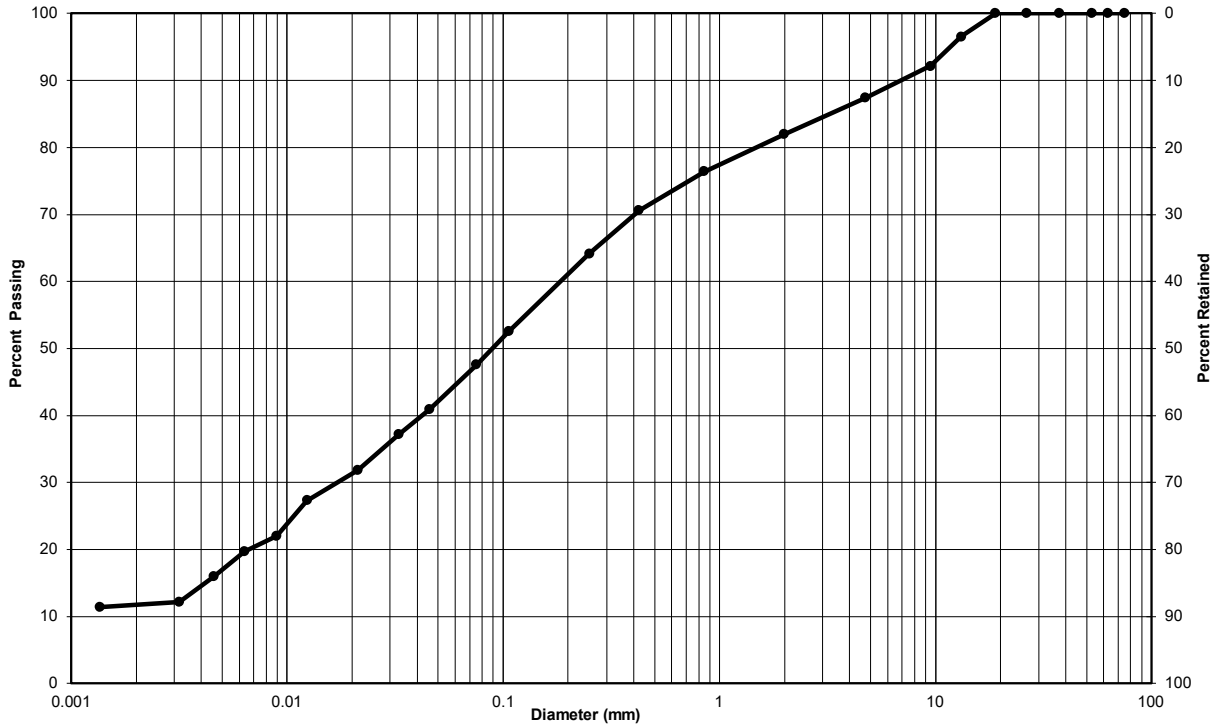
Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client: Cavan Monaghan **Lab No.:** SS-21-71

Project/Site: Millbrook Firehall **Project No.:** 11231078

Borehole no.: MW6-21 **Sample no.:** SS7

Depth: 6.1 to 6.7m **Enclosure:** _____



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty sand	13	40	47
Silt-size particles (%):	35		
Clay-size particles (%) (<0.002mm):	12		

Remarks:

Performed by: Jade Gorman **Date:** August 26, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 7, 2021



