Kawartha Lakes-Haliburton Housing Corporation

Gull River Housing

Specifications – Issued for Tender
May 1, 2023

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Design Discipline

Documents prepared by the respective Consultants are designated by the following discipline symbols:

- Owner (O)
- Architect (A)
- Civil Consultant (C)
- Commissioning Consultant (COMM)
- Electrical Consultant (E)
- Hardware Consultant (H)
- Landscape Consultant (L)
- Mechanical Consultant (M)
- Structural Consultant (S)

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 05 - METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 22 - PLUMBING

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DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING

DIVISION 26 - ELECTRICAL

DIVISION 31 - EARTHWORK

DIVISION 33 - UTILITIES

APPENDICES

END OF DOCUMENT

1 GENERAL

1.1 The requirements of the Articles of Agreement, Conditions of the Contract, Division 1 apply to and from all Sections of the Contract Documents and the Work.

1.2 Work in this Specification is divided into descriptive sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and their Subcontractors. The Contractor is responsible for organizing division of labour and supply of materials essential to complete the Contract. The Consultant and Owner assume no liability to act as an arbiter to establish Subcontract limits between Sections or Divisions of Work.

1.3 It is intended that Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown on Drawings, to make finished Work complete and fully operational, consistent with the intent of the Contract Documents.

1.4 Mention in the specifications or indication on the drawings of materials, Products, operations, or methods, requires that the Contractor provide each item mentioned or indicated of the quality or subject to the qualifications noted; perform according to the conditions stated in each operation prescribed; and provide labour, materials, Products, equipment, and services to complete the Work.

1.5 Specifications, Schedules and Drawings are complementary, and items mentioned or indicated on one may not be mentioned or indicated on the others.

1.6 Contractors finding discrepancies or ambiguities in, or omissions from the Drawings, Specifications or other Contract Documents, or having doubt as to the meaning and intent of any part thereof shall contact the Consultant for clarification.

2 SPECIFICATION LANGUAGE, STYLE, AND DEFINITIONS

2.1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to Contractor, unless stated otherwise. Fulfill and perform all indicated requirements whether stated imperatively or otherwise.

2.2 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.

2.3 Work designated as “N.I.C.” is not included in this Contract.

2.4 The terms “approved”, “review”, “reviewed”, “accepted”, “acceptance”, “acceptable”, “satisfactory”, “selected”, “directed”, “instructed”, “required”, “submit”, “permitted”, “approved alternative”, “approved equal”, or similar words or phases are used in standards or elsewhere in Contract Documents, it shall be understood, that words “by (to) the Consultant” follow, unless context provides otherwise.

2.5 The term ‘or approved alternative’ following a list of Products, systems, or manufacturers used in the Contract Documents shall be construed to mean approved by Consultant. Specified products to be Base Bid. Contractor to follow ‘Substitution Procedures’ specified in this Section for submitting proposed Products, systems, and manufacturers and obtain Consultant’s approval of the same prior to proceeding with ordering proposed Products and systems or engaging manufacturers. Contractors who purchase Products and systems or engage manufacturers prior to Consultant’s review and acceptance do so at their own risk.

2.6 Where the words 'submit', 'acceptable' and 'satisfactory' are used in the Contract Documents, they shall be considered to be followed by the words 'to the Consultant' unless the context provides otherwise.

2.7 The terms “exposed” or “exposed to view” refers to surfaces that are within the line of vision of persons from any accessible viewpoint, both within and without the building. Where any part of a surface is exposed to view, all other portions of that surface shall also be considered as exposed to view.

3 CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES

3.1 Owner will supply Contractor with a complete set of Contract Documents in electronic format before commencement of the Work. Contractor may print hard copies for construction purposes as required.

4 DOCUMENTS AT THE SITE

4.1 Keep ongoing Contract Documents at Place of the Work, stored securely and in good order and available to Owner and Consultant, in hard copy and or electronic form.

4.2 Keep the following documents at Place of the Work, stored securely and in good order and available to Owner and Consultant, in hard copy and or electronic form:

.1 Current Contract Documents, including Drawings, Specifications, and addenda.

.2 Change Orders, Change Directives, and Supplementary Instructions.

.3 Reviewed Shop Drawings, Product data, and samples.

.4 Field test reports and records.

.5 Construction progress schedule.

.6 Meeting minutes.

.7 Manufacturer's certifications.

.8 Permits, inspection certificates and other documents required by authorities having jurisdiction.

.9 Current as-built drawings.

.10 Material Safety Data Sheets (MSDS) for all controlled Products.

5 EXISTING SITE CONDITIONS

5.1 Make a careful examination of the site, and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken, as to the means of access and egress thereto and therefrom, as to the obstacles to be met with, as to the extent of the Work to be performed, any limitations under which the work has to be executed, and any and all matters which are referred to in the Contract Documents. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to Tender closing.

5.2 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to the Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant. Ensure that each Subcontractor performing work related to the site conditions has examined it so that all are fully informed on all particulars which affect the Work thereon in order that construction proceeds competently and expeditiously.

5.3 Before commencing the Work of any Section or trade, carefully examine the Work of other Sections and trades upon which it may depend, examine substrate surfaces, and report in writing to the Consultant, defects which might affect new Work. Commencement of Work shall constitute acceptance of conditions and Work of other sections, trades, and Other Contractors upon which the new Work depends. If repair of surfaces is required after commencement of specific work it shall be included in the work of the trade providing the specific system or finish.

6 CONTRACTOR’S USE OF SITE

6.1 Except as otherwise specified, Contractor has unrestricted use of Place of the Work from time of Contract award until Ready-for-Takeover.

6.2 Accept full responsibility for the Work and storage areas from the time of Contract award until Ready-for-Takeover.

6.3 Confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and Contract Documents, whichever is most restrictive. Do not unreasonably encumber Place of the Work.

7 ACCESS/PROPERTY CONSTRAINTS

7.1 Perform Work only during the following times unless otherwise approved by the Owner:

.1 As per local by-laws and authorities.

7.2 Provide and maintain access facilities as may be required for access to the Work.

7.3 Confine Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.

7.4 Organize delivery of materials/equipment to and removal of debris and equipment from place of Work to permit continual progress of work.

7.5 Determine and make arrangement as required for loading and unloading of equipment and Products at times that will not affect public traffic flow and that will be permitted by the City of Minden Hills. Conform to City by-laws with regard to parking restrictions and other conditions.

7.6 Make provisions and arrangements and provide allowances if times for loading and unloading allowed by the City of Minden Hills are other than regular working hours.

7.7 All Products, materials and equipment required on Site shall be portable and/or size suitable for access and movement on Site and without causing damage.

7.8 Provide locked doors in barriers, permit access by Owner and Consultant to Work areas and to areas Contractor is responsible for.

8 SETTING OUT

8.1 Before commencing work, verify lines, levels and dimensions shown on the drawing and report discrepancies in levels or dimensions to the Consultant. Be responsible for work done prior to the receipt of the Consultant's decision regarding reported discrepancies.

9 CASH ALLOWANCES

9.1 Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.

9.2 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in Conditions of the Contract.

9.3 A schedule and scope of work shall be prepared jointly by the Consultant and Contractor to show when items called for under allowances must be authorized by the Consultant for ordering purposes so that the progress of the Work will not be delayed.

9.4 Submit, before application for final payment, copies of all invoices and statements from suppliers and Subcontractors for work which has been paid from cash allowances.

9.5 Owner, through Consultant, will provide Contractor with documentation required to permit pricing of a cash allowance item.

9.6 Where a Cash Allowance is for work performed under a Subcontract, the Contractor shall Bid the work involved and submit the Bids received, with the Contractor’s recommendations, for approval.

9.7 Contractor will provide to the Owner and Consultant bids, quotations, and other price related information received from potential Suppliers and Subcontractors complete with Contractor's recommendations for approval.

9.8 Owner, through Consultant, will determine by whom and for what amount each cash allowance item will be performed. Obtain Owner's prior written approval in the form of a Change Order before entering into a subcontract, amending an existing subcontract, or performing own forces work included in a cash allowance. Upon issuance of the Change Order, the Contractor's responsibilities for a cash allowance item shall be the same as for other work of the Contract.

9.9 Where costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.

9.10 Amount of each cash allowance does not include Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

9.11 Cash allowances, unless otherwise specified, cover the net cost to the Contractor of services, Products, supply, construction machinery and equipment, freight, delivery, handling, unloading, storage, installation where indicated, all related costs, and other authorized expenses incurred in performing the Work.

9.12 Cash allowances shall not be included by a Subcontractor in the amount for their Subcontract work.

9.13 Supply only allowances shall include:

.1 Net cost of Products as invoiced by Supplier.
.2 Delivery to Site.
.3 Applicable taxes and duties, excluding HST.

9.14 Supply and install allowances shall include:
- .1 Net cost of Products.
- .2 Subcontractor's overhead and profits related to the Cash Allowance.
- .3 Delivery, unloading, storing, handling or Products on Site.
- .4 Installation, finishing and commissioning of Products.
- .5 Applicable taxes and duties, excluding HST.

9.15 Inspection and testing allowances shall include:
- .1 Net cost of inspection and testing services.
  - a. Cost of engaging an inspecting or testing agency, execution of inspecting and tests, and reporting results.
- .2 Applicable taxes and duties, excluding HST.
- .3 Costs Not Included in the Inspecting and Testing Allowance but Included in the Contract Price:
  - a. Costs of incidental labor and facilities required to assist inspecting or testing agency.
  - b. Costs of testing services used by Contractor separate from Contract Document Requirements.
  - c. Costing is retesting upon failure of previous tests as determined by Consultant.
- .4 Inspecting and Testing Allowance Schedule:

  .1 Include the sum of **$40,000** for testing and inspection. Differences in cost will be adjusted by Change Order. Testing Inspection Schedule:

  .1 Reinforcing Steel
  .2 Concrete Strength
  .3 Granular compaction of subgrade materials
  .4 Structure
  .5 Roofing
  .6 Building Envelope
  .7 Others as required by local authorities.

9.16 Other costs related to work covered by cash allowances are not covered by the allowance but shall be included in the Contract Price.

9.17 Include in the Bid Price the amount of each cash allowance:

- .1 **Mailboxes (2) and Mailbox Installation: $20,000**
- .2 **Landscape: Topsoil, Plant Materials, Finish Landscaping: Allowance provided by Owner.**
- .3 **Canopies for river side entrances: $24,000**

10 SUBSTITUTION PROCEDURES

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

10.2 Substitution Procedures:

- .1 Requests for substitutions will not be accepted prior to the Notification of Award.

.2 Contractor may only propose a Substitution wherever a Product or manufacturer is specified by proprietary name(s) and accompanied by language such as "or approved alternative", "or approved equal", or other similar words. Do not construe such language as an invitation to unilaterally provide a Substitution without Consultant's prior acceptance in writing. Do not order or install any Substitution without a Supplemental Instruction or Change Order. If the above wording is not indicated, no Substitution of a Product or manufacturer will be accepted.

.3 Provided a proposed Substitution submission includes all of the information specified in this Section, Consultant will promptly review and accept or reject the proposed Substitution.

.4 Substitutions will not be considered if:

a. They do not meet the requirements of this Section.
b. They are indicated or implied on Shop Drawings or Product data without Consultant's acceptance.
c. Acceptance with require substantial revisions to the Specifications and Contract Drawings.

.5 Consultant may accept a Substitution if satisfied that:

a. the proposed substitute Product is the same type as, is capable of performing the same functions as, interfaces with adjacent work the same as, and meets or exceeds the standard of quality, performance and, if applicable, appearance and maintenance considerations, of the specified Product,
b. the proposed substitute manufacturer has capabilities comparable to the specified manufacturer, and
c. the Substitution provides a benefit to Owner.

.6 If Contractor fails to order a specified Product or order a Product by a specified manufacturer in adequate time to meet Contractor's construction schedule, Consultant will not consider that a valid reason to accept a Substitution.

.7 If Consultant accepts a Substitution and subject to Owner's agreement, the change in the Work will be documented in the form of either a Supplemental Instruction or Change Order as specified under Contract Modification Procedures.

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

.9 Installation of the accepted substitution is coordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

.10 Approved substituted Products shall be subject to the Consultant's inspection and testing procedures. Approved substituted Products shall only be installed after receipt of the Consultant's written approval.

.11 All claims are waived for additional costs related to the substitution which may subsequently arise.

10.3 Submission Requirements for Proposed Substitutions:

.1 Include with each proposed Substitution the following information:

a. Reason(s) for proposing the Substitution and the proposed substitutions has been investigated and complete information and data as specified in this Section is submitted. Consultant will only review information and data submitted. Incomplete data will be grounds for non-acceptance.

b. Identification of the Substitution, including product name and manufacturer's name, address, telephone numbers, and web site.

c. Data and a statement verifying that the proposed Substitution will not affect the Contract Price and Contract Time, unless the proposed Substitution results in a decrease in the Contract Price and Contract Time.

d. Same warranty or better is given for the substitution as for the original Product specified.

e. A statement verifying that the Substitution will not affect the performance or warranty of other parts of the Work.

f. Manufacturer's Product literature for the Substitution, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.

g. Product samples as applicable or requested.

h. A summarized comparison of the physical properties and performance characteristics of the specified Product and the Substitution, with any significant variations clearly highlighted.

i. Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.

j. Details of other projects and applications where the Substitution has been used.

k. Identification of any consequential changes in the Work to accommodate the Substitution and any consequential effects on the performance of the Work as a whole. A later claim for an increase to the Contract Price or Contract Time for other changes in the Work attributable to the Substitution will not be considered.

10.4 Substitutions to Methods and Processes:

.1 Substitutions to methods or processes described in the Specifications or drawings, may be proposed for the consideration of the Consultant. Ensure that such substitutions are in accordance with the following requirements:

.2 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Contract Time.

.3 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation.

.4 Be responsible for substitutions to methods or processes concerning such Work and ensure that the warranty covering all parts of the Work will not be affected

.5 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor.

.6 The substituted methods or processes fit into space allotted for the specified methods

or processes. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

11 CONTRACT MODIFICATION PROCEDURES

11.1 Schedule of Labour Rates:

.1 Prior to the first application for payment, submit for the Consultant's review a schedule of labour rates for all trades and classifications of trades, such as journeymen, apprentices, and foremen that will be employed in the Work. Provide a breakdown of payroll burden component of labour rates.

.2 Labour rates shall reflect the salaries, wages, and benefits paid to personnel in the direct employ of the Contractor, Subcontractors, and sub-Subcontractors, stated as hourly rates, that will be used when:

a. Preparing price quotations for Change Orders, and
b. Determining the cost of work attributable to Change Directives.

c. Labour rates stated in the schedule of labour rates shall be consistent with rates that will actually be paid, and payroll burden costs that will actually be incurred, in the normal performance of the Work, during regular working hours. Labour rates shall not include any additional overhead and profit component.

d. Where collective agreements apply, the labour rates shall not exceed those established by collective agreement.

e. Obtain the Owner's written acceptance of the schedule of labour rates before submitting the first Change Order quotation.

f. Accepted schedule of labour rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.

g. The Contractor may request amendments to the accepted schedule of labour rates if changes in the labour rates that will actually be paid, or payroll burden cost that will actually be incurred, in the normal performance of the Work can be demonstrated. Obtain the Owner's written acceptance of such changes.

11.2 Schedule of Equipment Rates:

.1 Equipment rates shall reflect the rates that will be used when:

a. Preparing price quotations for Change Orders, and
b. Determining the cost of work attributable to Change Directives.

.2 Equipment rates stated in the schedule shall be consistent with local equipment rental market rates and shall not include any additional overhead and profit component.

.3 Obtain the Owner's written acceptance of the schedule of equipment rates before submitting the first Change Order quotation.

.4 Accepted schedule of equipment rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.

.5 The Contractor may request amendments to the accepted schedule of equipment rates if changes in local equipment rental market rates can be demonstrated. Obtain the Owner's written acceptance of such changes.

11.3 Change Orders:

.1 Method of Contract Price Adjustment: Unless otherwise agreed, the adjustment of the Contract Price on account of a proposed change in the Work shall be based on a quotation for a fixed price increase or decrease to the Contract Price regardless of the Contractor's actual expenditures and savings.

.2 Change Order procedures: Upon issuance by the Consultant to the Contractor of a proposed change in the Work, and unless otherwise requested in the proposed change or unless otherwise agreed:

a. Submit to the Consultant a fixed price quotation for the proposed change in the Work within 5 days after receipt of the proposed change in the Work.

b. If requested in the proposed change, provide a detailed breakdown of the price quotation including the following to the extent applicable, with appropriate supporting documentation:

.1 Estimated labour costs, including hours and applicable hourly rates based on the accepted schedule of labour rates.

.2 Estimated Product costs, including Supplier quotations, estimated quantities and unit prices.

.3 Estimated Construction Equipment costs.

.4 Enumeration of all other estimated costs included in the price quotation.

.5 Estimated credit amounts for labour and Products not required on account of the proposed change.

.6 Fees, not exceeding the applicable percentages for overhead and profit as specified in this Section.

.7 Where applicable, Subcontractor quotations, also including a detailed breakdown of all of the above.

c. Include in the quotation the increase or decrease to the Contract Time, if any, for the proposed change, stated in number of days.

d. Include in the quotation the number of days for which the quotation is valid.

e. The quotation will be evaluated by the Consultant and the Owner and, if accepted by the Owner, be documented in the form of a signed Change Order.

11.4 Fees for Overhead and Profit - Change Orders:

.1 Where the Contractor's price quotation for a Change Order results in a net increase to the Contract Price, the Contractor's entitlement to a fee for overhead and profit in the quotation shall be as follows, as applicable:

a. For work to be performed by the Contractor's own forces, 10 % of the Contractor's

price quotation before the Contractor's fee is applied.

b. For work to be performed by a Subcontractor, 5 % of the Subcontractor's price quotation including the Subcontractor's fee.

.2 Where a Subcontractor's price quotation for a Change Order results in a net increase to the Subcontractor's contract price, the Subcontractor's entitlement to a fee for overhead and profit in the quotation shall be as follows, as applicable:

a. For work to be performed by the Subcontractor's own forces, 10 % of the Subcontractor's price quotation before the Subcontractor's fee is applied.

b. For work to be performed by a sub-Subcontractor, 5 % of the sub-Subcontractor's price quotation including the sub-Subcontractor's fee.

c. Where the Contractor's or a Subcontractor's price quotation for a Change Order results in a net decrease in price before adjustment for fees for overhead and profit, such a price quotation shall be for the net decrease without any adjustment for fees for overhead and profit.

11.5 Method of Contract Price Adjustment - Change Directives: Unless the Owner and the Contractor reach an earlier agreement on the adjustment to the Contract Price by means of a Change Order that cancels the Change Directive, the adjustment in the Contract Price for change carried out by way of a Change Directive shall be determined as specified in the General Conditions of Contract after the change in the Work is completed.

11.6 Change Directive Procedures:

.1 If a Change Directive is issued for a change in the Work for which a proposed change was previously issued, but no Change Order has yet been signed, the Change Directive shall cancel the proposed change and any Contractor quotations related to that change in the Work.

.2 When proceeding with a change in the Work under a Change Directive, keep accurate records of daily time sheets for labour and Construction Equipment, and invoices for Product and Construction Equipment costs. Submit such records to the Consultant daily, until the Change Order superseding the Change Directive is issued.

11.7 Fees for Overhead and Profit - Change Directives:

.1 The Contractor's entitlement to a fee for overhead and profit on the Contractor's expenditures and savings attributable to a Change Directive shall be as follows, as applicable:

a. For work performed by the Contractor's own forces, 10 % of the Contractor's net increase in costs.

b. For work performed by a Subcontractor, 5 % of the sum of the Subcontractor's net increase in costs plus the Subcontractor's fee.

.2 A Subcontractor's entitlement to a fee for overhead and profit on the Subcontractor's expenditures and savings attributable to a Change Directive shall be as follows, as applicable:

a. For work performed by the Subcontractor's own forces, 10 % of the Subcontractor's net increase in costs.

b. For work performed by a Sub-subcontractor, 5 % of the sum of the Sub-subcontractor's net increase in costs plus the Sub-subcontractor's fee.

.3 Where a Change Directive results in net savings on account of work not required to be performed and a net decrease in the Contractor's or Subcontractor's cost, the net savings to the Contractor or Subcontractor shall be calculated without any adjustment for fees for overhead and profit.

.4 When a Change Directive is ultimately recorded as a Change Order, there shall be no additional entitlement to fees for overhead and profit beyond those specified in this article.

12.8 Supplemental Instructions

.1 The Consultant may issue Supplemental Instructions to provide clarifications to the Contract Documents, provide additional information, or make minor variations in the Work not involving adjustment in the Contract Price or Contract Time.

.2 If the Contractor considers a Supplemental Instruction to require an adjustment in Contract Price or Contract Time, the Contractor shall promptly notify the Consultant and the Owner in writing and shall not proceed with any work related to the Supplemental Instruction pending receipt of a Change Order, a Change Directive, or, in accordance with the dispute resolution provisions of the General Conditions of Contract, a Notice in Writing of a dispute and instructions to proceed.

13 **PAYMENT PROCEDURES**

.1 Schedule of Values:

.1 Prior to the first application for payment, submit for Consultant's review an initial schedule of values. Modify the initial schedule of values if and as requested by Consultant. Obtain Consultant's written acceptance of the initial schedule of values prior to the first application for payment.

.2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and Products delivered to Place of the Work.

.3 Provide the schedule of values in an electronic spreadsheet format based on a format acceptable to all parties to the Contract, that provides for inclusion of the following information:

.1 Identifying information including title and location of the Work, name of Contractor, number and date of application for payment, and period covered by the application for payment.

.2 A work breakdown structure that is sufficiently detailed and comprehensive to facilitate Consultant's evaluation of applications for payment at an appropriate level of detail.

.3 Provisions for approved Change Orders, allowances, and other relevant values, so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price. Also provide for indicating the estimated value of Change Directives within the schedule of values, separately from the current total Contract Price.

.4 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:

.1 Breakdown Amount: A dollar amount, including an appropriate pro rata portion of Contractor's overhead and profit.

.2 Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for payment, stated as a percentage of the Contract Price and in dollars.

.3 Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.

.4 Current Period: The value of Work performed and Products delivered to Place of the Work for which Contractor is currently applying for payment, stated in dollars.

.5 Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.

.2 Cash flow projection:

.1 Prior to the first application for payment submit, for Consultant's review, a forecast of approximate monthly progress payments for each month of the Contract Time.

.2 Submit revised cash flow forecasts on a monthly basis when required due to significant changes in rate of progress of the Work or significant changes in the Contract Price or as requested by Consultant.

.3 Workers' Compensation Clearance: Submit proof of workers' compensation clearance with each application for payment.

.4 Statutory Declarations: Submit a statutory declaration in the form of CCDC 9A - Statutory Declaration of Progress Payment Distribution by Contractor with each application for payment except the first.

14 COORDINATION

14.1 Coordination of the Work of all Sections of the specifications as required to complete the Project is the responsibility of the Contractor.

14.2 Coordinate with removals/installations specified in other Divisions and Other Contracts.

14.3 Coordinate the work of this Contract with work of designated substance removal work and demolition work under separate contract. No allowance shall be made subsequently by the Owner or Consultant for lack of coordination and no claim will be considered for circumstances and omissions which could have been coordinated, prevented or included for had these procedures been followed.

14.4 Pay particular attention to types of ceiling construction and clearances throughout, especially where recessed fixtures are required. Coordinate work with Other Contractors and Subcontractors wherever ventilation ducts or piping installations occur to ensure that

conflicts are avoided.

14.5 Install ceiling mounted components in accordance with final ceiling plans. Inform Consultant of conflicting installations. Install as directed.

14.6 Install and arrange ducts, piping, tubing, conduit, equipment, fixtures, materials and products to conserve headroom and space with minimum interference and in neat, orderly and tidy arrangement. Run pipes, ducts, tubing and conduit, vertical, horizontal and square with building grid unless otherwise indicated. Install piping, ducts, and conduit as close to underside of structure as possible unless shown otherwise.

14.7 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Cutting, drilling and the subsequent patching required for failing to comply with this requirement shall be performed at a later date at no additional Cost to Owner.

14.8 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, fixtures, equipment, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires cooperative location and installation by other Sections, and that such information is communicated to the applicable installer. Cutting, fixing and 'making good' of the work of other Contractors, Subcontractors and trades and making up of lost time involved in failing to comply with this requirement shall be performed at no additional Cost to Owner.

14.9 Be responsible for coordinating products supplied in metric (SI) and imperial units into the overall layout.

14.10 Properly coordinate the work of the various Sections and trades, taking into account the existing installations to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the Work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to the Consultant for review before the commencement of Work.

14.11 Coordinate with mechanical and electrical trades to ensure protecting, supporting, disconnecting, cutting off, capping, diverting, relocating or removing of existing services in areas of Work before commencement of alteration work.

14.12 In case of damage to active services or utilities, notify Consultant and respective authorities immediately and make all required repairs under direction of Consultant and respective authorities. Carry out repairs to such damaged services and utilities continuously to completion, including working beyond regular working hours.

15 CUTTING AND PATCHING

15.1 Execute Work to avoid damage to other Work.

15.2 Execute cutting, patching, and remedial work including excavation and fill to make the affected parts of the Work come together properly and complete the Work.

15.3 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the Products affected, in a manner that neither damages nor endangers the Work.

15.4 Fit Work segments together, to integrate with penetrations through surfaces and with other Work.

15.5 Remove and replace defective and non-conforming Work.

15.6 Do any drilling, cutting, fitting, patching and finishing that may be required to make the various classes and kinds of other Work fit together in a professional and finished manner. Make watertight connections with adjoining structures.

15.7 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

15.8 Execute Work by methods to avoid damage to other Work and which will provide proper surfaces to receive patching and finishing.

15.9 Cut Products using proper equipment and methods. On rigid materials, use a masonry saw or core drill.

15.10 Where new Work connects with existing structures, cut, patch and make good existing work to match original condition.

15.11 Be responsible for correct formation and bridging of openings in masonry and structural walls as required.

15.12 Ensure compatibility between installed Products and ensure security of installation.

15.13 Restore Work with new Products in accordance with requirements of the Contract Documents.

15.14 Fit Work airtight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

15.15 Provide proper surfaces to receive patching, remedial work, and finishing

15.16 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

16 FIRE RATINGS, ASSEMBLIES AND SEPARATIONS

16.1 Where a material, component, assembly or separation is required to be fire rated, the fire rating shall be as determined or listed by one of the following testing authorities acceptable to the authorities having jurisdiction:

.1 Underwriters' Laboratories of Canada.

.2 Underwriters' Laboratories Inc.

.3 Factory Mutual Laboratories.

.4 The National Research Council of Canada.

.5 The National Board of Fire Underwriters.

.6 Intertek Testing Services.

16.2 Where reference is made to only one testing authority an equivalent fire rating as determined or listed by another of the aforementioned testing authorities is acceptable if approved by authorities having jurisdiction. Obtain and submit such approval of authorities, in writing when requesting acceptance of a proposed equivalent rating or test design.

16.3 Fire rated door assemblies shall include doors, frame, anchors, and hardware and shall bear label of fire rating authority showing opening classification and rating.

16.4 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.

16.5 Construct fire separations as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.

16.6 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are non-combustible and are tightly fitted and sealed with a ULC approved sealant for the assembly being sealed.

16.7 At penetration through fire rated walls, ceilings or floors, completely seal voids with ULC approved firestopping material; full thickness of the construction element. In locations that require a smoke seal, provide appropriate ULC approved system installed in accordance with the manufacturer's recommendations.

17 CODES

17.1 Reference is made to standards in the specifications to establish minimum acceptable standards of materials, products and workmanship. Ensure that materials, products and workmanship meet or exceed requirements of the Reference standards specified.

17.2 In the event of conflict between documents specified herein, execute the Work in accordance with the most stringent requirements.

18 REFERENCE STANDARDS

18.1 "Reference standards" means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.

18.2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.

18.3 Where a material or product is specified in conjunction with a referenced standard, do not supply the material or product if it does not meet the requirements of the standard. Supply another specified material or product, or an acceptable material or product of other approved manufacturer which does meet the requirements of the standard, at no additional cost to the Owner.

18.4 Reference standards establish minimum requirements. If Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.

18.5 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Consultant for clarification.

18.6 Where no standard is referred to, provide materials, products and workmanship which meet requirements of the applicable standards of the Canadian Standards Association, Canadian General Standards Board, Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD) and the applicable building code. References to "Measurement for Payment" and "Basis of Payment" in OPSS standard documents are not applicable to this Contract.

18.7 If there is question as to whether a material, product or system is in conformance with applicable standards, the Consultant reserves the right to have such materials, products or systems tested to prove or disprove conformance. The cost for such testing will be paid by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

18.8 Where application, installation and workmanship standards are cited, it is intended that referenced standards form the basis for minimum requirements of the specified item and specifications supplement the standards unless specified otherwise.

18.9 Matters may be dealt with in part by these specifications which are also dealt with, under the same or similar headings in cited standard. It is not intended that these specifications take the place of the standards but supplement them, unless specified otherwise.

18.10 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

19 CONSTRUCTION START-UP MEETING

19.1 Promptly after Contract award, Consultant will establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. Consultant will notify Contractor at least 5 Working Days before the meeting.

19.2 Senior representatives of Owner, Consultant(s), and Contractor, including Contractor's project manager and site superintendent, and major Subcontractors, shall be in attendance.

19.3 Consultant will arrange attendance of other interested parties not responsible to the Contractor.

19.4 Be prepared to provide specific information relative to agenda items as they are pertinent to the Contract.

19.5 Consultant's representative will chair the meeting and record and distribute the minutes within 5 Working Days of meeting date.

20 CONSTRUCTION PROGRESS MEETINGS

20.1 Attend regularly scheduled progress meetings to be held on Site at times and dates that are mutually agreed to by the Owner, Consultant, and Contractor. Consultant will notify Contractor at least 5 Working Days before the meeting.

20.2 Contractor to arrange for and provide physical space for meetings.

20.3 Contractor will prepare and distribute copies of Agenda prior to meeting.

20.4 Coordinate and organize attendance of individual Subcontractors and Suppliers when requested. Relationships and discussions between Subcontractor participants are not the responsibility of the Consultant and do not form part of the meetings content.

20.5 Ensure that Contractor representatives in attendance at meetings have required authority to commit Contractor to actions agreed upon. Assign same persons to attend such meetings throughout the contract period.

20.6 Consultant will arrange attendance of other interested parties not responsible to the Contractor.

20.7 Inform the Consultant in advance of meetings regarding all items to be added to the agenda.

20.8 Be prepared to provide specific information relative to agenda items at each meeting as they are pertinent to the Contract.

20.9 Consultant's representative will chair the meeting and record and distribute the minutes within 5 Working Days of meeting date.

20.10 Agenda will include but not be limited to the following topics as are pertinent to the Contract.

.1 Review and agreement of previous minutes.

.2 Construction safety.

.3 Work progress since previous meeting.

.4 Field observations, including any problems, difficulties, or concerns.

.5 Construction progress schedule.

.6 Submittal schedule and status of submittals.

.7 Quality control.

.8 Coordination.

.9 Contract Schedule.

.10 Work plan up to next scheduled meeting.

.11 Requests for information/clarification.

.12 Proposed changes in the Work.

.13 Other business.

21 SUBMITTALS, GENERAL

21.1 Submit electronic copies of submittals in a format acceptable to Owner where submittals are specified in technical Specifications.

21.2 Accompany each submittal with a letter of transmittal in duplicate containing all pertinent information required for identification and checking of submittals including but not limited to the following:

.1 Date of initial submission and date of each subsequent submission if required.

.2 Project title and Consultant’s project number.

.3 Names and address of:
- .1 Contractor.
- .2 Subcontractor.
- .3 Supplier/manufacturer/fabricator as applicable.

.4 Identification of each submittal item and quantity.

.5 Specification section numbers to which submission is related.

.6 Countersigned stamp of Contractor certifying that they have reviewed the submission.

21.3 Allow 10 Working Days for Consultant's review of each submittal and incorporate in submittals schedule specified in Contract Schedule. Allow additional 5 Working Days where sub-Consultant review is required.

21.4 When submittals are resubmitted, transmit under a new letter of transmission.

21.5 Where a submittal includes information not applicable to the Work, clearly identify applicable information and strike out non-applicable information.

21.6 If upon Consultant's review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of Work may proceed.

21.7 If upon Consultant's review significant errors or omissions are discovered, a so-noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.

21.8 Consultant's notations on submittals are intended to ensure compliance with Contract Documents and are not intended to constitute a change in the Work requiring change to the Contract Price or Contract Time.

21.9 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the Work proceeds. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant.

21.10 Do not carry out Work until Consultants review of submittals has been completed.

21.11 Be responsible for payment of charges for delivery of submissions and resubmission to Consultant.

22 SHOP DRAWINGS AND PRODUCT DATA

22.1 The term **"**Shop Drawings" means drawings, diagrams, schematics, illustrations, schedules, performance charts, product data, brochures and other data which are required to illustrate details of the Work.

22.2 Arrange for the preparation of Shop Drawings as called for in the Contract Documents or as may be reasonably requested by the Consultant. The Contractor and each Subcontractor shall operate as experts in their respective fields and all Shop Drawings and samples shall conform to the requirements of the Contract Documents.

22.3 In addition to Shop Drawings specified in the specification sections, submit Shop Drawings required by jurisdictional authorities in accordance with their requirements.

22.4 Shop Drawings for openings, sleeving and conduit:

.1 Prior to preparation of Shop Drawings, coordinate sizes of all structural openings and sleeves with respective fabricators for mechanical ducting. Adjustments to the opening sizes indicated on the Contract Drawings shall not be made without the approval of the Consultant.

.2 Prior to detailing structural reinforcement on Shop Drawings, arrange for the Structural Engineer to review formed holes, recesses and sleeving. Completely dimension openings, recesses and sleeves and relate to appropriate grid line(s) and elevation(s).

.3 Prior to forming of the structure, arrange for the preparation of Shop Drawings for review by the Consultant showing embedded conduit to be cast within the structure. Shop Drawings shall include conduit from all sources.

22.5 Shop Drawings shall indicate the following minimum criteria and any additional criteria indicated in the individual specification sections requiring Shop Drawings:

.1 Clear and obvious notes of any proposed changes from the Contract Documents.

.2 Indicate Products, methods of construction, and attachment or anchorage, fabrication and erection diagrams, dimensions, connections, explanatory notes and other information necessary for completion of the Work.

.3 Provisions for allowable construction tolerances and deflections provided for live loading.

.4 Where Products attach or connect to other Products, indicate construction arrangements and details of the parts and their connections, and interconnections with other work and that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.

.5 Location and type of anchors and exposed fastenings.

.6 Materials, physical dimensions including thicknesses, and finishes.

.7 Descriptive names of equipment.

.8 Mechanical and electrical characteristics when applicable.

.9 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnection work.

.10 Assumed design loadings, and dimensions and material specifications for load-bearing members.

22.6 Include in Shop Drawing submissions detailed information, templates, and installation instructions required for incorporation and connection of the Work.

22.7 Before submitting to the Consultant, review all Shop Drawings to verify that the Products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers and similar data and that it has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a qualified person possessing the appropriate authorization from the Contractor.

22.8 Be responsible for dimensions, confirmed at the Site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the Work of all Subtrades.

22.9 Submit Shop Drawings for the Consultant's review with reasonable promptness and in orderly sequence so as to cause no delay in the Work nor in the work of Other Contractors. At the time of submission, notify the Consultant in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents. The Contractor will be held responsible for changes made from the Contract Documents which are not indicated or otherwise communicated in writing with the submission.

22.10 Drawings submitted by the Contractor as required herein are the property of the Owner who may use and duplicate such drawings where required in association with the Work.

22.11 Submit Shop Drawings signed and sealed by a licensed Professional Engineer registered in the place of the Work where indicated in individual Sections.

22.12 Shop drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints at original as well as reduced size.

22.13 Shop drawings shall contain the following minimum information:

.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, date, and signature of Contractor's authorized representative responsible for Shop Drawing review, indicating that each Shop Drawing has been reviewed for compliance with Contract Documents and, where applicable, that field measurements have been verified.

.5 Details of appropriate portions of the 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 Relationships to other parts of the Work.

.6 On submissions subsequent to the first, the following additional identification:
    .1 The revision number.
    .2 Identification of the item(s) revised.

22.14 Dimensions and designations of elements shall be shown in the same system of measurement used on the applicable Contract Drawings.

22.15 Consultant reserves the right to refuse acceptance of drawing submissions not meeting the above requirements.

22.16 Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the Shop Drawings has been approved in writing by the Consultant. Review does not mean that Consultant approves detail inherent in Shop Drawings, responsibility which shall remain with Contractor submitting same.

22.17 Only drawings noted for revision and resubmission need be resubmitted.

22.18 File one copy of each submitted shop drawing at the Site.

22.19 Product Data:

.1 Before delivery of Products to the Site, submit Product data as specified in each section or as requested by the Consultant.

.2 Product data submittals shall include material safety data sheets (MSDS) for all controlled Products.

.3 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable/specified standards.

23 **SAMPLES**

23.1 Before delivery of Products to the Site, submit duplicate samples of Products as specified or as requested by the Consultant. Label samples as to origin and intended use in the Work and in accordance with the requirements of the Specification Sections. Samples must represent physical examples to illustrate materials, equipment, or work quality and to establish standards by which completed Work is judged.

23.2 Deliver samples prepaid to Consultant's business address unless another mutually agreed to location is established.

23.3 Identify samples with Project name, Contract number, date, Contractor's name, number and description.

23.4 Where a required colour, pattern or texture has not been specified, submit full range of available Products meeting other specified requirements.

23.5 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:

.1 The quality and functional characteristics of Products, including integrally related parts and attachment devices.

.2 The full range of colours available.

23.6 Notify the Consultant in writing, at time of submission, of any deviations in samples from requirements of the Contract Documents, and state the reasons for such deviations.

23.7 Consultant selection from samples is not intended to change the Contract Price or Contract Time. If a selection would affect the Contract Price or Contract Time, notify Consultant in writing prior to proceeding with the Work.

23.8 If samples are not acceptable, both samples will be returned. If samples are acceptable, one sample will be so indicated and returned. Be responsible for the cost of samples that are not accepted and for resubmission of samples.

23.9 Resubmit samples as required by Consultant to comply with Contract Documents.

23.10 Reviewed and acceptable samples will establish the standard against which installed Work will be reviewed.

23.11 Each Product incorporated in the Work shall be precisely the same in all details as the acceptable sample.

23.12 Should there be any change from the accepted sample, submit in writing for approval of the revised characteristics and resubmit samples of the Product for approval if requested.

23.13 When samples are very large, require assembly, or require evaluation at the Site, they may be delivered to the Site, but only with approval and as directed.

24 CERTIFICATES

24.1 Submit certificates that are required by authorities having jurisdiction or that are requested in the specification sections.

24.2 Clearly show on each certification the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery and name of certifying company.

24.3 Certificates shall verify that Products and/or methods meet the specified requirements and shall include test reports of acceptable testing laboratories to validate certificates.

24.4 Submit certificates in duplicate and signed by an authorized representative of the certifying company.

25 EXTENDED WARRANTIES

25.1 Submit extended warranties as requested in sections of the Specifications showing title and address of Contract, warranty commencement date and duration of warranty.

25.2 Extended warranties shall commence on termination of the standard warranty specified in the conditions of the contract and shall be an extension of these provisions. Clearly indicate what is being warranted and what remedial action is to be taken under the warranty. Ensure warranty bears the signature and seal of the Contractor.

25.3 Submit each extended warranty on a form that is acceptable to the Owner and Consultant.

26 INSPECTION AND TEST REPORTS

26.1 Submit inspection and test reports as specified in the Sections of the specifications for "Source Quality Control" and "Field Quality Control" within 5 Working days of inspection or testing. If immediate action is required by the Contractor or Consultant inform the Consultant immediately and submit inspection and testing report within one working day.

26.2 Submit 3 copies of reports submitted with certificates of compliance indicating but not limited to the following:

.1 Project name and number.

.2 Date of inspection or test and date report is issued.

.3 Name and address of inspection and testing company.

.4 Name and signature of inspector or tester.

.5 Identification of Product and Specification Section covering inspected or tested work.

.6 Specified requirements for which the inspection or testing was performed and results of inspections or tests.

.7 Location of inspection or from which tested material was derived.

.8 Overview of inspection and testing methods and procedures.

.9 Remarks and observations on compliance with Contract Documents.

26.3 Inspection and test reports shall be signed by a responsible officer of the inspection and testing company.

27 PROGRESS RECORDS

27.1 Maintain on site, permanent written records of daily progress of the Work. Records shall be open to review by Consultant and Owner at all times and a copy shall be furnished to Consultant on a weekly basis.

27.2 Records shall show dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to number of employees of various trades and type and quantity of equipment employed daily, temperature, protection methods and other such data shall be noted.

28 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

28.1 Obtain from Consultant an electronic copy of the construction Drawings for the purpose of creating as-built drawings. Record information in electronic form, clearly identifying as-built deviations from the originally obtained construction Drawings.

28.2 CAD drawings of Contract Drawings can be obtained from Consultant upon signing a waiver re: digital drawings that will be supplied by the Consultant.

28.3 Clearly label each drawing as "AS-BUILT DRAWING prepared by (name of Contractor)". Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

28.4 Authorized deviations from drawings shall be marked in red accurately on one set of drawing prints in a neat, legibly printed manner and shall be dated. Prior to final inspection, neatly transfer the recorded information to a second set of drawing prints of the most recent revision to the drawings and submit both sets to the Consultant.

28.5 Maintain as-built drawings up to date as Work progresses. Status of maintained as-built drawings may be considered as a condition for validation of applications for payment. Make as-built drawings available to the Consultant at all times.

28.6 Record actual construction including but not limited to the following:

.1 Accurate dimensioned record of deviations and changes in Work from drawings.

.2 Measured depths of elements of foundation in relation to finish first floor datum.

.3 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.4 Measured locations of pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.

.5 Field changes of dimension and detail.

.6 Changes made by Change Orders and Supplemental Instructions

.7 References to Shop Drawings, where Shop Drawings show more detail.

.8 Do not use as-built drawings for construction purposes.

28.7 Accurately record locations of concealed structure, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration Work and future additions. Do not conceal such Work until the location has been recorded.

28.8 Accurately record locations of equipment bases, anchors, concrete pads and roof curbs, sleeves, piping, conduits, ducts, maintenance holes and valves, etc. located either below, outside or within structure.

28.9 Where piping, conduits and ducts are underground, underfloor, embedded in concrete or otherwise in inaccessible locations, accurately record with respect to structure column lines or walls and elevations with respect to finished floor levels or grades referenced to the centre line of components.

28.10 Accurately record any components which will be in inaccessible locations for Consultant's review before the component is covered, or buried, or made inaccessible.