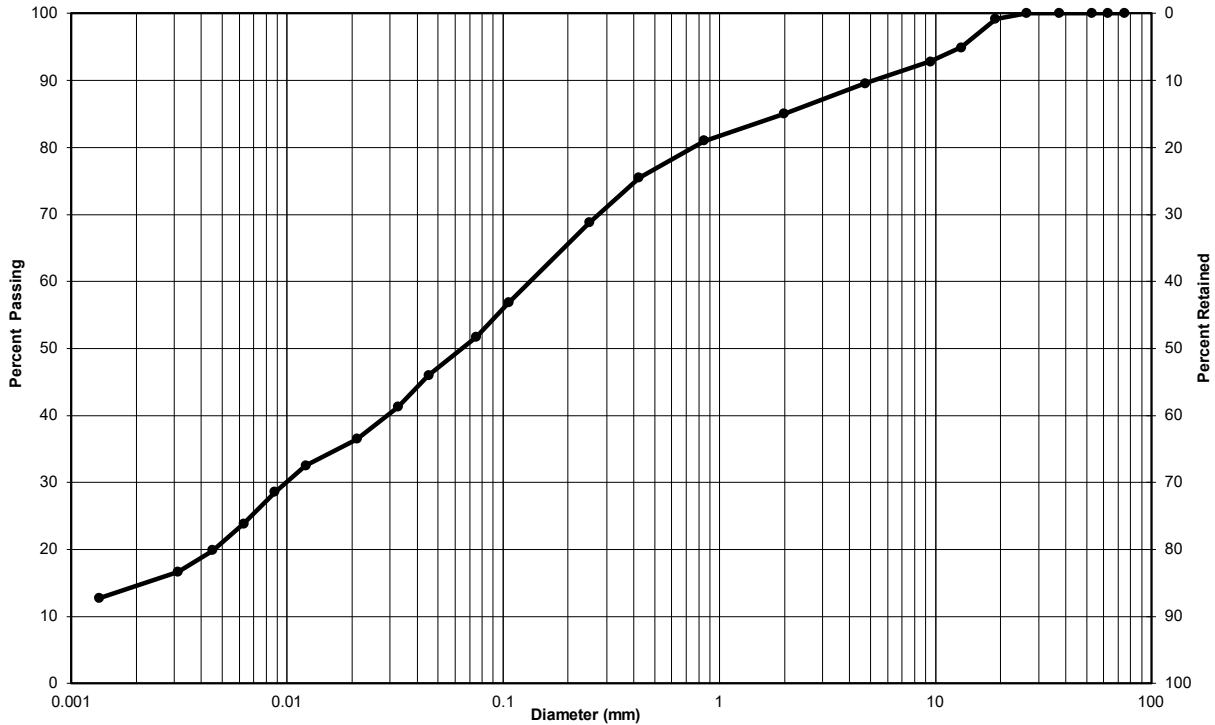
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: Cavan Monaghan **Lab No.:** SS-21-71

Project/Site: Millbrook Firehall **Project No.:** 11231078

Borehole no.: BH8-21 **Sample no.:** SS4

Depth: 2.3 to 2.9m **Enclosure:** _____



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silt	10	38	52
Silt-size particles (%):		38	
Clay-size particles (%) (<0.002mm):		14	

Remarks:

Performed by: Jade Gorman **Date:** August 26, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 7, 2021

Appendix D

Analytical Laboratory Testing Results

C.O.C.: G099582

REPORT No. B21-27433 (i)

Rev. 1

Report To:

GHD Limited
 455 Phillip Street,
 Waterloo Ontario N2L 3X2 Canada

Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9
 Tel: 289-475-5442
 Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

JOB/PROJECT NO.: Millbrook/11231078

DATE REPORTED: 23-Sep-21

SAMPLE MATRIX: Soil

P.O. NUMBER: 735000487

WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Cyanide	4	Kingston	US	31-Aug-21	A-CN s K	in house
Conductivity	4	Holly Lane	ST	01-Sep-21	A-COND-01 (o)	SM 2510B
pH	4	Richmond Hill	HAZ	31-Aug-21	A-pH-02 (rh)	MOEE3530
Chromium (VI)	4	Holly Lane	LMG	01-Sep-21	D-CRVI-02 (o)	EPA7196A
Mercury	4	Holly Lane	PBK	01-Sep-21	D-HG-01 (o)	EPA 7471A
Boron - HWS	4	Holly Lane	AHM	01-Sep-21	D-HWE s	MOE3470
Sodium Adsorption Ratio	4	Holly Lane	AHM	01-Sep-21	D-ICP-01 SAR (o)	SM 3120
Metals - ICP-OES	4	Holly Lane	AHM	01-Sep-21	D-ICP-02 (o)	EPA 6010
Metals - ICP-MS	4	Holly Lane	TPR	01-Sep-21	D-ICPMS-01 (o)	EPA 6020

µg/g = micrograms per gram (parts per million) and is equal to mg/Kg

F1 C6-C10 hydrocarbons in µg/g, (F1-btex if requested)

F2 C10-C16 hydrocarbons in µg/g, (F2-naph if requested)

F3 C16-C34 hydrocarbons in µg/g, (F3-pah if requested)

F4 C34-C50 hydrocarbons in µg/g

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

Any deviations from the method are noted and reported for any particular sample.

nC6 and nC10 response factor is within 30% of response factor for toluene:

nC10, nC16 and nC34 response factors within 10% of each other:

C50 response factors within 70% of nC10+nC16+nC34 average:

Linearity is within 15%:

All results expressed on a dry weight basis.

Unless otherwise noted all chromatograms returned to baseline by the retention time of nC50.