28.11 As-built drawings shall be signed and dated by Contractor.

28.12 Submit as-built drawing to Consultant for review and make corrections as directed by Consultant.

29 SCHEDULES

29.1 Be responsible for planning and scheduling of the Work. As a minimum, prepare and update the following schedules:

.1 Contract Schedule.

.2 Detailed Construction Schedule.

.3 Submittals Schedule.

29.2 Be responsible for ensuring that Subcontractors plan and schedule their respective portions of the Work. Subcontractor's schedules shall form part of the above mentioned schedules.

29.3 Schedule management:

.1 A schedule submitted as specified and accepted by Consultant shall become the baseline schedule and shall be used as the baseline for updates.

.2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Consultant, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.

.3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

29.4 Contract Schedule:

.1 Prepare and submit, in a format acceptable to the Owner, the Contract Schedule within 10 Working Days following award of Contract. This schedule, once it is reviewed by the Consultant and if it meets the project requirements, will form part of the Contract.

.2 Contract Schedule shall be developed using a logic network technique for planning and scheduling.

.3 Contract Schedule shall be submitted for approval in its optimum levelled form. This presentation may be in either a time scaled network or a bar chart form. It shall be subdivided into either work areas or systems as applicable.

.4 Contract Schedule shall include but not be limited to the following information. Information to be provided in a sufficient level of detail to effectively manage the construction process.

- .1 Starting and ending dates, milestones, and key activities of each activity including the float periods.
- .2 Work Packages.
- .3 Manpower requirements for each activity.
- .4 Order and delivery dates for long delivery Products and major or critical equipment.
- .5 Interdependency with activities of other Contractors.
- .6 Dates specified in the Contract Documents.
- .7 Milestone dates for Ready-for-Takeover.
- .8 Inspection and testing activities.
- .9 Dates on which specific data will be required for submittal, i.e., Vendor data, drawings for review, etc.
- .10 Preparation and review of Mock-ups.
- .11 Shutdown or closure activities.
- .12 Demonstration and training activities.

.5 Submit updated schedule to the Consultant and Owner monthly indicating as a minimum actual and projected start and finish dates, report date line and progress, activity relationships, float, Contract changes as well as major changes to the schedule.

29.5 Detailed Construction Schedule:

.1 Prepare and submit a detailed construction schedule within 10 Working Days of final review and acceptance of the Contract Schedule. This schedule, once reviewed and accepted by the Consultant, will be updated and submitted monthly with the Contract Schedule and weekly once the Contractor starts on Site.

.2 This schedule shall cover the construction period. It will show, in detail, activities on a daily basis indicating durations, manpower and constraints. The activities shown on this schedule shall further clarify or detail the activities shown on the Contract Schedule.

.3 The detailed construction schedule shall be presented in a bar chart form.

29.6 Submittals Schedule:

.1 Prepare schedule in electronic format acceptable to Owner, identifying all required Shop Drawing, Product data, and sample submissions, including samples required for testing.

.2 Provide a separate line for each required submittal, organized by Specification section names and numbers, and further broken down by individual Products and systems as required.

.3 Allow time in schedule for review of submittals and resubmission of submittals, should resubmission be necessary.

.4 Submit initial schedule to Consultant in format acceptable to Owner, within 15 Working Days after Contract award.

.5 Consultant will review format and content of initial schedule and request necessary changes, if any, within 10 Working Days after receipt. If changes are required, resubmit finalized schedule within 5 Working Days after return of review copy.

.6 Submit updated submittals schedule monthly to Owner and Consultant.

30 INSPECTION AND TESTING

30.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.

30.2 Employment of inspection and testing agencies by Contractor or Owner does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.

30.3 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off site manufacturing and fabrication plants.

30.4 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections.

30.5 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

30.6 Inspection and Testing by Owner:

.1 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.

.2 Owner retained inspection and testing:

.1 The Consultant, on behalf of the Owner may appoint an independent inspection and testing company to carry out quality control reviews of parts of the Work for conformance to the Contract Documents.

.2 Such costs for inspection and testing will be paid by the Owner. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.

.3 Inspection and testing under allowances:

.1 Submit a list of inspection and testing agencies for approval by the Owner and Consultant. Inspection and testing services will be tendered by the Contractor and the results submitted to the Consultant for review and approval.

.2 Such costs for inspection and testing will be paid by the Cash Allowance. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense. Cash allowance excludes any inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.

.4 Inspections and testing by the independent inspection and testing company will be promptly made. Uncover for examination any Work covered up prior to inspection or without approval of the Consultant. Make good such Work at no cost to the Owner.

30.7 Inspection and Testing by Contractor:

.1 Retain and pay for inspection and testing required for Contractor's own quality control, by regulatory requirements, to ensure performance of the work or where identified in the Contract Documents.

.2 Source and Field Quality Control specified in Other Sections:

.1 This Section includes requirements for performance of inspection and testing specified under Source Quality Control and Field Quality Control in other Sections of the specifications.

.2 Contractor’s own inspection and testing quality control shall not include responsibilities and procedures that relate solely to an inspection and testing company's functions that are retained directly by the Owner or paid for under a cash allowance. Such information is included in this Section for Contractor's information only.

.3 Do not limit responsibility for ensuring that products and execution of the work meet Contract requirements, and inspection and testing required to this end, to specified inspection and testing.

31 TOLERANCES FOR INSTALLATION OF WORK

31.1 Unless specifically indicated otherwise, work shall be installed plumb, level, square and straight.

31.2 Unless acceptable tolerances are otherwise specified in specification sections or are otherwise required for proper functioning of equipment, site services, and mechanical and electrical systems:

.1 "Plumb and level" shall mean plumb or level within 1 mm in 1 m.

.2 "Square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.

.3 "Straight" shall mean within 1 mm under a 1 m long straightedge.

.4 "Flush" shall mean within:

.1 6 mm for exterior concrete, masonry, and paving materials.

.2 1 mm for interior concrete, masonry, tile and similar surfaces.

.3 0.05 mm for other interior surfaces.

31.3 Allowable tolerances shall not be cumulative.

32 DEFECTS AND REMEDIAL WORK

32.1 Defective products, materials and workmanship found at any time prior to Ready-for-Takeover will be rejected regardless of previous inspections, testing, and reviews of the Work. Inspections, testing, and reviews shall not relieve the Contractor from their responsibility, but are a precaution against oversight or error. Remove and replace defective and rejected products, materials, systems, and workmanship. Be responsible for delays and expenses caused by rejection.

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

33 MOCK UPS

33.1 Construct mock-ups of Work as specified in the technical Specifications prior to start of affected work and to include all related specified materials and workmanship. If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by Consultant. Construct mock-ups of Work as required by Contract Documents on site unless otherwise indicated herein or directed by Consultant.

33.2 Allow sufficient time for Consultant’s review. Work affected by mock-ups may not commence prior to acceptance of mock-ups.

33.3 Modify mock-up as required and in accordance with the intent of the Contract Documents, until Consultant approval is obtained. Mock-ups, reviewed and accepted by Consultant, shall become the standard of quality against which installed work will be measured.

33.4 Mock-ups, by prior arrangement, may be incorporated into finished work if approved by Consultant only. Remove mock-ups only when the Work they represent is complete or when otherwise directed by Consultant.

34 TEMPORARY CONTROLS

34.1 Provide temporary controls and construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements. Maintain in good condition for the duration of the Work.

34.2 Remove controls and temporary construction facilities from Place of the Work when no longer required.

34.3 Hoarding and barriers:

.1 Erect temporary hoarding and barriers around entire perimeter of Site to height determined by applicable regulatory requirements.

.2 Before commencing operations, supply, erect and maintain hoarding as determined by applicable regulatory requirements to protect public and private property from injury or damage. Paint outside of hoarding in a colour selected by the Consultant and mark with "POST NO BILLS" signs.

.3 Provide temporary enclosures as required to protect the building in its entirety or in its parts, against the elements, to maintain environmental conditions required for work within the enclosure, and to prevent damage to materials stored within.

.4 Provide lockable gates through hoarding and barriers for access to Site by workers and vehicles.

34.4 Prevent unauthorized entry to the Site. Barricade, guard or lock access points to the satisfaction of the Consultant and post "NO TRESPASSING" signs.

34.5 Provide hoarding, barriers and covered walkways required by governing authorities for public safety, public rights-of-way and for access to buildings. Snow fencing is not allowed as protection for sidewalk.

34.6 Install signs for movement of people around Work Site as required and directed by the Consultant.

34.7 Provide secure, rigid guide rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs as required for protection of Work, workers, and the public.

34.8 Remove hoarding, barriers, building enclosures, guide rails and barricades upon completion of Contract, unless otherwise noted on the Contract Drawings or as directed by the Consultant.

35 SITE SECURITY

35.1 Provide and pay for security personnel to guard the Site and contents of the Site after working hours and during holidays as established by the Owner. Control of access shall be through hoarding and barricades during times work is in progress, and by locking hardware otherwise.

35.2 Make provisions to permit Owner's security personnel to view areas where all Work is being performed.

35.3 Any security service provided by the Owner is for the protection of the Owner's interest in the Work on the Site and shall not relieve the Contractor of the responsibility to protect the Site and the Work of the Contract.

36 TEMPORARY WORKS

36.1 Installation and Removal: Provide temporary utilities, facilities and controls, and as otherwise necessary to perform the Work expeditiously. Remove from Site all such Work after use.

36.2 Arrange for connections with appropriate utility company and pay all costs for installation, maintenance and removal.

36.3 Pay all costs for temporary works consumed prior to Ready-for-Takeover.

36.4 Temporary Power and Lighting Systems:

.1 Supply, install and maintain electrical power and necessary electrical equipment. Connections will be made available to any part of the Work within distance of a 30 m extension.

.2 Provide temporary lighting of adequate intensity to illuminate construction activities.

.3 Make all necessary arrangements for a temporary electrical service of sufficient capacity to supply temporary lighting, operation of power tools, and equipment for all construction, implementation, and inspection and testing purposes. Supply and install necessary temporary cables and other electrical equipment and make all temporary connections as required.

.4 Temporary power distribution wiring shall comply with Ontario Hydro Electrical Safety Code. Obtain inspection certificates for temporary electrical work.

.5 Maintain the lighting systems in operation during the life of the Contract. Replace burned or missing lamps immediately.

.6 Upon completion of Contract, remove electrical plant and temporary lighting from the Site.

36.5 Water Supply:

.1 Provide and pay for a continuous supply of potable water for construction use.

.2 Provide and maintain all temporary lines, extensions and hoses as required. Remove all temporary connections and lines on completion of the Work and make good any damage.

36.6 Temporary heating:

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside buildings must be vented to the outside or be flameless type. Solid fuel salamanders are not permitted.

.3 Maintain temperatures of minimum 10^{o}C in areas where construction is in progress unless otherwise indicated in the Contract Documents. Protect exposed and adjacent services from freezing. Repair at no cost to the Owner any such services, buildings or other utilities disrupted by freezing.

.4 Ventilate heated areas and keep the Work free from fumes, vapours, exhaust and combustion gases, and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.

.5 Ventilate temporary sanitary facilities.

.6 The permanent heating system of the building or portions thereof may be used when available only upon written permission by Consultant.

36.7 Sanitary Facilities:

.1 Provide sanitary facilities in accordance with occupational health and safety requirements in the place of the Work. Use of new sanitary facilities is not allowed.

.2 Keep sanitary facilities clean and fully stocked with the necessary supplies.

37 PROTECTION

37.1 Protection of Public Area: Protect surrounding private and public property from damage during performance of the Work.

37.2 Take all necessary precautions to prevent damage to work affected by temperature, water, weather and other environmental conditions.

37.3 Protection of Building Finishes and Equipment:

.1 Provide protection for existing structure, finished and partially finished building finishes, waterproofing systems, and equipment during performance of the Work.

.2 Cover Owner's equipment and plant within the Site with 6 mil PVC sheet, or equal, taped to make it dust-tight. Equipment and existing work moved or altered to facilitate construction, movement of Products or equipment shall be stored, protected with dust-tight covers and subsequently returned to its original location.

.3 Obtain approval from the Consultant prior to the installation of temporary supporting devices into existing roof, ceiling, or wall members for the erecting of equipment or machinery. Repair roof, ceiling, and wall members used for this purpose to the satisfaction of the Consultant.

.4 Provide necessary screens, covers and hoarding as required.

.5 Any Products or equipment damaged while carrying out the Work shall be restored with new Products or equipment matching the original equipment. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations.

37.4 Fire Protection:

.1 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, by-laws and to the satisfaction of the Consultant and insurance authorities.

.2 Excessive storage of flammable liquids and other hazardous materials is not allowed on Site. Flammable liquids must be handled in approved containers. Remove combustible wastes frequently.

.3 Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently.

.4 Open burning of rubbish is not permitted on the Site.

37.5 Report any discharge of a contaminant to the Authorities having jurisdiction.

38 PEST CONTROL

38.1 Be responsible for providing control measures, restraining procedures, and treatments to prevent infestation and spread of insects, rodents and other pests deemed to be present at Site and/or noticed during course of the Work. Carry out fumigation, pest control procedure, and posting of warning signs, notices including contents of such notices in accordance with requirements of Pesticides Act and any other authorities having jurisdictions. Pesticides used shall be in accordance with Canada Pest Control Products Act, and provincial and municipal regulations.

39 SITE MAINTENANCE

39.1 Maintain the Site and adjacent premises in a clean and orderly condition, free from debris and other objectionable matter. Immediately remove rubbish and surplus Products, equipment and structures from the Site. If the Site is not cleaned (within 48 hours after the Contractor has been instructed to do so), the Consultant may clean the Site and retain the cost from monies due, or to become due, to the Contractor.

39.2 When the Work is substantially performed, remove surplus Products, tools, construction machinery and equipment not required for the performance of the remaining Work.

40 SITE STORAGE AND OVER LOADING

40.1 Confine the Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the Site with Products.

40.2 Products shall be stored only in areas designated or approved by the Consultant, and shall not be left lying on streets, sidewalks, boulevards or elsewhere within public view. Products which the Consultant may permit to be stored elsewhere than in the Contractor's storage areas shall be neatly stacked or otherwise disposed and shall be so maintained.

40.3 Do not load or permit to be loaded any part of the Work with a weight or force that it is calculated to bear safely. Be solely responsible and liable for damages resulting from violation of this requirement. Provide temporary supports as strong as permanent support.

40.4 Do not cut, drill or sleeve load bearing members unless shown on drawings or otherwise approved by the Consultant in writing for each location.

40.5 Site storage and loading requirements to be in accordance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

41 CONSTRUCTION PARKING

41.1 Limited parking will be permitted at Place of the Work in locations as indicated by the Owner, provided it does not disrupt the performance of Work, Site safety or the movement of vehicular or pedestrian traffic and is acceptable to the Consultant.

42 APPROVAL OF PRODUCTS AND INSTALLATION METHODS

42.1 Wherever in the Specifications it is specified that Products and installation methods shall meet approval of Authorities having Jurisdiction, underwriters, the Consultant, or others, such approval shall be in writing.

43 PRODUCT DELIVERY CONTROL

43.1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which he intends to use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.

43.2 Promptly upon Contract award and periodically during construction, review and confirm Product availability and delivery times. Order Products in sufficient time to meet the construction progress schedule and the Contract Time.

43.3 Contact the Consultant immediately upon receipt of information indicating that the specified Product is no longer available or if any material or item, will not be available on time, in accordance with the original schedule.

43.4 The Consultant reserves the right to receive from the Contractor at any time, upon request, copies of actual purchase or work orders of any material or products to be supplied for the work.

43.5 If materials and products have not been placed on order, the Consultant may instruct such items to be placed on order, if direct communication in writing from the manufacturer or prime suppliers is not available indicating that delivery of said material will be made in sufficient time for the orderly completion of the Work.

43.6 The Consultant's review of purchase orders or other related documentation shall in no way release the Contractor, or his subcontractors and suppliers from their responsibility for ensuring the timely ordering of all materials and items required, including the necessary expediting, to complete the work as scheduled in accordance with the Contract Documents.

43.7 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to direct the Contractor to take the following measures at no increase in Contract Price:

.1 Substitute more readily available Products of similar or better quality and character, or

.2 Temporarily install another Product until such time as the specified Product becomes available, at which time the temporarily installed product shall be removed and the specified Product installed;
or

.3 Request Contractor to propose actions to maintain the construction progress schedule for Consultant's review and acceptance.

44 DELIVERY, STORAGE, HANDLING AND PROTECTION

44.1 Be responsible for handling and delivery of Products. Protect Products from damage during handling, storage and installation. Deliver store and handle items in accordance with manufacturer's instructions and as specified. Be responsible for all costs of delivery, loading and off-loading, and for transportation back to its origin for correction, if required, due to damage or defect. Reject materials and Products delivered to the Site which are damaged.

44.2 Manufacture, pack, ship, deliver, and handle Products so that no damage occurs to structural qualities and finish appearance, nor in any other way which is detrimental to their function and appearance.

44.3 Ensure that Products, while transported, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

44.4 Organize delivery of materials, Products and equipment to, and removal of debris and equipment from, the site and surrounding property.

44.5 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at the Place of the Work.

44.6 Coordinate mechanical and electrical equipment and apparatus deliveries with the manufacturer's and suppliers such that equipment and apparatus is delivered to the site when it is required, or so that it can be stored within the building and protected from the elements.

44.7 Shop assemble work for delivery to Site in size easily handled and to ensure passage through building openings.

44.8 Deliver packaged Products, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

44.9 Label packaged products to describe contents, quantity, and other information as specified.

44.10 Labels attesting that materials conform to specified reference standards will be acceptable as verification that contents meet specified requirements. In the absence of labels, submit affidavits to validate conformance of Product to reference standards, as requested by the Consultant.

44.11 Label fire-rated Products to indicate Underwriters' Laboratories approval.

44.12 Handle and store materials and products in such a manner that no damage is caused to the materials and products, the Work, the Site and surrounding property.

44.13 Locate products on Site in a manner to cause minimal interference with the Work.

44.14 Store Products off the ground, in a manner to prevent damage, adulteration, deterioration and soiling to the Products, other building components, assemblies, other products, the structure, the Site and surrounding property, and in accordance with manufacturer's instructions when applicable.

44.15 Store packaged or bundled Products in original and undamaged condition complete with written application instructions. Keep manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.

44.16 Do not place or store materials and Products in corridors, public areas, streets, lanes, passageways or similar locations.

44.17 Store Products so as not to create any overloading conditions to any part of the building, structure, falsework, form work and scaffolding.

44.18 Store Products subject to damage from weather in weatherproof enclosures.

44.19 Store cementitious Products clear of earth or concrete floors, and away from walls.

44.20 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

44.21 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

44.22 Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous material in bulk within the Work.

44.23 Store and mix paints in a heated and ventilated room or area assigned for this purpose. Keep this room or area locked when unattended. Remove oily rags and other combustible debris from the Place of the Work daily. Take every precaution necessary to prevent spontaneous combustion.

44.24 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup. Protection shall be easily removable without damage to finishes. Do not permit strippable tape or coatings to become baked on surfaces which they protect.

44.25 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use primer and paint to match original.

44.26 Protect glass and other finishes against heat, slag and weld splatter by provision of adequate shielding. Do not apply Visible markings to surfaces exposed to view in finished state or that receive transparent finishes.

44.27 Protect surfaces of completed work exposed to view from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable for the material and surface location.

44.28 Adequately protect trowelled concrete floors from damage. Take special measure when moving heavy loads or equipment on them.

44.29 Keep finished concrete floors free from oils, grease or other material likely to damage or discolour them or affect bond of applied finishes. One building is enclosed, keep floors as dry as possible after curing.

44.30 Protect finished flooring from pedestrian traffic with minimum reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape. Maintain protection in place until completion of Contract.

44.31 Protect finished flooring from continuing construction work and delivery of products with plywood panels of minimum 6 mm thickness with joints between panels sealed with reinforced pressure sensitive tape. Maintain protection in place until work and deliveries are complete.

44.32 Promptly remove, replace, clean, repair, or make good as directed by Consultant, work damaged as a result of inadequate protection.

44.33 Hazardous Materials Information:

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) in accordance with jurisdictional authorities.

.2 Deliver copies of Safety Data Sheets (SDS) to the Consultant on all Products intended for use in the Work and designated as a "controlled product."

45 MANUFACTURER'S INSTRUCTIONS

45.1 Unless otherwise indicated in the Specifications, fabricate, install, apply, connect, install, erect, use, clean, and condition Products in accordance with manufacturer's instructions except where more stringent requirements are specified. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

45.2 Notify the Consultant in writing, of conflicts between the Specifications and manufacturer's instructions, so that the Consultant may establish the course of action. If requested, make a copy of those instructions available at the Site.

45.3 In cases of improper installation or erection of Products, due to failure in complying with these requirements, the Consultant may direct removal and re-installation at no increase in Contract Price.

46 WORKMANSHIP

46.1 Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce required results.

46.2 Do not employ any unfit person or anyone unskilled in their required duties. The Consultant reserves the right to require the dismissal from the Place of the Work, workers deemed incompetent, careless, insubordinate or otherwise objectionable.

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

46.4 Give particular attention to finished dimensions and elevations of the Work. Make finished Work fit indicated spaces accurately. Make finished Work flush, plumb, true to lines and levels and accurate in all respects.

46.5 Ensure that service poles, fill-pipes, vents, regulators, metres and similar service installations are located in inconspicuous locations. If not indicated on drawings, verify location of service installations with Consultant prior to commencing installation.

46.6 Ensure that integrity of fire separations is maintained throughout the Work. When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

46.7 Finish access panels and doors to match adjacent wall and/or ceiling finish unless otherwise specified or indicated.

46.8 Keep surfaces, on which finished materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.

46.9 Enforce fire prevention methods at site. Do not permit fires, open flame heating devices or accumulation or debris. Use flammable materials only if all safety precautions are taken. Provide and maintain in working order ULC labelled fire extinguishers of types suitable for fire hazard in each case, and locate them in prominent location and to approval of jurisdictional authorities.

46.10 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.

47 DIMENSIONS

47.1 Check all dimensions at the Site before fabrication and installation commences and report discrepancies to the Consultant.

47.2 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.

47.3 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained

47.4 Wall thicknesses and openings shown on the drawings may be nominal only; ascertain actual sizes at the Site.

47.5 Verify dimensions of shop fabricated portions of the Work at the Site before shop drawings and fabrications are commenced. The Owner will not accept claims for extra expense by reason of non-compliance with this requirement.

47.6 Fabricate and erect manufactured items, shop fabricated items, and items fabricated on or off site, to suit site dimensions and site conditions.

47.7 In areas where equipment is to be installed, check dimensional data on equipment to ensure that area and equipment dimensions are compatible with necessary access and clearance provided. Ensure that equipment supplied is dimensionally suitable for space provided.

47.8 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.

47.9 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes.

48 CONCEALMENT

48.1 In finished areas, conceal pipes, ducts, conduit and wiring in floors, walls, ceilings, chases, or behind furring except where indicated otherwise:

.1 After review by Consultant and authority having jurisdiction.

.2 Where locations differ from those shown on Drawings, after recording actual locations on as-built drawings.

48.2 Provide incidental furring or other enclosures as required.

48.3 Notify Consultant in writing of interferences before installation.

49 EXPANSION, CONTRACTION, AND DEFLECTION

49.1 Conform to manufacturer's recommended installation temperatures. If items, components, assemblies, systems, and finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and consultant. Repair all resulting damage should expansion provisions provide inadequate.

49.2 Make provisions for expansion and contraction due to temperature changes within components, Products and assemblies, and between adjacent components, Products and assemblies, and due to building movements including but not limited to creep, column shortening, deflection, sway and twist. Ensure provisions for expansion, contraction and building movements prevent damages from occurring to and within components, Products and assemblies.

49.3 Make adequate allowance at wall and partition heads for deflection of the structure above. Determine requirements from Consultant where additional information is required. Where partitions butt to underside of floor assembly, or structural framing, the clearance shall be based on the span of the members supporting the floor or structural framing. In making such allowance use methods which maintain the integrity of the wall or partition as a sound, and/or fire barrier.

49.4 Make provisions in pipes, plenums, ducts and vessels containing air and fluids as is necessary to prevent damage due to fluid and air induced pressure, surges and vibrations, to pipes, plenums, ducts and vessels and to adjacent components, assemblies and construction to which pipes, ducts, plenums and vessels are attached or pass through.

50 DIELECTRIC SEPARATION

50.1 Ensure that a dielectric separator is provided in a permanent manner over entire contact surfaces to prevent electrolytic action (galvanic corrosion) between dissimilar materials. Similarly, prevent corrosion to aluminum in contact with alkaline materials such as contained in cementitious materials.

51 PRODUCTS AT SOUND ATTENUATING PARTITIONS

51.1 Avoid sound transfer at sound attenuating partitions by careful location and treatment of mechanical and electrical equipments, ducts, grilles, diffusers, electrical outlets and boxes, and similar items. Where electrical boxes are back-to-back, serving each side, locate them at least 250 mm apart laterally and, if interconnected, use flexible connections.

52 FASTENINGS

52.1 Include in the work of each section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work or other sections, deliver and locate devices in ample time for installation.

52.2 Do not install fibre, plastic or wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on drawings.

52.3 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, construction, components and equipment under static conditions, and to resist building thermal movement, creep and vibration.

52.4 Provide metal fastenings and accessories in same material, texture, colour, sheen and finish as metal on which they occur, unless indicated otherwise.

52.5 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.

52.6 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, and where attached to, or contained within, exterior walls and slabs, unless stainless steel or other material is specified. Leave steel anchors bare where cast in concrete.

52.7 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

52.8 Conceal fasteners where indicated. Keep exposed fastenings to a minimum, space evenly and in an organized symmetrical pattern.

52.9 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

52.10 Bolts shall not project more than one diameter beyond nuts.

52.11 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

53 ADJUSTING

53.1 Ensure that all components of assemblies fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.

53.2 Verify that work functions properly and adjust it accordingly to ensure satisfactory operation. Lubricate Products as recommended by manufacturer.

54 DEMONSTRATION AND INSPECTION OF PRODUCTS AND SYSTEMS

54.1 Arrange for a demonstration of equipment, systems and operating Products upon the 100% completion of their installation, testing, adjusting and balancing has been performed, equipment and systems are fully operational, completed operation and maintenance manual is available, and prior to application for Ready-for-Takeover.

54.2 Include in the arrangements for the attendance of the Consultant, Owner, jurisdictional authorities, and personnel assigned by the Owner for the operation of the systems and/or Products.

54.3 Demonstrations shall be conducted by the Subcontractor responsible for the installation of the systems and/or Product, assisted by representatives of the manufacturer or supplier. All personnel conducting the demonstration shall be completely knowledgeable of all conditions of the operating, functioning and maintenance of the systems and/or Products.

54.4 Owner's representative will acknowledge the successful completion of each demonstration on a form provided by the Contractor. The form shall be agreed to by the Owner, Consultant and Contractor prior to demonstration and testing.

54.5 Submit copies of letters from manufacturers of Systems and/or Products before making application for Ready-for-Takeover to verify that the Products have been installed and connected correctly, and that they are operating in a satisfactory manner. The certification shall be based upon inspection and testing of the Products by competent technical personnel. Include in letter of certification the names of personnel conducting the testing and inspection, the methods of inspection utilized, and the location in the building of the Products certified.

54.6 Following submission of letters of certification and their acceptance by the Owner, the Owner shall have the right to use the Products on a trial basis and for instructing their personnel in its use.

55 FINAL INSPECTIONS AND CLOSE OUT

55.1 Submit proposed closeout procedures and schedule of inspection to Consultant for approval before final demonstrations and inspections commence.

55.2 Arrange for, conduct and document final demonstrations, inspections, close-out and take-over at completion of the Work in accordance with procedures described in OAA/OGCA TAKE-OVER PROCEDURES, OAA/OGCA Document No. 100. Where "Architect" is referred to in Document No. 100 it shall mean Consultant.

55.3 Certificate of Compliance:

.1 Submit Certificates of Compliance, prior to the application for Ready-for-Takeover for each of the following items.

.1 An affidavit relative to the use of lead-free solder for all domestic water lines, regardless of location.

.2 Products for which Safety Data Sheets have been submitted and accepted.

.3 Other Work/Products identified in the Contract Documents as requiring a Certificate of Compliance.

.2 Each Certificate of Compliance shall indicate names and addresses of the project, the Owner, the date of issue, product description including name, number, manufacturer, with a statement verifying that the Work/Product installed meets specified requirements and, if applicable, complies with the submitted and accepted Safety Data Sheets.

.3 Each Certificate of compliance shall be issued on the subcontractor's letterhead, properly executed, under whose work the prospective Work/Product has been provided.

.4 Each Certificate of Compliance shall be endorsed by the Contractor with his authorized stamp/signature. Ensure that submissions are made to allow sufficient time for review without delaying progress of scheduled completion.

55.4 Ready-for-Takeover:

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

.2 Inspection and Review before Ready-for-Takeover:

.1 Contractor's Inspection: Before applying for the Consultant's review to establish Ready-for-Takeover of the Work:

.1 Ensure that the specified prerequisites to Ready-for-Takeover of the Work are completed.

.2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.

.3 Prepare a comprehensive and detailed list of items to be completed or corrected.

.4 Provide an anticipated schedule and costs for items to be completed or corrected.

.2 Consultant's Review: Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Consultant and the Contractor shall arrange a mutually satisfactory agreed date and time to jointly review the Work. The Consultant will advise the Contractor whether or not the Work is Ready-for-Takeover and will add additional items, if any, to the Contractor's list of items to be completed or corrected. Provide the Consultant with a copy of the revised list.

.3 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The Contractor's inspection and Consultant's review procedures specified above shall be repeated until the Work is Ready-for-Takeover and no items remain on the Contractor's list of items to be completed or corrected.

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

55.5 Prerequisites to Final Payment:

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

55.6 Substantial Performance of the Work:

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

56 CLEANING AND WASTE MANAGEMENT

56.1 Comply with applicable regulatory requirements when disposing of waste materials.

56.2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

56.3 Progress Cleaning and Waste Management:

.1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.

.2 Ensure that only cleaning materials are used which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.

.3 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.

.4 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.

.5 Maintain building work areas "broom clean" at least on a daily basis, but shall also be done immediately before finishing work.

.6 Remove from finish work, spatters, droppings, soil, labels, and debris, before they set up.

.7 No waste material may be burned or buried at site. Remove as often as required to avoid accumulation, no less than, at the end of each working day.

.8 Remove packaging materials and debris from the site immediately after product and equipment is unwrapped or uncrated.

.9 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers, in open drain courses, or anywhere on site.

.10 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water. Provide containers in which to collect waste material and debris. Dispose of hazardous products in accordance with requirements of jurisdictional authorities.

.11 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.

.12 Ensure that cleaning operations are scheduled to avoid deposits, of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.

.13 Provide instructions for final cleaning of finishing work, and for inclusion in Maintenance and Operating Manuals.

56.4 Final Cleaning:

.1 In addition to requirements for progress cleaning, Work shall include final cleaning by professional cleaning specialists on completion of construction.

.2 Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that Owner, Consultant, Contractor and cleaning company are in attendance.

.3 Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, and Construction Equipment not required to perform any remaining work.

.4 Before final inspection, replace glass and mirrors broken, damaged, and etched during construction, or which are otherwise defective.

.5 Remove waste material and debris from crawlspaces and other accessible concealed spaces.

.6 Remove temporary protections and make good defects before commencement of final cleaning.

.7 Final cleaning shall remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building for all new work throughout new and existing Building. Work shall be done in accordance with manufacturer's instructions for each material. This work shall include:

.1 Washing of exterior paved surfaces, and of interior stone, brick, and concrete floors.
.2 Remove stains, spots, marks, and dirt from exterior facades.
.3 Clean exterior and interior window glass and frames.
.4 Cleaning and polishing of glass, mirrors, porcelain, enamel and finish metals.

.5 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.

.6 Vacuum cleaning of ceilings, walls and floors, and behind grilles, louvres and screens.

.7 Cleaning of resilient flooring.

.8 Washing clean of glazed wall surfaces.

.9 Cleaning of hardware, mechanical fixtures, plumbing fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components. Replace filters for mechanical equipment if equipment is used during construction.

.10 Cleaning of windows, entrances and skylights, both interior and exterior surfaces.

.8 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.

.9 Re-clean as necessary areas that have been accessed by Contractor's workers prior to Owner occupancy.

56.5 Waste Audit, Management and Disposal:

.1 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.

.2 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.

.3 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.

.4 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.

.5 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.

.6 Cover or wet down dry waste materials to prevent blowing dust and debris.

57 PROJECT RECORD DRAWINGS

57.1 Transfer all information marked up on the as-built drawings during the progress of the Work to a master set of record drawing files provided by Consultant, in electronic format agreed to with Owner.

57.2 Mark revised drawings as "RECORD DRAWINGS".

57.3 Submit completed record drawings in electronic form to Owner.

57.4 FINAL SURVEY – Submit final site survey certificate certifying that elevations and location of completed Work are in conformance, or con-conformance with Contract Documents. Inaccurate or neglectful information shall become a liability of the Contractor.

58 OPERATION AND MAINTENANCE MANUALS

58.1 Hand over to the Consultant, in format acceptable to Owner, two (2) copies of a comprehensive operations and maintenance manual and material suitable for a training course for the Owner's maintenance employees. Manuals shall cover all Products supplied and installed under the Contract.

58.2 Submit draft of the operation and maintenance manuals for the Consultant's review at least 15 days before testing systems and equipment. Incorporate alterations and additions, as found to be necessary during testing, and prepare the final version of the manual from the corrected draft.

58.3 Submit final version of operation and maintenance manuals prior to Ready-for-Takeover.

58.4 Testing of systems and equipment will not be deemed to be complete until the requisite number of copies of the final version of the manuals has been handed over to the Consultant.

58.5 If standard literature is incorporated into the operations and maintenance manual, any irrelevant information shall be deleted, or suitably noted.

58.6 The manuals shall have sufficient detail in order that the Owner can totally maintain the equipment without outside help.

58.7 Submit all material in English.

END OF SECTION

Part 1 GEOTECHNICAL INFORMATION

1.1 A copy of the following detailed geotechnical information is appended to this Document:

.1 Report on Geotechnical Investigation.
Proposed Residential Subdivision
Lots 1 & 2, Concession 3
Minden Hills, Ontario
Prepared by: GHD Limited
Project No. 11205754 (01)
Dated: February 7, 2020

1.2 This geotechnical information records properties of subsurface conditions and recommendations for the design of foundations, pavements and soil remediation as outlined in the information provided.

1.3 The geotechnical information by its nature, cannot reveal all conditions that exist or can occur on the Site. Should subsurface conditions be found to vary substantially from the report, immediately notify Consultant in writing and await instructions.

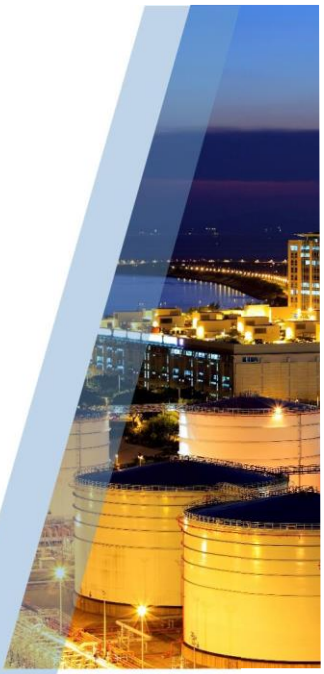
1.4 Contractor shall not be entitled to extra payment or extension of Contract Time for work which is required and which is reasonably inferable in the geotechnical information as being necessary.

1.5 In case of discrepancies between recommendations contained in geotechnical information and requirements of Contract Documents, the latter shall govern. Advise Consultant in writing of any discrepancies discovered.

END OF DOCUMENT

Geotechnical Investigation Report

Proposed Residential Subdivision
Lots 1 & 2, Concession 3
Minden Hills, Ontario



Report for
F.W. Gwillim & Associates Ltd.

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Enclosure

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1. Introduction

This report presents the results of a Geotechnical Investigation conducted in support of the proposed residential development to be located at Part of Lots 1 and 2, Concession 3, Minden Hill, Ontario (the Site). GHD Limited (GHD) was retained by F.W. Gwillim & Associates Ltd. (the Client) being represented by Tim Welch Consulting Inc. to complete this geotechnical investigation. The work conducted for this investigation was carried out in accordance with our proposal PG-4561 dated July 17, 2019.

Based on information provided by the Client, it is GHD's understanding that the proposed development will consist of thirty-two (32) 1 to 2-storey semi-detached residential buildings, with or without basements, associated servicing and asphalt paved access roadway. The proposed final grades and utility invert depths were not available to GHD a the time of writing this report.

2. Purpose and Scope

The purpose of this geotechnical investigation is to explore the subsurface soil and groundwater conditions at the project site, and to develop preliminary geotechnical recommendations regarding earthwork construction, reuse of existing soils and backfill material, foundation and slab-on-grade design, service installation and pavement design. In addition, a Long Term Stable Top of Slope (LTSTOS) assessment was conducted in order to locate a safe setback from the existing site slope.

The following scope of work was performed in order to accomplish the foregoing purposes:

1. A site-specific health and safety plan was prepared.
2. Underground services were cleared prior to advancing the boreholes. The boreholes were located as shown on the Test Hole Location Plan (Figure 1).
3. The subsurface conditions were explored by advancing, sampling and logging four (4) boreholes to a depth ranging from 6.7 to 10.0 metres (m) within the proposed development area and five (5) shallow hand dug test holes to depths ranging from 0.4 to 0.8 m at the bottom of the slope to confirm soils conditions for slope analysis.
4. Monitoring wells were installed in three (3) borehole location to facilitate groundwater level measurements. Groundwater level was obtained from these monitoring wells on January 15, 2020.
5. The ground at the borehole locations was reinstated as close as possible to its original condition upon completion of the fieldwork.
6. Physical laboratory analysis of the encountered material was carried out including grain size analysis and moisture content tests.
7. Two (2) soil samples were submitted for chemical testing for volatile organic compounds (VOCs), petroleum hydrocarbons (PHCs, F1 to F4), a suite of metals and inorganics.

8. A visual assessment of the slope was conducted and a summary rating of the slope's stability was prepared in accordance with Table 4.2 of the Ontario Ministry of Natural Resources document entitled "Technical Guide – River & Stream Systems: Erosion Hazard Limit" (2002) (hereafter referred to as the Guide).

9. Geotechnical engineering analysis of acquired field and laboratory data have been compiled in this report outlining our findings, conclusions, and preliminary geotechnical engineering recommendations.

3. Field and Laboratory Procedures

A field investigation was conducted under the supervision of GHD staff on December 20, 2020 and January 8, 2020. The work consisted of subsurface exploration by means of advancing and sampling a four (4) boreholes to a depth ranging from of 6.7 to 10.0 m below ground surface and five (5) shallow hand dug test holes were advanced to depths ranging from 0.4 to 0.8 m. The location of each test hole is shown on the attached Test Hole Location Plan (Figure 1).

A detailed log of each borehole was maintained and representative samples of the materials encountered were collected. A detailed log of each borehole is presented in Appendix A.

The boreholes were advanced using a track mounted drill rig equipped with continuous flight, solid stem power augers. Representative, disturbed samples of the strata penetrated were obtained using a split-barrel, 50 mm outer-diameter (OD) sampler advanced by a 63.5 kg hammer dropping approximately 760 mm. The results of these standard penetration tests (SPT's) are reported as "N" values on the borehole logs at the corresponding depths.

Soil samples obtained from the boreholes were inspected in the field immediately upon retrieval for type, texture, and colour. All samples were sealed in clean plastic containers and transported to the GHD laboratory for further visual-tactile examination, and to select samples for laboratory analysis.

Groundwater measurements and observations were obtained from the open boreholes during drilling operations. A groundwater monitoring well was installed in three (3) borehole to a depths ranging from 6.1 to 9.1 m. The wells were installed with sand pack around the screened interval, and bentonite sealant above the screened interval. The monitoring wells were recorded and registered as wells with the Ministry of Environment, Conservation and Parks (MECP), and remains in place as of writing this report. Groundwater level measurement were obtained from the monitoring wells on January 15, 2020. Groundwater data is presented on individual Borehole logs.

Upon completion, the boreholes were backfilled with a mixture of auger cuttings and bentonite pellets and sealed at the top with compacted auger cuttings.

Physical laboratory testing was completed on representative soil samples, and consisted of moisture content tests on all samples recovered, gradation analyses on five (5) representative soil samples, including 3 hydrometers. The analytical results of the moisture content tests are plotted on the attached logs. The results of the gradation test are incorporated into the borehole logs, and are presented graphically in Appendix B.

Two (2) soil samples were submitted to Caduceon Environmental Laboratories (CEL) for chemical testing of O.Reg. 153 parameters of VOCs, PHCs (F1 to F4 fractions), a suite of metals and inorganics. CEL's Certificates of Analysis for the testing are included in Appendix C.

A GHD geotechnical engineer visited the Site and visually inspected the slope conditions running along the east side of Gull River on January 15, 2020. GHD conducted Slope Stability Ratings for two locations along the length of the slope indicated by cross-sections A-A' and B-B' shown on Figure 2, in accordance with the requirements of the Guide. The ratings for each of these cross sections are attached in Appendix D.

Ground surface elevations at the borehole locations were interpolated from the topographic plan prepared by Dearden and Stanton Ltd, Drawing No. E-3170, dated December 18, 2018. These interpolated elevations are for analytical purposes only, and must be verified prior to finalizing any design or contract parameters upon which they are based.

4. Site Location and Surface Conditions

The Site is located along the western side of Highway 35, in the municipality of Minden Hill, Ontario. The site is bordered to the west by Gull River and to the north and south by residential/commercial properties, respectively. Drainage is towards Gull River. At the time of the investigation, the Site was mostly wooded, with a well-established ground covering of vegetation.

5. Subsurface Conditions

Details of the subsurface conditions encountered at the Site are graphically presented on the test hole logs (Appendix A). It should be noted that the boundaries between the strata have been inferred from the test hole observations and non-continuous samples. They generally represent a transition from one soil type to another, and should not be inferred to represent an exact plane of geological change. Further, conditions may vary between and beyond the boreholes.

The boreholes generally encountered a surficial layer of topsoil over silty sand/sandy silt soils. Groundwater seepage was observed in three (3) of the boreholes during drilling operations at depths ranging from 4.6 to 9.1 m (approximately 270 to 271 masl). Groundwater measurements obtained on January 15, 2020 form the monitoring well installed in borehole BH-4 yielded water level of 3.7 m (271.1 masl). Monitoring wells installed in boreholes BH-1 and BH-2 were measure to be dry on January 15, 2020.

The following sections describe the major soil strata and subsurface conditions encountered during this investigation in more detail.