Unless otherwise noted all extraction, analysis, QC requirements and limits for holding time were met. If analyzed for F4 and F4G they are not to be summed but the greater of the two numbers are to be used in application to the CWS PHC QC will be made available upon request.

O. Reg. 153 - Soil, Ground Water and Sediment Standards
 Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
 Lab Manager

R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an *

Site Analyzed=K-Kingston, W-Windsor, O-Ottawa, R-Richmond Hill, B-Barrie

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

C.O.C.: G099582

REPORT No. B21-27433 (i)

Rev. 1

Report To:

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455 Phillip Street,
 Waterloo Ontario N2L 3X2 Canada

Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9

Tel: 289-475-5442

Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

JOB/PROJECT NO.: Millbrook/11231078

DATE REPORTED: 23-Sep-21

P.O. NUMBER: 735000487

SAMPLE MATRIX: Soil

WATERWORKS NO.

Parameter	Units	R.L.	Client I.D.	MW-3-21 - SS-4	MW-6-21 - SS-1	BH-7-21 - SS-2	BH-2-21 - SS-1	O. Reg. 153
			Sample I.D.	B21-27433-1	B21-27433-2	B21-27433-3	B21-27433-4	Tbl. 1 - All
			Date Collected	20-Aug-21	20-Aug-21	20-Aug-21	20-Aug-21	
pH @25°C	pH Units			7.62	7.52	7.43	7.23	
Conductivity @25°C	mS/cm	0.001		0.168	0.115	0.112	0.167	0.57
Cyanide (Free)	µg/g	0.05		< 0.05	< 0.05	< 0.05	< 0.05	0.051
Sodium Adsorption Ratio	units			1.86	0.0802	0.0757	0.295	2.4
Antimony	µg/g	0.5		< 0.5	< 0.5	< 0.5	< 0.5	1.3
Arsenic	µg/g	0.5		1.7	2.0	2.1	2.0	18
Barium	µg/g	1		38	34	53	47	220
Beryllium	µg/g	0.2		0.2	0.2	0.4	0.3	2.5
Boron	µg/g	0.5		3.9	3.3	2.9	3.8	36
Boron (HWS)	µg/g	0.02		0.02	0.03	< 0.02	0.11	
Cadmium	µg/g	0.5		< 0.5	< 0.5	< 0.5	< 0.5	1.2
Chromium	µg/g	1		8	8	12	11	70
Chromium (VI)	µg/g	0.2		< 0.2	< 0.2	< 0.2	< 0.2	0.66
Cobalt	µg/g	1		3	3	5	4	21
Copper	µg/g	1		5	5	6	6	92
Lead	µg/g	5		< 5	< 5	5	9	120
Mercury	µg/g	0.005		< 0.005	0.008	0.022	0.024	0.27
Molybdenum	µg/g	1		< 1	< 1	< 1	< 1	2
Nickel	µg/g	1		7	6	7	7	82
Selenium	µg/g	0.5		< 0.5	< 0.5	0.5	< 0.5	1.5
Silver	µg/g	0.2		< 0.2	< 0.2	< 0.2	< 0.2	0.5
Thallium	µg/g	0.1		< 0.1	< 0.1	< 0.1	< 0.1	1
Uranium	µg/g	0.1		0.4	0.5	0.4	0.4	2.5
Vanadium	µg/g	1		16	17	24	25	86

O. Reg. 153 - Soil, Ground Water and Sediment Standards
 Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
 Lab Manager

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C.O.C.: G099582

REPORT No. B21-27433 (i)

Rev. 1

Report To:

GHD Limited
 455 Phillip Street,
 Waterloo Ontario N2L 3X2 Canada

Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9
 Tel: 289-475-5442
 Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21
 DATE REPORTED: 23-Sep-21
 SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Millbrook/11231078
 P.O. NUMBER: 735000487
 WATERWORKS NO.

Parameter	Units	R.L.	Client I.D.	MW-3-21 - SS-4	MW-6-21 - SS-1	BH-7-21 - SS-2	BH-2-21 - SS-1	O. Reg. 153 Tbl. 1 - All
			Sample I.D.	Date Collected	B21-27433-1	B21-27433-2	B21-27433-3	
Zinc	µg/g	3		20	22	27	40	290

1. Revised report to correct sample ID as per client request

O. Reg. 153 - Soil, Ground Water and Sediment Standards
 Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
 Lab Manager

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Rev. 1

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110 West Beaver Creek Rd Unit 14

Richmond Hill ON L4B 1J9

Tel: 289-475-5442

Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

DATE REPORTED: 23-Sep-21

SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Millbrook/11231078

P.O. NUMBER: 735000487

WATERWORKS NO.