5.1 Topsoil

A layer of surficial topsoil was encountered in all boreholes. This topsoil layer ranged from approximately 150 to 300 mm in thickness. 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, for the purposes of this investigation.

5.2 Silty Sand/Sandy Silt

Brown silty sand/sandy silt was encountered beneath the topsoil in all boreholes, and extended to the full depth of the investigation. The soil was observed to be in a moist in-situ state transitioning to wet at depths below the Gull river elevation. A layer of sand was observed within the silty sand/sandy silt layer in borehole BH-1 starting at 2.4 m and extending to 4.6m. N-values collected from within the soils ranged from 3 to 19 blows/300 mm, indicating a very loose to compact in-situ state of relative density.

Moisture content tests conducted on samples of these soils yielded values ranging from 5 to 24 % moisture by weight. Grain size distribution analysis conducted on representative samples of the silty sand/sandy silt suggests the following compositional ranges: 0 % gravel, 15 to 83 % sand, and 17 to 85 % silt and clay-sized particles. Hydrometer analyses conducted on these samples suggest the silty sand/sandy silt contains 15 to 69 % particles between 5 and 75 μm in size. A grain size distribution analysis conducted on a representative samples of the sand suggests the following composition: 2 % gravel, 93 % sand, and 5 % silt and clay-sized particles.

5.3 Groundwater

Groundwater observations and measurements were obtained from the open boreholes upon completion. . Groundwater seepage was observed in three (3) of the boreholes during drilling operations at depths ranging from 4.6 to 9.1 m (approximately 270 to 271 masl). Groundwater measurements obtained on January 15, 2020 form the monitoring well installed in borehole BH-4 yielded water level of 3.7 m (271.1 masl). Monitoring wells installed in boreholes BH-1 and BH-2 were measure to be dry on January 15, 2020.

It must be noted that groundwater levels are transient and tend to fluctuate with the seasons, periods of precipitation, and temperature.

5.4 Chemical Analysis

Two (2) soil samples were submitted to CEL for chemical testing of O.Reg. 153 parameters of VOCs, PHCs (F1 to F4), a suite of metals and inorganics for the purpose of soil management, i.e. assessing the handling and disposal options available for excess soils generated during construction. The chemical results generally characterize the soils. However, 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.

CEL's Certificates of Analysis for the testing are included in Appendix C and are compared to MECP Table 2 Full Depth Generic Site Condition Standards in a Potable Groundwater Condition, coarse textured soil ("Soil, Groundwater and Sediment Standards for use Under Part XV.1 of the Environmental Protection Act", April 15, 2011), Agricultural (Ag), Institutional / Commercial / Community (ICC) and Residential / Parkland / Institutional (RPI) Property Use. All samples met table 2 and table 1 Ag, RPI and ICC criteria.

6. Discussion and Recommendations

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the site and assume that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the assessment, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like. Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor.

The boreholes generally encountered a surficial layer of topsoil over silty sand/sandy silt soils. Groundwater seepage was observed in three (3) of the boreholes during drilling operations at depths ranging from 4.6 to 9.1 m (approximately 270 to 271 masl). Groundwater measurements obtained on January 15, 2020 form the monitoring well installed in borehole BH-4 yielded water level of 3.7 m (271.1 masl). Monitoring wells installed in boreholes BH-1 and BH-2 were measure to be dry on January 15, 2020.

Details regarding our conclusions and recommendations are outlined in the following sections.

6.1 Site Preparation, Excavation, Dewatering and Backfill

Any and all topsoil, vegetation, fill, organic and organic-bearing material is to be stripped and removed from the proposed building envelope areas (including floor slab areas) and proposed asphalt paved areas prior to commencing earthwork construction. The subexcavated surface must be proof rolled and/or approved by a member of GHD prior to placement of fill or foundations.

Excavations must be carried out to conform to the manner specified in Ontario Regulation 213/91 and the Occupational Health and Safety Act and Regulations for Construction Projects (OHSA). All excavations above the water table not exceeding 1.2 m in depth may be constructed with unsupported slopes. The soils encountered above the groundwater during the investigation are classed by OHSA as Type 3 soil, requiring unsupported walls of excavations to be sloped to the bottom of the excavation with a gradient of 1 horizontal to 1 vertical (1H: 1V) or flatter. The Site soils encountered below the groundwater table are classed by OHSA as Type 4 soil, requiring unsupported wall of excavations to be slope to the bottom of the excavation with a gradient of 3H:1V or flatter or otherwise appropriately shored.

Based on the groundwater conditions observed, and the anticipated excavation depths for the proposed development, significant groundwater infiltration into open excavations is not expected. Groundwater or surficial water infiltration into open excavations above the groundwater table is expected to be controlled by pumping from sump(s) to an acceptable outlet. Should more significant groundwater infiltration be encountered, the use of filtered pumps, sheet piling, or other forms of groundwater control may be required.

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. 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.

Some excavated inorganic soils such as the sand or silty sand soils may be suitable for use as service trench or pavement subgrade backfill. The reuse of all existing excavated soils is conditional on it being workable, at a suitable moisture content, and receiving final review and approval for such reuse at the time of construction. Some soils will require prior processing (such as aeration) to lower their moisture content before being considered for approval as backfill material.

6.2 Excess Soil Generated During Construction – Handling Options

The results of chemical testing performed on soil samples as part of this investigation are presented on Appendix C. The samples tested met the MECP criteria for Table 1 land use. Based on the chemical test results, the following handling options are recommended for excess soils excavated at this site during the proposed construction for this project:

1. Remain on-site (i.e.: appropriately reused as trench or subgrade backfill), under the guidance of a Qualified Person (QP) as defined by the MECP. Note that additional chemical testing is recommended during the proposed works for quality control purposes;

2. Moved to a Table 1, Table 2 or 3 RPI and ICC property under the guidance of a QP as defined by the MECP; or

3. Disposed of at a waste disposal landfill appropriately certified by the MECP. This option would require further chemical testing to ensure compliance with the landfill's C of A.

GHD notes that the chemical results generally characterize the soils. However, 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.

6.3 Service Installation

The materials encountered during this investigation at typical service invert elevations (2 to 3 m) generally consist of silty sand/sandy silt soils. As such, normal compacted bedding material, placed in the Class “B” or Class “C” arrangement, is recommended for all underground services. The recommended bedding material is Granular “A” or 19 mm crusher run (angular) limestone, as per Ontario Provincial Standard Specifications (OPSS). The minimum recommended bedding thickness for the underground services is 150 mm. If any bedding subgrade consists of unsuitable or otherwise incompetent soils (such as the very loose native soils encountered at variable depths witin our boreholes), either subexcavate to competent soils, and/or thicken the bedding material to 300mm. All bedding, surround, and cover materials should be compacted to at least 100 % of its Standard Proctor Maximum Dry Density (SPMDD).

It is recommended that cover backfilling of the underground services be accomplished using Granular “A”, sand, or other suitable material as allowed by the Municipality’s standards, to a minimum of 300 mm above the pipe. Compaction of this material should attain 100 % SPMDD. It is expected that the excavated, inorganic materials may be suitable for reuse as trench backfill, conditional upon suitable moisture content (within 2 % of optimum) and final review and approval by an experienced geotechnical engineer at the time of construction. It should be noted that the native soils would likely require some form of processing including aeration to lower the moisture content to make it workable and able to be appropriately compacted.

6.4 Asphalt Paved Access Roadway

Based on the results of this investigation, we would recommend the following procedures be implemented to prepare the proposed new asphalt paved access roadways for construction:

1. Remove any organic topsoil, fill, vegetation and/or organic-bearing materials, frozen earth, and boulders larger than 150 mm in diameter encountered at subgrade elevation for the full width of construction.
2. Proof roll the subgrade for the purpose of detecting possible zones of overly wet or loose subgrade. Any deleterious areas thus delineated should be replaced with approved earth fill or granular material compacted to a minimum of 98 % of its SPMDD. Approved excavated till can be reused as road subgrade backfill provided the soil is workable and at a moisture content that will permit adequate compaction. A final review and approval to reuse any soils must be made during construction.
3. If further stabilization of the pavement subgrade is deemed necessary, place woven geotextile such as Terrafix 200W or Mirafi HP270 on the exposed pavement subgrade surface, after its approval and prior to placement of any subsequent fill.

4. 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.

5. 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.

6. Construct transitions between varying depths of granular subbase materials at a rate of 1:25 minimum.

The subgrade materials in the proposed pavement areas will consist of silty sand/sandy silt native soils. The frost susceptibility of these soils is assessed as being generally moderate to high. In this regard, the following minimum flexible pavement structures are recommended for the construction of the new access roadway areas.

Table 6.1 Recommended Material Thickness For Pavement Structure

Profile	Material	Thickness (mm)		In Conformance with OPSS
		Light Duty	Heavy Duty	
Asphalt Surface	H.L.3	40	40	1150
Asphalt Base	H.L.8	50	50	
Granular Base	Granular “A”	150	150	1010
Granular Subbase	Granular “B”	300	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% of their respective SPMDD’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% 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% of their optimum moisture content. All granular materials should be compacted to 100% SPMDD. 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 unfavorable weather.

6.5 Foundation Design

It is recommended that structural loading for the new proposed residential buildings be supported on spread and continuous strip footings for column and load bearing walls, respectively. The footings should be founded on competent approved native soils or on engineered fill placed directly on such soils. The following table summarizes the minimum depths at which such suitably competent soils were first encountered in boreholes BH-1 through BH-4.

Table 6.2 Depth to Competent Native Soil

Test Hole	Minimum Depth (m)
BH-1	4.6
BH-2	4.6
BH-3	0.8
BH-4	0.8

For design purposes, and based on one- to two-storey residential houses, it is generally recommended that footings constructed on the competent native soils or engineered fill be proportioned using the following bearing capacities:

Table 6.3 Bearing Pressures for Footing Design

Parameter	Bearing Pressure			
	Approved Undisturbed Native Soils	Engineered Fill		
		Rock-based Fill (2)	Granular Fill (3)	Earth Borrow Fill (3)
Factored Bearing Capacity at ULS (1)	130 kPa	255 kPa	205 kPa	155 kPa
Bearing Capacity at SLS	75 kPa	150 kPa	120 kPa	90 kPa

Notes:

(1) Resistance factor Φ = 0.5 applied to the ULS bearing pressure for design purposes.
(2) At least 1m of Rock-based Fill, or at least 0.3m of Granular or Earth Borrow fill. Quality of material is to be approved prior to use as engineered fill.

It is noted that a pockets of very loose native soils were observed in borehole, BH-4 below the proposed FFE depth. If such loose soils are encountered at the foundation subgrade level, they must be subexcavated and replaced with engineered fill.

Foundation components must be suitably reinforced; as a minimum, and where not already specified in the structural design drawings, this reinforcing should use a continuous run of two 15 M rebar throughout the strip footings, and two continuous runs of two 15 M rebar throughout the foundation walls, with one run of two bars near the top, and one run of two bars near the bottom of the foundation walls.

Any engineered fill upon which footings are placed must be a minimum thickness corresponding to the notes that accompany the Table 6.3. Rock-based fill that is overly free of fines and therefore contains excessive voids (eg: clean crushed clear stone), must be completely encapsulated with suitable non-woven geotextile to minimize any migration of fine-grained particles from surrounding soils into the voids within the rock fill.

The following is recommended for the construction of any engineered fill for the footings:

1. Remove any and all existing vegetation, topsoil, fill, organics, and organic-bearing soils and any overly loose or soft native soils to the competent, undisturbed native soil from within the area of the proposed engineered fill.
2. The area of the engineered fill should extend horizontally 1 m beyond the outside edge of the proposed building foundations and then extend downward at a 1:1 slope to the competent native soil.
3. The base of the engineered fill area must be approved by a member of GHD prior to placement of any fill, to ensure that all unsuitable materials have been removed, that the materials encountered are similar to those observed, and that the subgrade is suitable for the engineered fill.
4. All engineered fill material is to be approved by GHD at the time of construction.
5. Place approved engineered fill, in maximum 300 mm lifts, compacted to 100% of its SPMDD. Any fill material placed under sufficiently wet conditions should consist of an approved, rock-based fill; with the inclusion of appropriate geotextile fabric around the rock-based fill should the rock fill contain enough voids to warrant.
6. Full time testing and inspection of the engineered fill will be required, to ensure compliance with material and compaction specifications.

All exterior footings or footings in unheated areas, should be founded at least 1.4 m below the final adjacent grade for frost protection, or be treated with an equivalent frost protection (such as suitable insulation). Footings and walls exposed to frost action should be backfilled with non-frost susceptible granular material.

Under no circumstances should the foundations be placed above organic materials, loose, frozen subgrade, construction debris, or within ponded water. Prior to forming, all foundation excavations must be inspected and approved by a member of GHD. This will ensure that the soils exposed are similar and consistent with those encountered during this investigation, and that the exposed material has been prepared properly at the foundation subgrade level.

Should basement or otherwise subgrade areas be incorporated into any of the buildings' designs, it is recommended that for drainage purposes, perimeter drains be installed about the structure. The subdrains would serve to drain seepage water that infiltrates the backfill, intersect the groundwater, 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 clear, crushed stone and suitable filter protection. The drain should discharge to a positive sump or other permanent frost free outlet. It is also strongly recommended that the building's foundation walls be sealed and waterproofed.

For design purposes this site is classed as Site Class E for Seismic Site Response, in accordance with the Ontario Building Code (OBC).

For foundations constructed in accordance with the procedures and recommendations given above, total and differential settlements are estimated to be less than 25 mm.

6.6 Slab on Grade

Floors may generally be constructed as normal slabs-on-grade, on granular or 19 mm clear stone over native, inorganic subsoils. The floor slab should be formed over a base course consisting of at least 150 mm of Granular "A" backfill as per OPSS or (19 mm clear stone beneath basement areas) compacted to a minimum of 100 percent of its SPMDD. All grade increases or infilling below the granular "A" or clearstone should be constructed in accordance with the engineered fill steps provided in Section 6.5 of this report. If the groundwater table is intersected by any basement excavations, the floor slabs should incorporate under slab drains, and a vapour barrier should be installed beneath the slab to prevent migration of moisture vapour. All fill placed as engineered fill must be inspected, approved and compaction verified by personnel from GHD.

6.7 Basement and Retaining Walls

It is recommended that free draining backfill to basement and retaining walls be provided. Walls located above the groundwater table may be designed for lateral earth pressures using the following equation:

p = k (w h + q), where:

- p = the lateral earth pressure in kPa acting on the subsurface wall at depth h;
- ka= the coefficient of active earth pressure;
  (= 0.3 for walls restrained from the bottom only);
  (= 0.5 for walls restrained at the top and bottom*);
- kp= the coefficient of passive earth pressure, (= 3.0);
- w= the granular or native soil bulk density in kN/m3;
  (= 21.0 kN/m3 for well compacted, OPSS-approved Granular "B" or native soils);
- h = the depth (in metres) below the exterior grade at which the earth pressure is being calculated; and
- q = the equivalent value of any surcharge (in kN/m3) acting on the ground surface adjacent to the walls.

(*) This value is recommended for rigid walls retaining compacted backfill.

The recommended value for the coefficient for sliding friction between the soil and the concrete is 0.4. In addition to the above, hydrostatic forces must be taken into account in the design where the walls extend below the groundwater table. Also, any additional surcharge loading that will influence the wall must be taken into account in its design.

6.8 Long Terms Stable Top of Slope Assessment

6.8.1 Setback Evaluation

A GHD geotechnical engineer visited the Site and visually inspected the slope conditions running along the western side of Gull River on January 15, 2020.

The slope inspections suggest the water channel is more than 15m distance from the slope at section A-A' and less than 15m distance from the slope toe at section B-B' (see figure 2 illustrating cross-section locations). The flood plain between the channel and the slope, and the slope itself, are generally forested with mature trees and bushes.

The slope crest and face are typically covered by mature trees. No slope face erosion, erosion gullies or signs of seepage were observed at any location on the slope face east of Gull River. No signs of slope instability were observed during the Site visit, such as bulging, sloughing or tension cracks.

The slope inclinations were visually assessed during the slope inspections, and verified using the topographic information provided by the Client. These inclinations were assessed as follows at the approximate locations of cross-sections A-A' and B-B' on Figure 2.

- Section A-A': 29 degrees (1.8H:1V)
- Section B-B': 18 degrees (3H:1V)

See Section 5 of this report for a detailed description of the soil and groundwater conditions encountered. The groundwater table was encountered at elevation of approximately 271 masl, approximately matching the water level at Gull River. There was no observed seepage from the slope face.

Based on the results of the Site inspection, and geological conditions encountered during GHD's geotechnical investigation of the Site, GHD conducted Slope Stability Ratings for two locations along the length of the slope indicated by cross-sections A-A' and B-B' shown on Figure 2, in accordance with the requirements of the Guide. The ratings for each of these cross sections are attached in Appendix D. A review of the Slope Stability Ratings shows that for cross-sections A-A' and B-B', obtained rating values of 34 and 28 respectively. According to the MNR Guidelines, a slope with a rating of less than 24 has a low instability potential, and no further study is required. For a slope with a rating ranging from 25 to 35, the potential for instability is considered 'slight', requiring a topographic survey to confirm the field measurements and preliminary slope stability study using the geologically inferred subsurface soil and/or bedrock conditions. For a slope with a rating value higher than 35, the MNR Guidelines require intrusive subsurface investigations in addition to the topographic survey and slope stability evaluations.

As presented above, the slope at cross-sections A-A' and B-B' received a rating between 25 and 35, and therefore has a slight instability potential requiring a preliminary slope stability study using the geologically inferred subsurface soil conditions. A full intrusive investigation however was carried out as part of the geotechnical investigation and the information obtained will be used to complete the slope assessment to provide the stable top of slope line location for future development.

6.8.2 Toe Erosion Allowance

The erosion allowance was determined in accordance with the MNR Guidelines, applicable if the channel is within 15 m of a slope toe (cross-section B-B'), which are reproduced below.

Type of Material Native Soil Structure	Evidence of active erosion or where the bankfull velocity is greater than competent flow velocity	No Evidence of Active Erosion Bankfull Width		
		< 5 m	5 – 30 m	>30 m
Hard Rock (e.g. granite)	0 – 2 m	0 m	0 m	1 m
Soft rock (shale, limestone), cobbles, boulders	2 – 5 m	0 m	1 m	2 m
Clays, clay-silt, gravels	5 – 8 m	1 m	2 m	4 m
Sand, silt and Fill	8 – 15 m	1 – 2 m	5 m	7 m

The slope is comprised of silty sand/sandy silt soils, and no evidence of active erosion was observed during the Site visit. Based on the topographic survey and other available information, the bankfull width is 5 to 30 m. Using this data, the toe erosion allowance is set at 5 m (from the above table).

6.8.3 Stable Top of Slope Evaluation

In order to determine the global stability of the slope at the two cross-sections, global stability analyses were carried out. Global stability refers to the potential of a slope to undergo a relatively deep seated circular failure. The subsurface stratigraphy was selected using the GHD borehole logs and the published geology.

The static slope stability analyses were performed using the Morgenstern & Price Method using the module Slope/W of the computer software Geo-Studio, developed and distributed by Geo Slope International Ltd.

The properties required for the stability analyses of the slopes are the bulk densities and shear strength parameters of the materials identified at the Site. The subsurface soils encountered in the boreholes are generally comprised of silty sand and sandy silt soils. Based on the Standard Penetration Test (SPT) blow counts recorded as 'N' values on the GHD borehole logs, the soil ranged from loose to compact in-situ state of relative density.

The material parameters assigned to the soil layer in the slope stability analyses are provided on the slope stability analysis Figures 3 and 4. The selected parameters are considered conservative while realistic based on the field and laboratory testing performed on representative samples of the soils, as well as published technical literature and our experience with similar materials.

Piezometric surfaces can affect the results of the slope stability analyses if they pass through the soil mass above the critical slip circle/plane. Using the groundwater observations obtained from the open boreholes, in conjunction with the data obtained from the groundwater monitoring well installed in boreholes BH-1, BH-2 and BH-4, the groundwater was assumed to follow a straight line path from the depth at which it was measure in borehole boreholes and the water level of Gull River.

A factor of safety (FS) in slope stability analysis can be defined as the ratio of the available shear strength to that of the applied stresses along a potential failure plane. A factor of safety of 1.0 or greater indicates stable conditions and a value of less than 1.0 represents unstable conditions. Typically, a target factor of safety between 1.3 and 1.5 is considered reasonable for natural slopes, under static conditions. For the purposes of this study a minimum factor of safety of 1.5 was targeted.

The graphical outputs of the slope stability analyses are provided on Figures 3 and 4. The following summarizes the minimum factor of safety (FS) obtained for each modelled cross section:

- Section A-A': FS=1.9
- Section B-B': FS=2.5

Cross-sections A-A' and B-B' obtained a factors of safety of 1.9 and 2.5 respectively, which exceeds the minimum targeted factor of safety of 1.5.

Based on the analytical results of the cross sections, it is concluded that the existing slopes can be considered stable. For planning purposes, the line identified in Figure 2 as the "LTSTOS" illustrates the location of this development setback provided an additional 6m access allowance is not required (see below).

6.8.4 Erosion Access Allowance

Based on the site plan provided it is GHD's understanding that access to the slope will remain available upon completion of development construction and it is assumed that an erosion access allowance would not be required. Should the local conservation authority or municipality require it, an additional 6m buffer zone in addition to the LTSTOS (defined in Figure 2) could be applied.

6.8.5 Conclusion

It is our conclusion that development of this site is feasible, provided the erosion hazard limit allowances provided in this report are respected. Development may take place no closer to the slope than the "Total Erosion Hazard Limit" line illustrated on Figure 2.

The following summarizes our overall conclusions and recommendations for this project:

1. No slope degradation or stability issues were identified in the visual inspection of the existing slope along the easterly Property boundary.

2. Existing slopes along cross-section A-A' and B-B' were plotted and achieved a factor or safety of 1.9 and 2.5, respectively, which exceeds the minimum targeted factor of safety of 1.5.
3. A toe erosion allowance of 5 m is recommended, along section B-B' only as Gull River is located more than 15m away from toe of slope along section A-A.'
4. Access to the slope will remain available upon completion of development construction and it is assumed that an erosion access allowance would not be required.
5. The line identified in Figure 2 as the "LTSTOS" illustrates the location of this development setback.

It is further recommended that any future development consider the following:

- The existing vegetative cover must not be disturbed for any future development for continuation of the existing conditions.
- Storm water should not be directed to flow over the crest of the slope.
- The slope must be inspected at regular intervals for signs of erosion/instability and any remedial measures should be performed in consultation with a geotechnical engineer.
- The geotechnical engineer should be consulted when the development plans have been finalized to ensure that the proposed development does not affect the stability of the easterly slope.

6.9 General Recommendations

6.9.1 Wells

Any decommissioning of wells on-site must be performed by an appropriately- licensed well contractor, in compliance with O.Reg. 903.

6.9.2 Test Pits During Tendering

It is strongly recommended that test pits be excavated at representative locations of this Site during the tendering phase, with mandatory attendance of interested contractors. This will allow them to make their own assessment of the groundwater and soil conditions at the Site and how these will affect their proposed construction methods, techniques and schedules.

6.9.3 Subsoil Sensitivity

The native subsoils are susceptible to strength loss or deformation if saturated or disturbed by construction traffic. Therefore, where the subgrade consists of approved soil, care must be taken to protect the exposed subgrade from excess moisture and construction traffic. If there is site work carried out during periods of wet weather, then it can be expected that the subgrade will be disturbed unless a suitable working surface is provided to protect the integrity of the subgrade soils from construction traffic. Subgrade preparation work cannot be adequately accomplished during overly wet weather, and the project must be scheduled accordingly.

6.9.4 Winter Construction

The subsoils encountered across the site are moderately frost-susceptible and freezing conditions could cause problems to the structures. During cold weather, unanticipated conditions will be more difficult to deal with and more disruptive to fill placement and compaction process. As preventive measures, the following recommendations are presented:

1. During winter construction, exposed surfaces intended to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.
2. Care must be exercised so that any sidewalks and/or asphalt pavements do not interfere with the opening of doors during the winter when the soils are subject to frost heave. This problem may be minimized by any one of several means, such as keeping the doors well above outside grade, installing structural slabs at the doors, and by using well-graded backfill and positive drainage, etc.
3. Because of the frost heave potential of the soils during winter, it is recommended that the trenches for exterior underground services be excavated with shallow transition slopes in order to minimize the abrupt change in density between the granular backfill, which is relatively non-frost susceptible, and the more frost-susceptible native soils.
4. Backfill materials cannot be adequately compacted while in a frozen state, and care should be taken to prevent stockpiled material from freezing before it can be placed and adequately compacted.

6.9.5 Design Review

Due to the preliminary nature of the design details at the time of this report, GHD's geotechnical group must be allowed to review the foundation design and proposed final grading plans, prior to their finalization. It is recommended that more borehole be advanced once plans are finalized in order to confirm subsurface soil conditions below proposed buildings. In addition, we strongly recommend that our firm be retained to review the related earthworks specifications when they are available.

Geotechnical inspection and review of foundation excavations and compaction procedures must be carried out by GHD to ensure consistency with this investigation's findings and compliance with our recommendations.

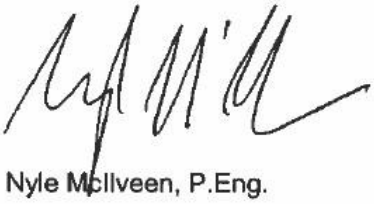
7. Statement of Limitations

The attached Statement of Limitations is an integral part of this report. Should questions arise regarding any aspect of this report, please contact our office.

Sincerely,

GHD

Leandro Ramos, P.Eng.



Nyle McIlveen, P.Eng.

STATEMENT OF LIMITATIONS

This report is intended solely for F.W Gwillim & Associates Ltd., and other parties explicitly identified in the report 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. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. 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.

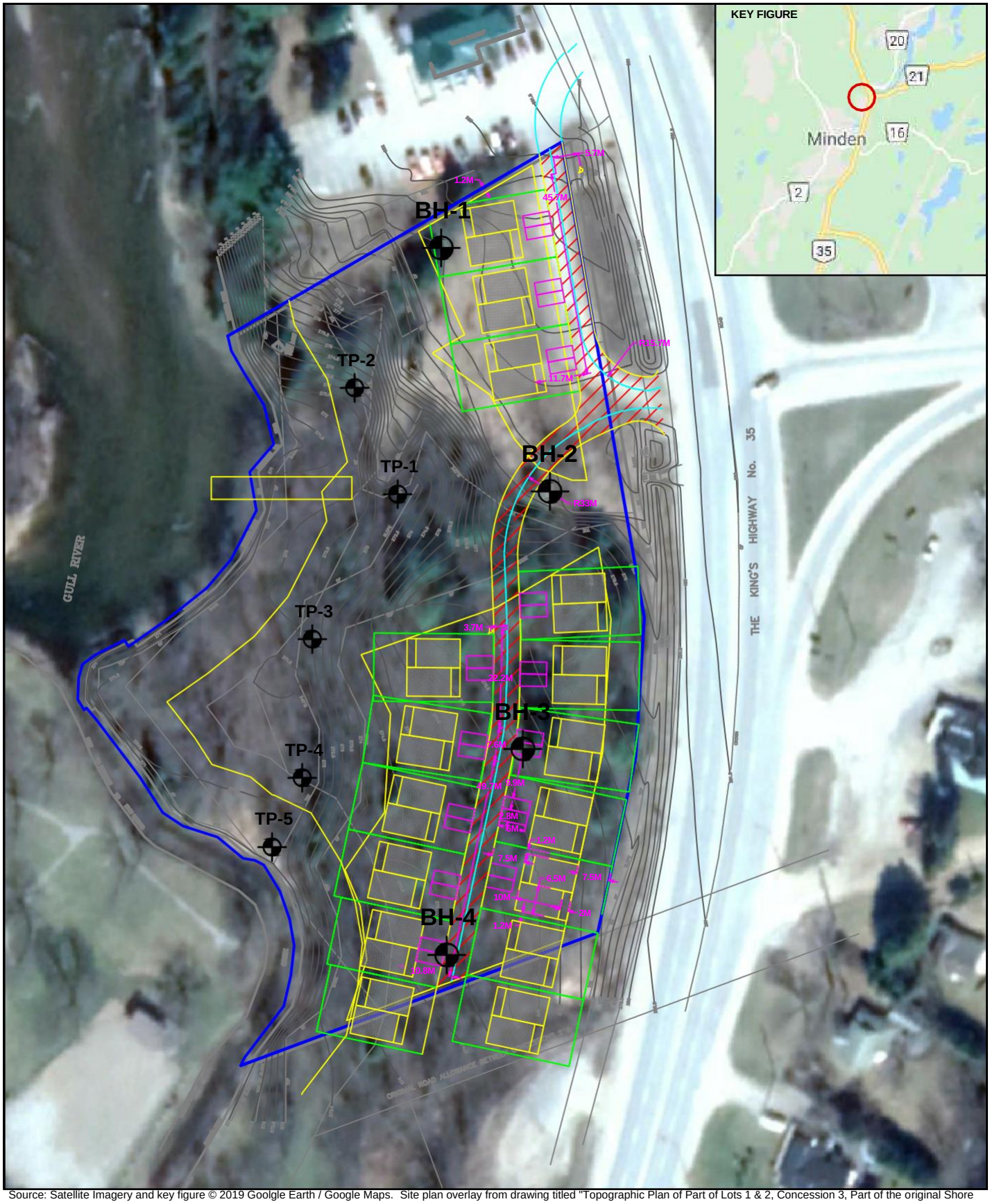
The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent 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 four (4) borehole locations only. The subsurface conditions confirmed at the 4 borehole locations may vary at other locations. The subsurface conditions can also be significantly modified by 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.

Enclosures



Source: Satellite Imagery and key figure © 2019 Goolgle Earth / Google Maps. Site plan overlay from drawing titled "Topographic Plan of Part of Lots 1 & 2, Concession 3, Part of the original Shore Road Allowance...", dated 2019-12-18, by Dearden and Stanton Ltd. O.L.S, as provided by Client.

0 10 20 30 40m

Coordinate System:
WGS 1984, UTM Zone 17T

F. W. GWILLIM & ASSOCIATES LTD.
LOTS 1 & 2, CONCESSION 3, MINDEN, ON
GEOTECHNICAL INVESTIGATION

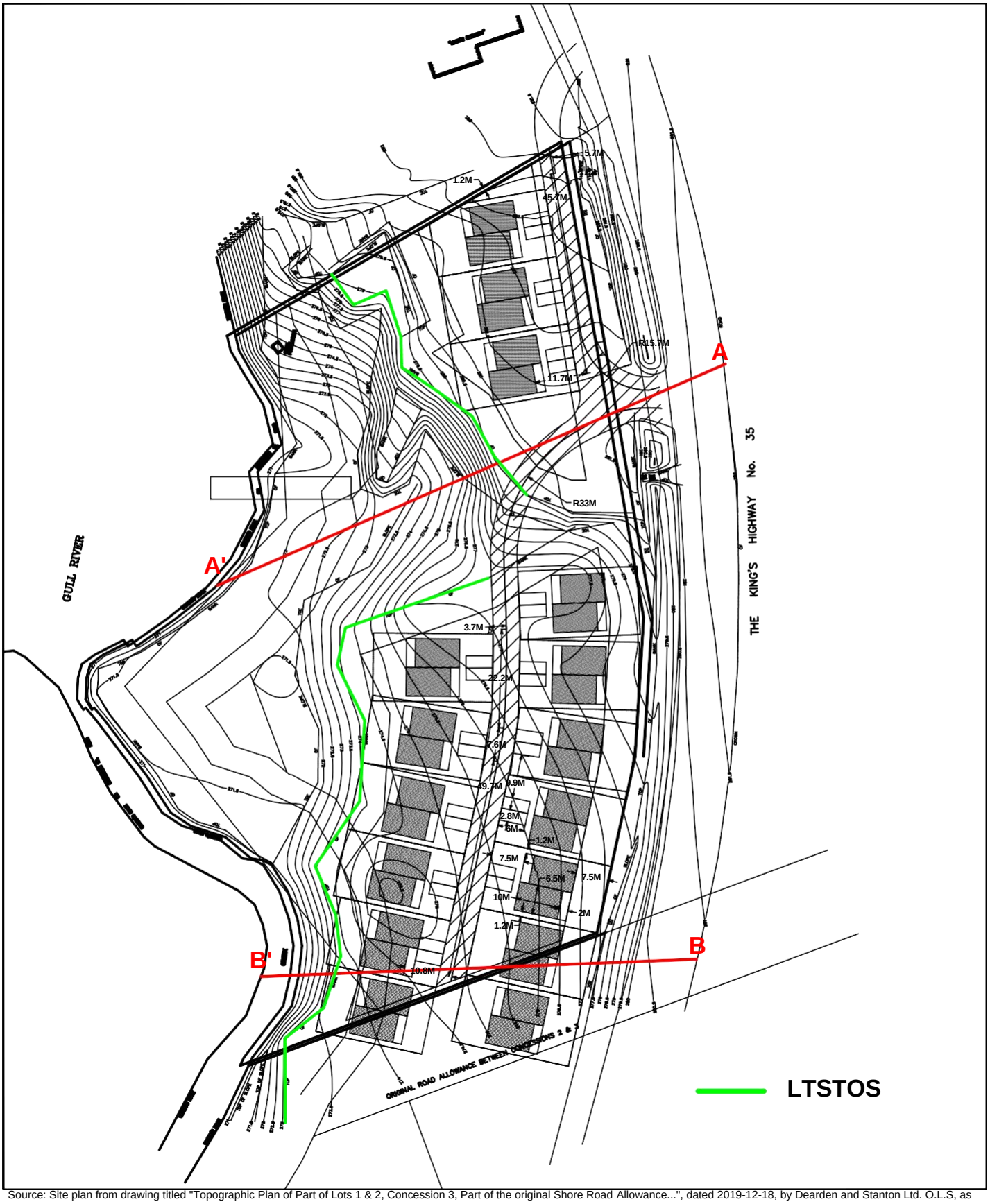
11205754-01

Feb 6, 2020

TEST HOLE LOCATION PLAN

FIGURE 1

CAD File: \\ghdnet\ghd\CA\Peterborough\Legacy\Geo-Logic General\2019\Projects\A - Geotechnical\11205754 - 01 Switzer, Minden Hills Residential Development, LR\Design\AutoCAD\11205754-01-DWG-19-11-27, Test Hole Location Plan, SS.dwg



Source: Site plan from drawing titled "Topographic Plan of Part of Lots 1 & 2, Concession 3, Part of the original Shore Road Allowance...", dated 2019-12-18, by Dearden and Stanton Ltd. O.L.S, as provided by Client.

0 10 20 30 40m

Coordinate System:
WGS 1984, UTM Zone 17T

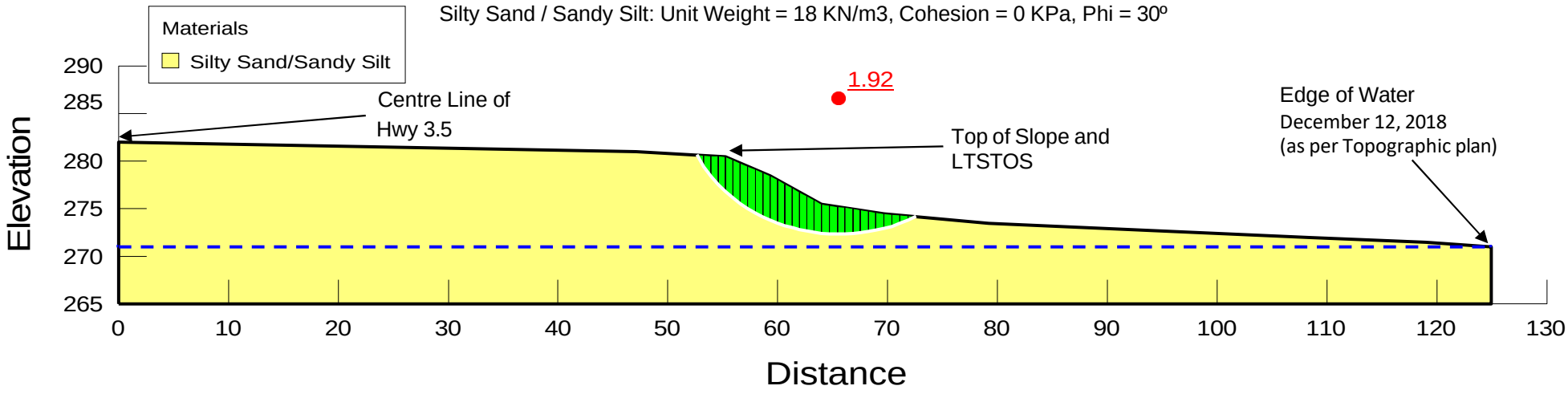
F. W. GWILLIM & ASSOCIATES LTD.
LOTS 1 & 2, CONCESSION 3, MINDEN, ON
GEOTECHNICAL INVESTIGATION

11205754-01

Feb 4, 2020

LONG TERM STABLE TOP OF SLOPE PLAN FIGURE 2

CAD File: \\ghdnet\ghd\CA\Peterborough\Legacy\Geo-Logic General\2019\Projects\A - Geotechnical\11205754 - 01 Switzer, Minden Hills Residential Development, LR\Design\AutoCAD\11205754-01-DWG-20-02-03, Long Term Stable Top of Slope Plan, SS



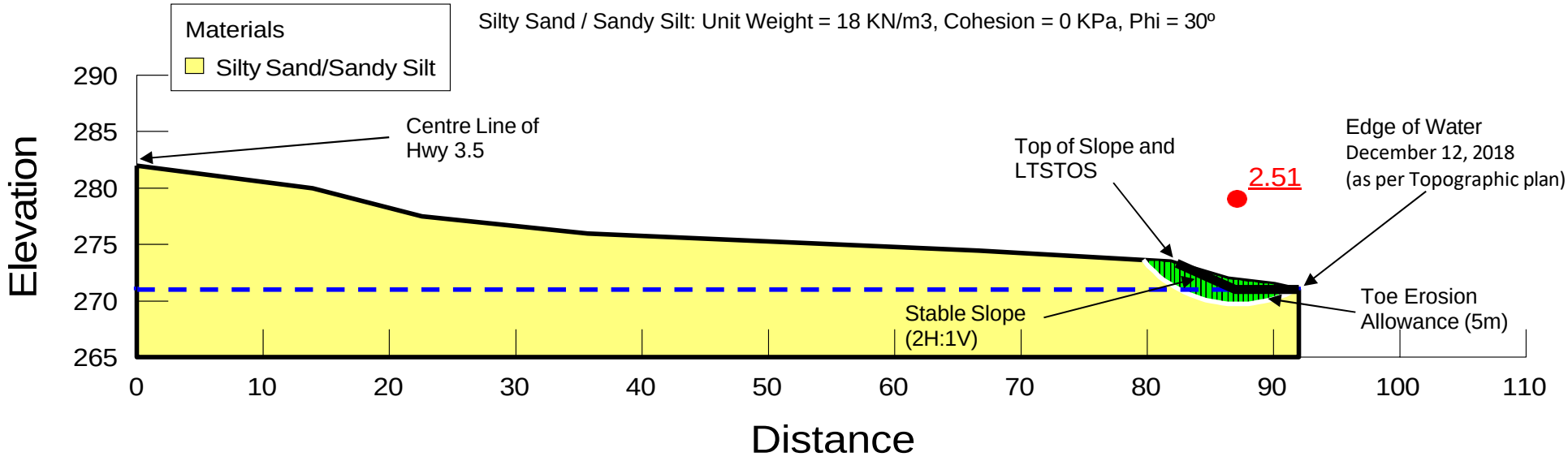
Scale:
As Shown Above

F.W GWILLIM & ASSOCIATES LTD.
LOTS 1 & 2, CONCESSION 3, MINDEN, ON
GEOTECHNICAL INVESTIGATION

CROSS SECTION A-A'

11205754-01
Feb. 4, 2019

FIGURE 3



Scale:
As Shown Above

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GEOTECHNICAL INVESTIGATION

CROSS SECTION B-B'

11205754-01
Feb. 4, 2019

FIGURE 4

Appendix A
Test Hole Logs

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-1

BOREHOLE No.: BH-1

ELEVATION: 281.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 8 January 2020

DRILLING COMPANY: Landshark Drilling Inc. METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.2		**TOPSOIL** (150 mm)					
1				**SILTY SAND** - Reddish Brown Silty Sand, Trace Gravel, Loose, Moist	SS-1	50	7	1 2 4	6
2									
3	1.0				SS-2	83	7	4 1 3 3	6
4									
5					SS-3	78	9	3 3 4	7
6	2.0				SS-4				
7									
8		2.4		**SAND** - Brown Sand, Trace Silt and Gravel, Moist, Very Loose to Loose		78	6	2 1 2	3
9					SS-5				
10	3.0					89	5	2 2 2	4
11									
12									
13	4.0				SS-6				
14									
15		4.6		**SILTY SAND** - Brown Silty Sand, Coarse Grained, Moist, Loose		94	12	3 3 3	6
16									
17	5.0								
18									
19					SS-7				
20	6.0								
21						100	7	2 3 3	6
22									
23	7.0								
24					SS-8				
25									
26	8.0	7.9		With Gravel, Compact		100	5	5 6 7	13
27									
28									
29	9.0				SS-9				
30									
31						100	5	9 9 10	19
32		9.6		END OF BOREHOLE					
33	10.0								
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) P I
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

m
1.00 m

BH-1, SS-3:
0% Gravel
83% Sand
17% Silt and Clay
15% between 5-75 µm

BH-1, SS-5:
2% Gravel
93% Sand
5% Silt and Clay

WL - Dry
01/15/2020

Borehole open and dry upon completion of drilling

BOREHOLE LOG GEOTECH 11205754-01-DWG-20-01-09, BOREHOLE LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-2

BOREHOLE No.: BH-2

ELEVATION: 280.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 8 January 2020

DRILLING COMPANY: Landshark Drilling Inc. METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
1		0.3		**TOPSOIL** (300 mm)					
2				**SILTY SAND** - Brown Silty Sand, Trace Clay, Some Organics, Moist, Loose	SS-1	50	14	0 3 3	6
3	1.0	0.9		With Gravel, Compact	SS-2a			2 3	
4					SS-2b	78	9	4 8	12
5					SS-3	100	7	50=3"	100+
6									
7	2.0								
8					SS-4a		13	2	
9		2.6			SS-4b	44	9	2 2	4
10	3.0			Reddish Brown, Trace Gravel, Moist, Very Loose to Loose					
11					SS-5	67	9	1 2 2	4
12									
13	4.0								
14									
15									
16					SS-6	89	12	3 4 4	8
17	5.0								
18									
19									
20	6.0	6.1		Light Brown, Compact	SS-7	100	11	5 5 6	11
21									
22									
23	7.0								
24									
25		7.6		**SANDY SILT** - Brown Sandy Silt, Some Clay, Moist, Loose	SS-8	100	18	4 4 5	9
26	8.0								
27									
28									
29									
30	9.0	9.1		Wet					
31					SS-9	100	21	3 4 5	9
32		9.6		END OF BOREHOLE					
33	10.0								
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) w_P w w_L
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

m

1.07 m

BH-2, SS-9:
0% Gravel
25% Sand
75% Silt and Clay
15% between 5-75 µm

Borehole caving at 9.1m
First encounter of groundwater at 9.1m

WL - Dry
01/15/2020

BOREHOLE LOG GEOTECH 11205754-01-DWG-20-01-09, BOREHOLE LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-3