Summary of Exceedances

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
Lab Manager

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C.O.C.: G099582

REPORT No. B21-27433 (ii)

Rev. 1

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 455 Phillip Street,
 Waterloo Ontario N2L 3X2 Canada

Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9
 Tel: 289-475-5442
 Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

JOB/PROJECT NO.: Millbrook/11231078

DATE REPORTED: 23-Sep-21

P.O. NUMBER: 735000487

SAMPLE MATRIX: Soil

WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
% Moisture	4	Richmond Hill	FAL	30-Aug-21	A-% moisture RH	
PHC(F2-F4)	4	Kingston	KPR	30-Aug-21	C-PHC-S-001 (k)	CWS Tier 1
PHC(F2-F4)	1	Kingston	NSC	31-Aug-21	C-PHC-S-001 (k)	CWS Tier 1
VOC's	4	Richmond Hill	FAL	30-Aug-21	C-VOC-02 (rh)	EPA 8260
PHC(F1)	4	Richmond Hill	FAL	30-Aug-21	C-VPHS-01 (rh)	CWS Tier 1

µg/g = micrograms per gram (parts per million) and is equal to mg/Kg

F1 C6-C10 hydrocarbons in µg/g, (F1-btex if requested)

F2 C10-C16 hydrocarbons in µg/g, (F2-naph if requested)

F3 C16-C34 hydrocarbons in µg/g, (F3-pah if requested)

F4 C34-C50 hydrocarbons in µg/g

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

Any deviations from the method are noted and reported for any particular sample.

nC6 and nC10 response factor is within 30% of response factor for toluene:

nC10, nC16 and nC34 response factors within 10% of each other:

C50 response factors within 70% of nC10+nC16+nC34 average:

Linearity is within 15%:

All results expressed on a dry weight basis.

Unless otherwise noted all chromatograms returned to baseline by the retention time of nC50.

Unless otherwise noted all extraction, analysis, QC requirements and limits for holding time were met. If analyzed for F4 and F4G they are not to be summed but the greater of the two numbers are to be used in application to the CWS PHC QC will be made available upon request.

O. Reg. 153 - Soil, Ground Water and Sediment Standards
 Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
 Lab Manager

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Rev. 1

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 Waterloo Ontario N2L 3X2 Canada

Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9

Tel: 289-475-5442

Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

JOB/PROJECT NO.: Millbrook/11231078

DATE REPORTED: 23-Sep-21

P.O. NUMBER: 735000487

SAMPLE MATRIX: Soil

WATERWORKS NO.

Parameter	Client I.D.		MW-3-21 - SS-4	MW-6-21 - SS-1	BH-7-21 - SS-2	BH-2-21 - SS-1	O. Reg. 153	
	Sample I.D.	Date Collected	B21-27433-1	B21-27433-2	B21-27433-3	B21-27433-4	Tbl. 1 - All	
	Units	R.L.	20-Aug-21	20-Aug-21	20-Aug-21	20-Aug-21		
Acetone	µg/g	0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	
Benzene	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	
Bromodichloromethane	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Bromoform	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Bromomethane	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Carbon Tetrachloride	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Monochlorobenzene (Chlorobenzene)	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Chloroform	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dibromochloromethane	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichlorobenzene,1,2-	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Dichlorobenzene,1,3-	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Dichlorobenzene,1,4-	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Dichlorodifluoromethane	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Dichloroethane,1,1-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichloroethane,1,2-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichloroethylene,1,1-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichloroethene, cis-1,2-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichloroethene, trans-1,2-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichloropropane,1,2-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Dichloropropene, cis-1,3-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02		
Dichloropropene, trans-1,3-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02		

O. Reg. 153 - Soil, Ground Water and Sediment Standards
 Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
 Lab Manager

R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an *

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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C.O.C.: G099582

REPORT No. B21-27433 (ii)

Rev. 1

Report To:

GHD Limited
 455 Phillip Street,
 Waterloo Ontario N2L 3X2 Canada

Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9

Tel: 289-475-5442

Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

JOB/PROJECT NO.: Millbrook/11231078

DATE REPORTED: 23-Sep-21

P.O. NUMBER: 735000487

SAMPLE MATRIX: Soil

WATERWORKS NO.