BOREHOLE No.: BH-3

ELEVATION: 276.6 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 8 January 2020

DRILLING COMPANY: Landshark Drilling Inc. METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)					
1				**SANDY SILT** - Brown Sandy Silt, Moist, Loose	SS-1	50	36	1 1 1	2
2		0.8		Compact				1 6 7	
3	1.0				SS-2	83	20	8	15
4								5	
5					SS-3	100	22	6 10	16
6	2.0								
7		2.3		**SILTY SAND** - Brown Silty Sand, Moist, Compact	SS-4	89	14	5 5 5	10
8									
9									
10	3.0	3.0		LIght Brown, Loose	SS-5	89	14	4 4 5	9
11									
12									
13	4.0								
14									
15									
16					SS-6	78	7	4 5 4	9
17	5.0								
18									
19									
20	6.0	6.1		Wet					
21					SS-7	67	24	2 2 2 2	4
22		6.7		END OF BOREHOLE					
23	7.0								
24									
25									
26	8.0								
27									
28									
29									
30	9.0								
31									
32									
33	10.0								
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

First encounter of groundwater at 6.1m
WL - 6.5m upon completion of drilling activities
Borehole open upon completion of drilling activities

BOREHOLE LOG GEOTECH 11205754-01-DWG-20-01-09, BOREHOLE LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-4

BOREHOLE No.: BH-4

ELEVATION: 274.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 8 January 2020

DRILLING COMPANY: Landshark Drilling Inc. METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
1		0.3		**TOPSOIL** (300 mm)					
2				**SANDY SILT** - Brown Sandy Silt, Moist, Loose	SS-1	50	30	1 1 2	3
3	1.0	0.8		Some Clay, Occasional Rootlets to 6.5'	SS-2	83	20	3 4 7	15
4								8	
5								6	
6	2.0				SS-3	78	20	6 6	12
7								6	
8		2.4			SS-4a		21	5	
9				**SILTY SAND** - Light Brown Silty Sand, Moist, Compact	SS-4b	94	16	5 7	12
10	3.0	3.0		Loose				4	
11					SS-5	78	14	4 4	8
12								4	
13	4.0								
14									
15		4.6		Wet				2	
16	5.0				SS-6	83	20	2 2	4
17								2	
18									
19									
20	6.0							3	
21					SS-7	100	24	3 3	5
22								2	
23	7.0								
24									
25									
26	8.0								
27									
28									
29	9.0								
30		9.1		END OF BOREHOLE					
31									
32									
33	10.0								
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%)
"N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

m
0.99 m

BH-4, SS-2:
0% Gravel
15% Sand
85% Silt and Clay
69% between 5-75 µm

BH-4, SS-5:
0% Gravel
66% Sand
34% Silt and Clay

WL - 3.7 m
1/15/2020

Borehole caving at 4.6m
First encounter of groundwater at 4.6m

BOREHOLE LOG GEOTECH 11205754-01-DWG-20-01-09, BOREHOLE LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-5

TEST PIT No.: TP-1
ELEVATION: 273.4 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 20 December 2019

EXCAVATION COMPANY: GHD Ltd. METHOD: Portable Equipment

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
				TOPSOIL (150 mm)				Borehole dry upon completion
		0.2		**SANDY SILT** - Light Brown Sandy Silt, Moist	GS-1	35	○	
1					GS-2	47	○	
	0.5				GS-3	53	○	
					GS-4	48	○	
2		0.6		**SILTY SAND** - Light Brown Silty Sand, Trace Gravel, Moist	GS-5	40	○	
		0.8		END OF TEST PIT				
3	1.0							
4								
5	1.5							
6								
7	2.0							
8								
9	2.5							
	3.0							

TEST PIT LOG GEOTECH 11205754-01-DWG-20-01-09, SHOVEL LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-6

TEST PIT No.: TP-2
ELEVATION: 273.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 20 December 2019

EXCAVATION COMPANY: GHD Ltd. METHOD: Portable Equipment

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				
		0.2		**SILTY SAND** - Brown Silty Sand, Trace Gravel, Some Organics, Loose, Moist	GS-1	16		
1		0.4		Wet	GS-2	37		Seepage first observed at 0.4 m
	0.5	0.5		**SANDY SILT** - Brown Sandy Silt, Trace Gravel, Wet	GS-3	68		
2		0.7		END OF TEST PIT				
3	1.0							
4								
5	1.5							
6								
7	2.0							
8								
9	2.5							
	3.0							

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90 %

TEST PIT LOG GEOTECH 11205754-01-DWG-20-01-09, SHOVEL LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-7

TEST PIT No.: TP-3
ELEVATION: 272.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.

PROJECT: Minden Hills Residential Development

LOGGED BY: J. McEachern DATE: 20 December 2019

EXCAVATION COMPANY: GHD Ltd. METHOD: Portable Equipment

NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) △ Field / □ Lab; Sensitivity (S); ○ Water content (%); w_p w_l Atterberg limits (%)	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
				TOPSOIL (270 mm)				Borehole dry upon completion
1		0.3		**SANDY SILT** - Light Brown Sandy Silt, Loose, Moist	GS-1	32	○	
		0.4		**SILTY SAND** - Light Brown Silty Sand, Trace Gravel, Moist	GS-2	28	○	
	0.5							
2		0.6		END OF TEST PIT	GS-3	27	○	
3	1.0							
4								
5	1.5							
6								
7	2.0							
8								
9	2.5							
	3.0							

TEST PIT LOG GEOTECH 11205754-01-DWG-20-01-09, SHOVEL LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-8

TEST PIT No.: TP-4
ELEVATION: 271.8 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.
PROJECT: Minden Hills Residential Development
LOGGED BY: J. McEachern DATE: 20 December 2019
EXCAVATION COMPANY: GHD Ltd. METHOD: Portable Equipment
NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) △ Field / □ Lab; Sensitivity (S); ○ Water content (%); w_p w_l Atterberg limits (%) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (300 mm)				Borehole dry upon completion
1					GS-1	34	○	
		0.4			GS-2	34	○	
	0.5	0.5		**SILTY SAND** - Light Brown Silty Sand, Trace Gravel, Loose, Moist				
2				END OF TEST PIT				
3	1.0							
4								
5	1.5							
6								
7	2.0							
8								
9	2.5							
	3.0							

TEST PIT LOG GEOTECH 11205754-01-DWG-20-01-09, SHOVEL LOGS.GPJ GEOLOGIC.GDT 6/2/20

REFERENCE No.: 11205754-01 ENCLOSURE No.: A-9

TEST PIT No.: TP-5
ELEVATION: 271.2 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: F.W Gwillim & Associates Ltd.
PROJECT: Minden Hills Residential Development
LOGGED BY: J. McEachern DATE: 20 December 2019
EXCAVATION COMPANY: GHD Ltd. METHOD: Portable Equipment
NOTES: Ground surface elevation interpolated from topographic plan prepared by Dearden and Stanton Ltd.

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) △ Field / □ Lab; Sensitivity (S); ○ Water content (%); w_p w_l Atterberg limits (%) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				Borehole dry upon completion
		0.2		**SILTY SAND** - Light Brown Silty Sand with Gravel, Moist	GS-1	20	○	
					GS-2	15	○	
1		0.3						
		0.4		Some Cobbles, Moist				
				END OF TEST PIT				
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								
6								
	2.0							
7								
8								
	2.5							
9								
	3.0							

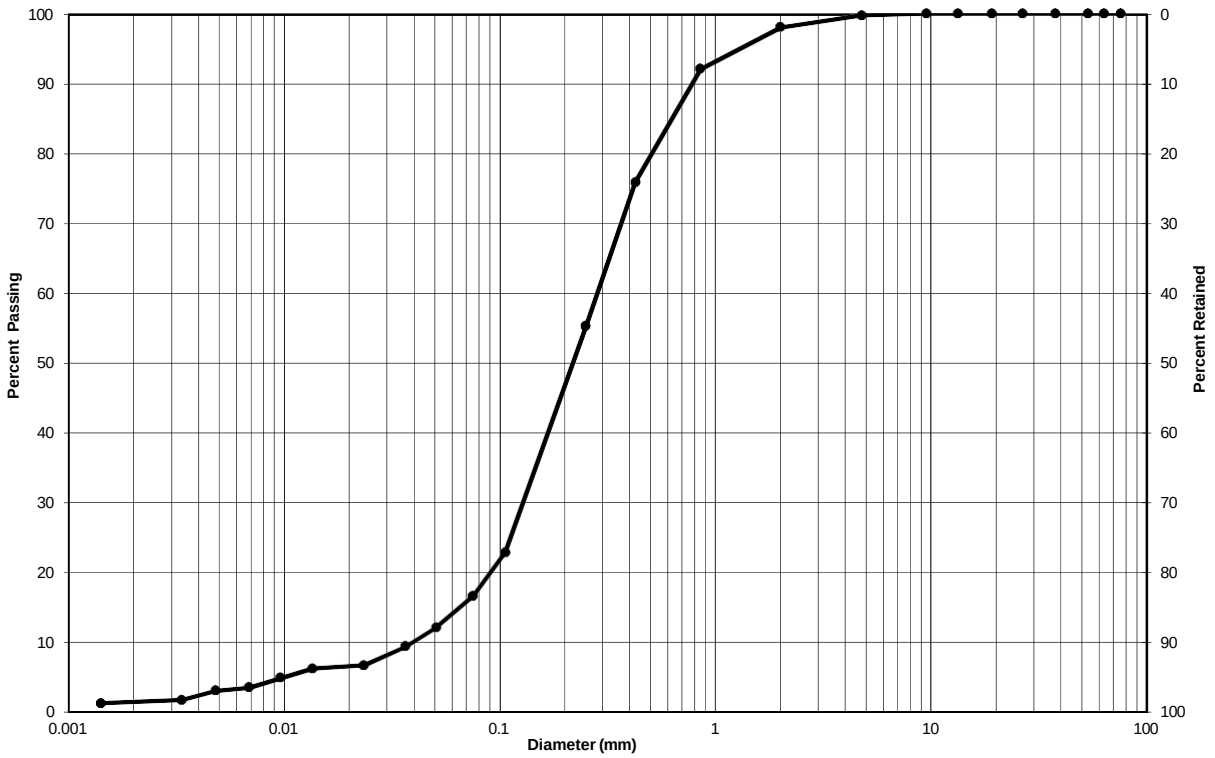
TEST PIT LOG GEOTECH 11205754-01-DWG-20-01-09, SHOVEL LOGS.GPJ GEOLOGIC.GDT 6/2/20

Appendix B
Physical Laboratory Data

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Switzer	**Lab no.:**	SS-20-01
Project/Site:	Minden Hills Residential Development, Hwy 35	**Project no.:**	11205754-01

Borehole no.:	BH-1	Sample no.:	SS-3
Depth:	1.5-2.0m	Enclosure:	B-1



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	0	83	17

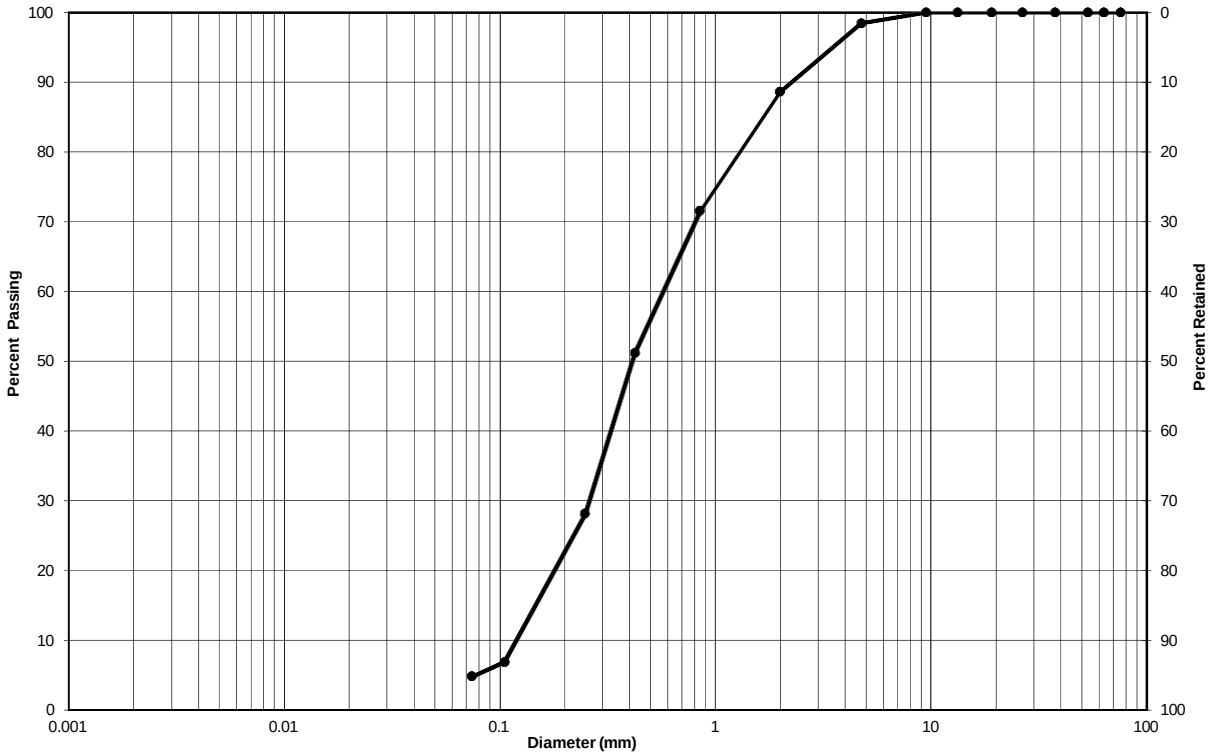
Remarks:

Performed by:	Josh Sullivan	**Date:**	January 16, 2020
Verified by:		**Date:**	January 16, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Switzer	**Lab no.:**	SS-20-01
Project/Site:	Minden Hills Residential Development, Hwy 35	**Project no.:**	11205754-01

Borehole no.:	BH-1	Sample no.:	SS-5
Depth:	3-3.5m	Enclosure:	B-2



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	2	93	5

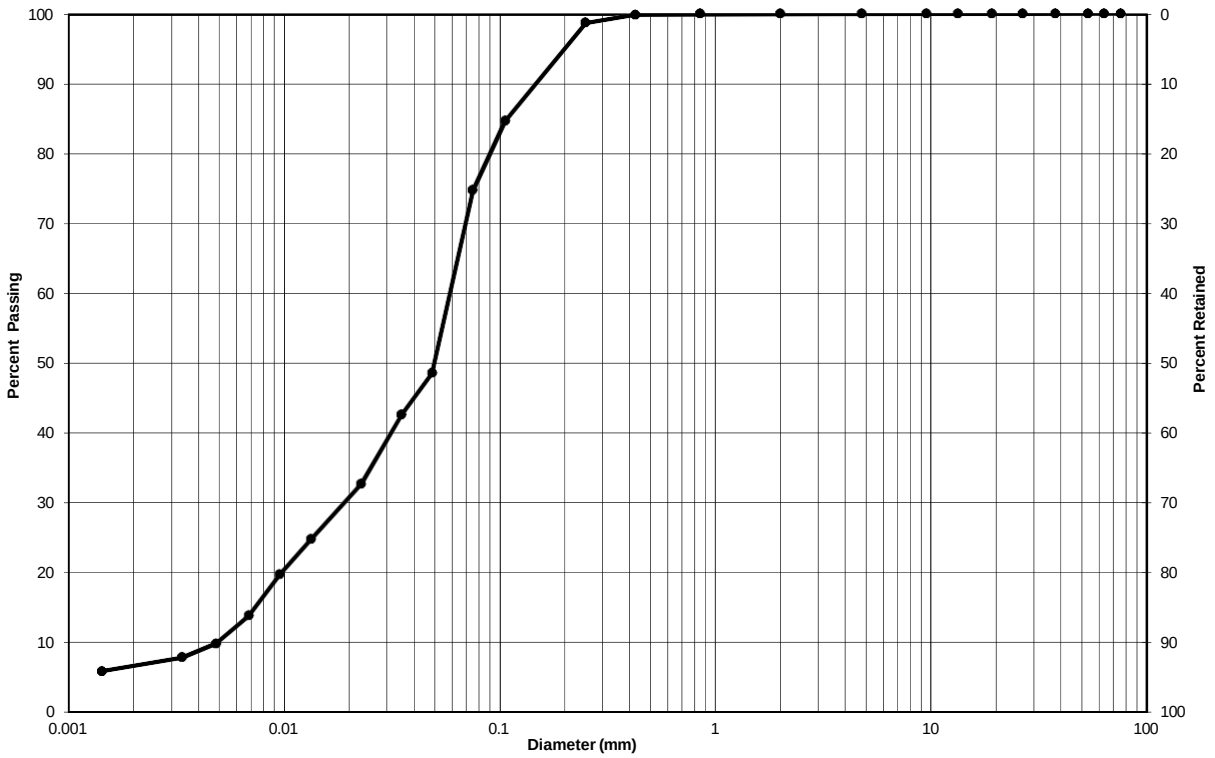
Remarks:

Performed by:	Josh Sullivan	**Date:**	January 16, 2020
Verified by:		**Date:**	January 16, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Switzer	**Lab no.:**	SS-20-01
Project/Site:	Minden Hills Residential Development, Hwy 35	**Project no.:**	11205754-01

Borehole no.:	BH-2	Sample no.:	SS-9
Depth:	9.1-10.6m	Enclosure:	B-3



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	0	25	75

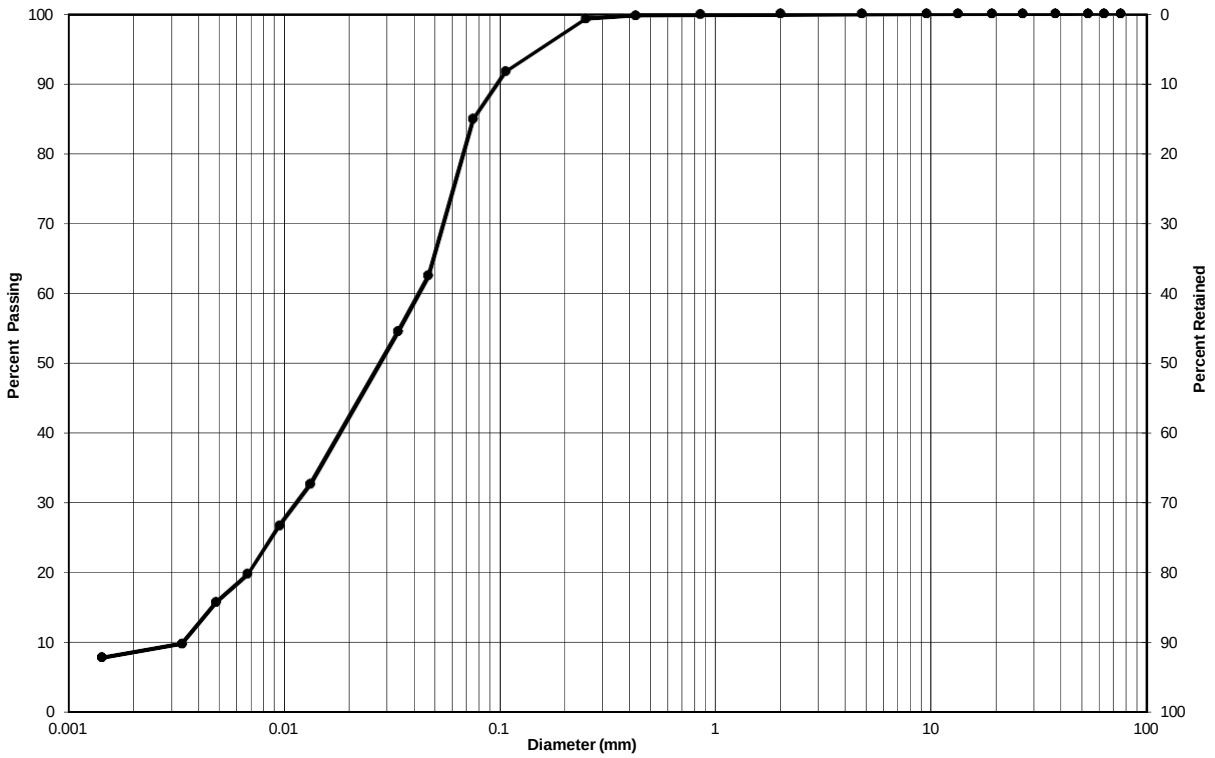
Remarks:

Performed by:	Josh Sullivan	**Date:**	January 16, 2020
Verified by:		**Date:**	January 16, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Switzer	**Lab no.:**	SS-20-01
Project/Site:	Minden Hills Residential Development, Hwy 35	**Project no.:**	11205754-01