Parameter	Client I.D.		MW-3-21 - SS-4	MW-6-21 - SS-1	BH-7-21 - SS-2	BH-2-21 - SS-1	O. Reg. 153 Tbl. 1 - All	
	Sample I.D.	Date Collected	B21-27433-1	B21-27433-2	B21-27433-3	B21-27433-4		
	Units	R.L.	20-Aug-21	20-Aug-21	20-Aug-21	20-Aug-21		
Dichloropropene 1,3-cis+trans	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Ethylbenzene	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Dibromoethane,1,2-(Ethylene Dibromide)	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Hexane	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Methyl Ethyl Ketone	µg/g	0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	
Methyl Isobutyl Ketone	µg/g	0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	
Methyl-t-butyl Ether	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Dichloromethane (Methylene Chloride)	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Styrene	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Tetrachloroethane,1,1,1,2-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Tetrachloroethane,1,1,2,2-	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Tetrachloroethylene	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Toluene	µg/g	0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.2	
Trichloroethane,1,1,1-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Trichloroethane,1,1,2-	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	
Trichloroethylene	µg/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	
Trichlorofluoromethane	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.25	
Vinyl Chloride	µg/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	
Xylene, m,p-	µg/g	0.03	< 0.03	< 0.03	< 0.03	< 0.03		

O. Reg. 153 - Soil, Ground Water and Sediment Standards
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 Lab Manager

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REPORT No. B21-27433 (ii)

Rev. 1

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Attention: Jamie McEachern

Caduceon Environmental Laboratories

110 West Beaver Creek Rd Unit 14
 Richmond Hill ON L4B 1J9
 Tel: 289-475-5442
 Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21
 DATE REPORTED: 23-Sep-21
 SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Millbrook/11231078
 P.O. NUMBER: 735000487
 WATERWORKS NO.

Parameter	Units	R.L.	Client I.D.	MW-3-21 - SS-4	MW-6-21 - SS-1	BH-7-21 - SS-2	BH-2-21 - SS-1	O. Reg. 153 Tbl. 1 - All
			Sample I.D.	Date Collected	B21-27433-1	B21-27433-2	B21-27433-3	
Xylene, o-	µg/g	0.03		< 0.03	< 0.03	< 0.03	< 0.03	
Xylene, m,p,o-	µg/g	0.03		< 0.03	< 0.03	< 0.03	< 0.03	0.05
PHC F1 (C6-C10)	µg/g	10		< 10	< 10	< 10	< 10	25
PHC F2 (>C10-C16)	µg/g	5		< 5	< 5	< 5	< 5	10
PHC F3 (>C16-C34)	µg/g	10		40	17	11	38	240
PHC F4 (>C34-C50)	µg/g	10		< 10	< 10	< 10	60 ¹	120
PHC F4 (Gravimetric)	µg/g	50					< 50 ²	120
% moisture	%			8.1	2.5	5.6	14.6	

1. F4 Gravimetric analysis required as chromatids did not return to baseline.
2. Sample silica cleaned
3. Revised report to correct sample ID as per client request

O. Reg. 153 - Soil, Ground Water and Sediment Standards
 Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
 Lab Manager

R.L. = Reporting Limit
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REPORT No. B21-27433 (ii)

Rev. 1

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Tel: 289-475-5442

Fax: 289-562-1963

DATE RECEIVED: 27-Aug-21

DATE REPORTED: 23-Sep-21

SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Millbrook/11231078

P.O. NUMBER: 735000487

WATERWORKS NO.

Summary of Exceedances

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun



Christine Burke
Lab Manager

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C.O.C.: G099582

REPORT No. B21-27434

Report To:

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 455 Phillip Street,
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DATE RECEIVED: 27-Aug-21

JOB/PROJECT NO.: Millbrook/11231078

DATE REPORTED: 03-Sep-21

P.O. NUMBER: 735000487

SAMPLE MATRIX: Soil

WATERWORKS NO.

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed	BH-5-21 - SS-6	MW-3-21 - SS-6		
pH @25°C	pH Units		MOEE3530	30-Aug-21/R	7.39	7.38		
Resistivity	ohms-cm		SM 2510B	01-Sep-21/O	10300	9070		
REDOX potential	mV		In-House	31-Aug-21/R	204	219		
Chloride	µg/g	5	SM4110C	01-Sep-21/O	9	41		
Sulphate	µg/g	10	SM4110C	01-Sep-21/O	< 10	10		
Sulfide	µg/g	0.3	In-House	03-Sep-21	0.7 ¹	0.7 ¹		

1 Subcontracted to Testmark Labs



Christine Burke
 Lab Manager

R.L. = Reporting Limit

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