Borehole no.:	BH-4	Sample no.:	SS-2
Depth:	0.8-1.2m	Enclosure:	B-4



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	0	15	85

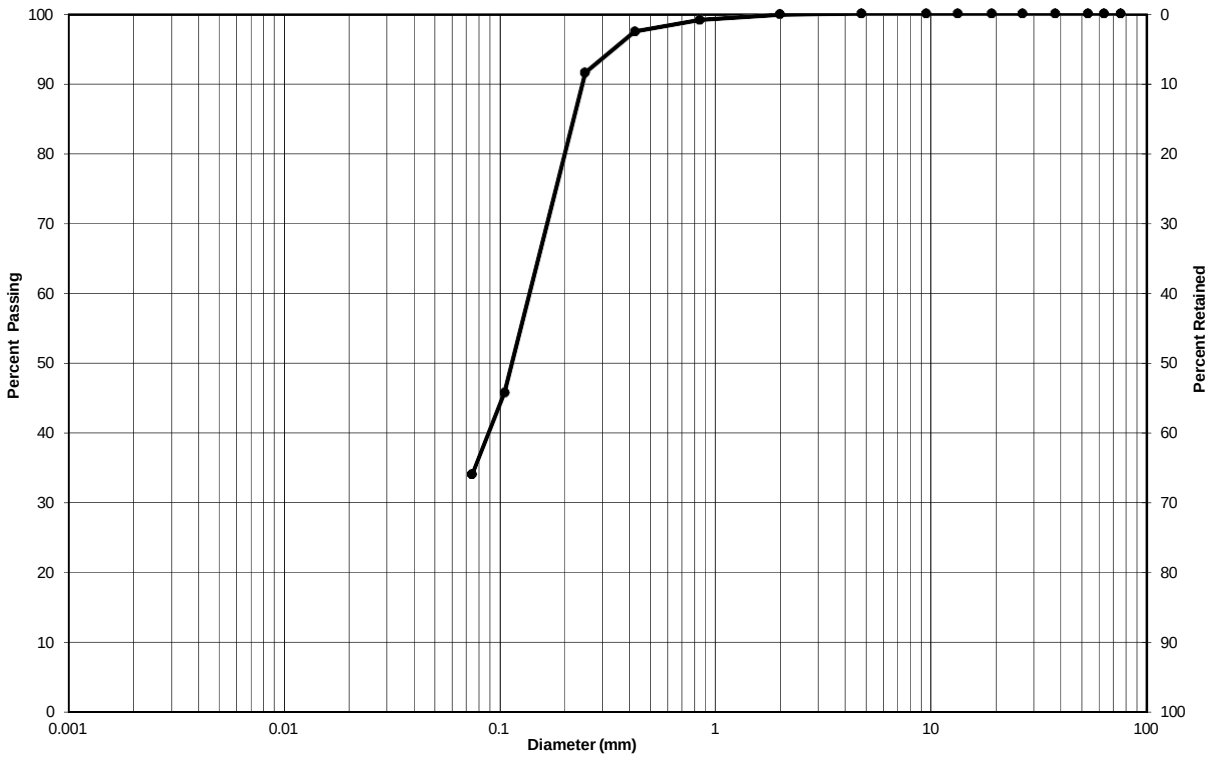
Remarks:

Performed by:	Josh Sullivan	**Date:**	January 16, 2020
Verified by:		**Date:**	January 16, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Switzer	**Lab no.:**	SS-20.01
Project/Site:	Minden Hills Residential Development, Hwy 35	**Project no.:**	11205754-01

Borehole no.:	BH-4	Sample no.:	SS-5
Depth:	3-3.5m	Enclosure:	B-5



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	0	66	34

Remarks:

Performed by:	Josh Sullivan	**Date:**	January 16, 2020
Verified by:		**Date:**	January 16, 2020

Appendix C
Chemical Laboratory Data

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G88212 **REPORT No. B20-00869 (i)**

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: 10-Jan-20
DATE REPORTED: 16-Jan-20
SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Cyanide	2	Kingston	US	14-Jan-20	A-CN s K	in house
Conductivity	2	Holly Lane	ROD	14-Jan-20	A-COND-01 (o)	SM 2510B
pH	2	Holly Lane	ROD	15-Jan-20	A-PH-01 (o)	SM 4500H
Chromium (VI)	2	Holly Lane	LMG	14-Jan-20	D-CRVI-02 (o)	EPA7196A
Mercury	2	Holly Lane	PBK	15-Jan-20	D-HG-01 (o)	EPA 7471A
Boron - HWS	2	Holly Lane	AHM	15-Jan-20	D-HWE s	MOE3470
Sodium Adsorption Ratio	2	Holly Lane	AHM	15-Jan-20	D-ICP-01 SAR (o)	SM 3120
Metals - ICP-OES	2	Holly Lane	AHM	15-Jan-20	D-ICP-02 (o)	EPA 6010
Metals - ICP-MS	2	Holly Lane	TPR	15-Jan-20	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-napth 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. 2 - ICC Soil - Table 2 - Ind./Commercial/Community Soil Std
Tbl. 2 - RPI Soil - Table 2 - Res./Parkland/Institutional Soil Std

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.

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

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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: 10-Jan-20
DATE REPORTED: 16-Jan-20
SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
WATERWORKS NO.

	Client I.D.		BH-1 SS-2	BH-2 SS-2			O. Reg. 153	
	Sample I.D.		B20-00869-1	B20-00869-2			Tbl. 2 - ICC	Tbl. 2 - RPI
	Date Collected		08-Jan-20	08-Jan-20			Soil	Soil
Parameter	**Units**	**R.L.**						
pH @25°C	pH Units		7.65	7.27				
Conductivity @25°C	mS/cm	0.001	0.099	0.061			1.4	0.7
Cyanide (Free)	µg/g	0.05	< 0.05	< 0.05			0.051	0.051
Sodium Adsorption Ratio	units		0.0721	0.212			12	5
Antimony	µg/g	0.5	< 0.5	< 0.5			40	7.5
Arsenic	µg/g	0.5	0.6	1.0			18	18
Barium	µg/g	1	48	98			670	390
Beryllium	µg/g	0.2	0.3	0.4			8	4
Boron	µg/g	0.5	1.9	< 0.5			120	120
Boron (HWS)	µg/g	0.02	< 0.02	< 0.02			2	1.5
Cadmium	µg/g	0.5	< 0.5	< 0.5			1.9	1.2
Chromium	µg/g	1	16	20			160	160
Chromium (VI)	µg/g	0.2	< 0.2	< 0.2			8	8
Cobalt	µg/g	1	5	8			80	22
Copper	µg/g	1	5	18			230	140
Lead	µg/g	5	< 5	< 5			120	120
Mercury	µg/g	0.005	0.012	0.011			3.9	0.27
Molybdenum	µg/g	1	< 1	< 1			40	6.9
Nickel	µg/g	1	12	13			270	100
Selenium	µg/g	0.5	< 0.5	< 0.5			5.5	2.4
Silver	µg/g	0.2	< 0.2	< 0.2			40	20
Thallium	µg/g	0.1	< 0.1	0.2			3.3	1
Uranium	µg/g	0.1	0.9	1.1			33	23
Vanadium	µg/g	1	38	50			86	86

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - ICC Soil - Table 2 - Ind./Commercial/Community Soil Std
Tbl. 2 - RPI Soil - Table 2 - Res./Parkland/Institutional Soil Std

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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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G88212 **REPORT No. B20-00869 (i)**

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: 10-Jan-20
DATE REPORTED: 16-Jan-20
SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
WATERWORKS NO.

	Client I.D. / Sample I.D. / Date Collected		BH-1 SS-2 B20-00869-1 08-Jan-20	BH-2 SS-2 B20-00869-2 08-Jan-20			O. Reg. 153 Tbl. 2 - ICC Soil	O. Reg. 153 Tbl. 2 - RPI Soil
Parameter	**Units**	**R.L.**						
Zinc	µg/g	3	43	71			340	340

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - ICC Soil - Table 2 - Ind./Commercial/Community Soil Std
Tbl. 2 - RPI Soil - Table 2 - Res./Parkland/Institutional Soil Std

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

Christine Burke
Lab Manager

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CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G88212 **REPORT No. B20-00869 (i)**

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: 10-Jan-20
DATE REPORTED: 16-Jan-20
SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
WATERWORKS NO.

Summary of Exceedances

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - ICC Soil - Table 2 - Ind./Commercial/Community Soil Std
Tbl. 2 - RPI Soil - Table 2 - Res./Parkland/Institutional Soil Std

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

Christine Burke
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G88212 **REPORT No. B20-00869 (ii)**

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: 10-Jan-20
DATE REPORTED: 16-Jan-20
SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
% Moisture	2	Richmond Hill	FAL	12-Jan-20	A-% moisture RH	
PHC(F2-F4)	2	Kingston	KPR	14-Jan-20	C-PHC-S-001 (k)	CWS Tier 1
VOC's	2	Richmond Hill	FAL	11-Jan-20	C-VOC-02 (rh)	EPA 8260
PHC(F1)	2	Richmond Hill	FAL	11-Jan-20	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-napth 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. 2 - ICC Soil - Table 2 - Ind./Commercial/Community Soil Std
Tbl. 2 - RPI Soil - Table 2 - Res./Parkland/Institutional Soil Std

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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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G88212 **REPORT No. B20-00869 (ii)**

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: 10-Jan-20
DATE REPORTED: 16-Jan-20
SAMPLE MATRIX: Soil

JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
WATERWORKS NO.

	Client I.D.		BH-1 SS-2	BH-2 SS-2			O. Reg. 153	
	Sample I.D.		B20-00869-1	B20-00869-2			Tbl. 2 - ICC	Tbl. 2 - RPI
	Date Collected		08-Jan-20	08-Jan-20			Soil	Soil
Parameter	**Units**	**R.L.**						
Acetone	µg/g	0.5	< 0.5	< 0.5			16	16
Benzene	µg/g	0.02	< 0.02	< 0.02			0.32	0.21
Bromodichloromethane	µg/g	0.02	< 0.02	< 0.02			1.5	1.5
Bromoform	µg/g	0.02	< 0.02	< 0.02			0.61	0.27
Bromomethane	µg/g	0.05	< 0.05	< 0.05			0.05	0.05
Carbon Tetrachloride	µg/g	0.05	< 0.05	< 0.05			0.21	0.05
Monochlorobenzene (Chlorobenzene)	µg/g	0.02	< 0.02	< 0.02			2.4	2.4
Chloroform	µg/g	0.02	< 0.02	< 0.02			0.47	0.05
Dibromochloromethane	µg/g	0.02	< 0.02	< 0.02			2.3	2.3
Dichlorobenzene,1,2-	µg/g	0.05	< 0.05	< 0.05			1.2	1.2
Dichlorobenzene,1,3-	µg/g	0.05	< 0.05	< 0.05			9.6	4.8
Dichlorobenzene,1,4-	µg/g	0.05	< 0.05	< 0.05			0.2	0.083
Dichlorodifluoromethane	µg/g	0.05	< 0.05	< 0.05			16	16
Dichloroethane,1,1-	µg/g	0.02	< 0.02	< 0.02			0.47	0.47
Dichloroethane,1,2-	µg/g	0.02	< 0.02	< 0.02			0.05	0.05
Dichloroethylene,1,1-	µg/g	0.02	< 0.02	< 0.02			0.064	0.05
Dichloroethene, cis-1,2-	µg/g	0.02	< 0.02	< 0.02			1.9	1.9
Dichloroethene, trans-1,2-	µg/g	0.02	< 0.02	< 0.02			1.3	0.084
Dichloropropane,1,2-	µg/g	0.02	< 0.02	< 0.02			0.16	0.050
Dichloropropene, cis-1,3-	µg/g	0.02	< 0.02	< 0.02				
Dichloropropene, trans-1,3-	µg/g	0.02	< 0.02	< 0.02				

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Lab Manager

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	Client I.D.		BH-1 SS-2	BH-2 SS-2			O. Reg. 153	
	Sample I.D.		B20-00869-1	B20-00869-2			Tbl. 2 - ICC	Tbl. 2 - RPI
	Date Collected		08-Jan-20	08-Jan-20			Soil	Soil
Parameter	**Units**	**R.L.**						
Dichloropropene 1,3-cis+trans	µg/g	0.02	< 0.02	< 0.02			0.059	0.050
Ethylbenzene	µg/g	0.05	< 0.05	< 0.05			1.1	1.1
Dibromoethane,1,2-(Ethylene Dibromide)	µg/g	0.02	< 0.02	< 0.02			0.05	0.05
Hexane	µg/g	0.02	< 0.02	< 0.02			46	2.8
Methyl Ethyl Ketone	µg/g	0.5	< 0.5	< 0.5			70	16
Methyl Isobutyl Ketone	µg/g	0.5	< 0.5	< 0.5			31	1.7
Methyl-t-butyl Ether	µg/g	0.05	< 0.05	< 0.05			1.6	0.75
Dichloromethane (Methylene Chloride)	µg/g	0.05	< 0.05	< 0.05			1.6	0.10
Styrene	µg/g	0.05	< 0.05	< 0.05			34	0.7
Tetrachloroethane,1,1,1,2-	µg/g	0.02	< 0.02	< 0.02			0.087	0.058
Tetrachloroethane,1,1,2,2-	µg/g	0.05	< 0.05	< 0.05			0.05	0.05
Tetrachloroethylene	µg/g	0.05	< 0.05	< 0.05			1.9	0.28
Toluene	µg/g	0.2	< 0.2	< 0.2			6.4	2.3
Trichloroethane,1,1,1-	µg/g	0.02	< 0.02	< 0.02			6.1	0.38
Trichloroethane,1,1,2-	µg/g	0.02	< 0.02	< 0.02			0.05	0.05
Trichloroethylene	µg/g	0.05	< 0.05	< 0.05			0.55	0.061
Trichlorofluoromethane	µg/g	0.02	< 0.02	< 0.02			4	4.0
Vinyl Chloride	µg/g	0.02	< 0.02	< 0.02			0.032	0.020
Xylene, m,p-	µg/g	0.03	< 0.03	< 0.03				
Xylene, o-	µg/g	0.03	< 0.03	< 0.03				

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	Client I.D.		BH-1 SS-2	BH-2 SS-2			O. Reg. 153	
	Sample I.D.		B20-00869-1	B20-00869-2			Tbl. 2 - ICC	Tbl. 2 - RPI
	Date Collected		08-Jan-20	08-Jan-20			Soil	Soil
Parameter	**Units**	**R.L.**						
Xylene, m,p,o-	µg/g	0.03	< 0.03	< 0.03			26	3.1
PHC F1 (C6-C10)	µg/g	10	< 10	< 10			55	55
PHC F2 (>C10-C16)	µg/g	5	< 5	< 5			230	98
PHC F3 (>C16-C34)	µg/g	10	10	12			1700	300
PHC F4 (>C34-C50)	µg/g	10	< 10	15			3300	2800
% moisture	%		5.4	10.0				

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Tbl. 2 - RPI Soil - Table 2 - Res./Parkland/Institutional Soil Std

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JOB/PROJECT NO.: Minden Hills/11205754-01
P.O. NUMBER:
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Summary of Exceedances

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - ICC Soil - Table 2 - Ind./Commercial/Community Soil Std
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Appendix D
Slope Stability Rating Inspection

SLOPE STABILITY RATING CHART

Section A-A'

Site Location:	Highway 35, Minden Hills	File No.	11205754-01
Property Owner:	F.W Gwillim & Associates Ltd.	Inspection Date:	January 15, 2020
Inspected By:	L. Ramos	Weather:	Cloudy 0˚C

Inspection Task		Rating Value
1. SLOPE INCLINATION		
Degrees	**Horizontal:Vertical**	
a) 18 or less	3:1 or flatter	0
b) 18 to 26	2:1 to more than 3:1	6
c) more than 26	Steeper than 2:1	**16**
2. SOIL STRATIGRAPHY		
a) Shale, Limestone, Granite (Bedrock)		0
b) Sand, Gravel		6
c) Glacial Till		9
d) Clay, Silt		**12**
e) Fill		16
f) Leda Clay		24
3. SEEPAGE FROM SLOPE FACE		
a) None or near bottom only		**0**
b) Near mid-slope only		6
c) Near crest only or from several levels		12
4. SLOPE HEIGHT		
a) 2 m or less		0
b) 2.1 to 5 m		2
c) 5.1 to 10 m		**4**
d) more than 10 m		8
5. VEGETATION COVER ON SLOPE FACE		
a) Well vegetated, heavy shrubs or forested with mature trees		**0**
b) Light Vegetation; Mostly grass, weeds, occasional trees, shrubs		4
c) No vegetaion, bare		8
6. TABLE LAND DRAINAGE		
a) Table land flat, no apparent drainage over slope		0
b) Minor drainage over slope, no active erosion		**2**
c) Drainage over slope, active erosion, gullies		4
7. PROXIMITY OF WATERCOURSE TO SLOPE TOE		
a) 15 m or more from slope toe		**0**
b) Less than 15 m from slope toe		6
8. PREVIOUS LANDSLIDE ACTIVITY		
a) No		**0**
b) Yes		6
	RATING VALUES TOTAL	**34**

SLOPE INSTABILITY RATING		INVESTIGATION REQUIREMENTS
1. Low Potential	<24	Site inspection only, confirmation, report letter
2. Slight Potential	25 - 35	Site inspection and surveying, preliminary study, detailed report
3. Moderate Potential	>35	Boreholes, piezometers, lab tests, surveying detailed report

Notes:

a) Choose only one rating value from each category; compare total rating value with above requirements

b) If there is a waterbody (stream, creek, river, pond, bay, lake) at the slope toe, the potential for toe ersoion and undercutting should be evaluated in detail and protection provided if required.

c) For leda clay and rock slopes, additional evaluation must be carried out

Source: Table 8.1 Geotechnical Principles for Stable Slopes (June 1998), Ontario Ministry of Natural Resources

SLOPE STABILITY RATING CHART

Section B-B'

Site Location:	Highway 35, Minden Hills	File No.	11205754-01
Property Owner:	F.W Gwillim & Associates Ltd.	Inspection Date:	January 15, 2020
Inspected By:	L. Ramos	Weather:	Cloudy 0˚c

Inspection Task		Rating Value
1. SLOPE INCLINATION		
Degrees	**Horizontal:Vertical**	
a) 18 or less	3:1 or flatter	0
b) 18 to 26	2:1 to more than 3:1	**6**
c) more than 26	Steeper than 2:1	16
2. SOIL STRATIGRAPHY		
a) Shale, Limestone, Granite (Bedrock)		0
b) Sand, Gravel		6
c) Glacial Till		9
d) Clay, Silt		**12**
e) Fill		16
f) Leda Clay		24
3. SEEPAGE FROM SLOPE FACE		
a) None or near bottom only		**0**
b) Near mid-slope only		6
c) Near crest only or from several levels		12
4. SLOPE HEIGHT		
a) 2 m or less		0
b) 2.1 to 5 m		**2**
c) 5.1 to 10 m		4
d) more than 10 m		8
5. VEGETATION COVER ON SLOPE FACE		
a) Well vegetated, heavy shrubs or forested with mature trees		**0**
b) Light Vegetation; Mostly grass, weeds, occasional trees, shrubs		4
c) No vegetaion, bare		8
6. TABLE LAND DRAINAGE		
a) Table land flat, no apparent drainage over slope		0
b) Minor drainage over slope, no active erosion		**2**
c) Drainage over slope, active erosion, gullies		4
7. PROXIMITY OF WATERCOURSE TO SLOPE TOE		
a) 15 m or more from slope toe		0
b) Less than 15 m from slope toe		**6**
8. PREVIOUS LANDSLIDE ACTIVITY		
a) No		**0**
b) Yes		6
	RATING VALUES TOTAL	**28**

SLOPE INSTABILITY RATING		INVESTIGATION REQUIREMENTS
1. Low Potential	<24	Site inspection only, confirmation, report letter
2. Slight Potential	25 - 35	Site inspection and surveying, preliminary study, detailed report
3. Moderate Potential	>35	Boreholes, piezometers, lab tests, surveying detailed report

Notes:

a) Choose only one rating value from each category; compare total rating value with above requirements

b) If there is a waterbody (stream, creek, river, pond, bay, lake) at the slope toe, the potential for toe ersoion and undercutting should be evaluated in detail and protection provided if required.

c) For leda clay and rock slopes, additional evaluation must be carried out

Source: Table 8.1 Geotechnical Principles for Stable Slopes (June 1998), Ontario Ministry of Natural Resources

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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Part 1 General

1.1 SECTION INCLUDES

.1 Finishing slabs-on-grade, monolithic floor slab, and separate floor toppings.

.2 Surface treatment with concrete hardener, sealer, and slip resistant coatings.

1.2 RELATED SECTIONS

.1 Refer also to structural specifications on the drawings.

.2 Section 07 92 00 - Joint Sealants.

1.3 REFERENCES

.1 ACI 301 - Structural Concrete.

.2 ACI 302 - Guide for Concrete Floor and Slab Construction.

.3 ASTM E1155/E1155M - Determining F Floor Flatness and F Floor Levelness Numbers.

1.4 SUBMITTALS

.1 Section 01 33 00: Submission procedures.

1.5 QUALITY ASSURANCE

.1 Perform Work in accordance with ACI 301 and ACI 302.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, protect, and handle products to site to Section 01 61 00.

.2 Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Temporary Heat: Ambient temperature of <10 degrees C minimum.

.2 Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.8 COORDINATION

.1 Section 01 33 00: Coordinate work.

.2 Coordinate the work with concrete floor placement and concrete floor curing.

Part 2 Products

2.1 COMPOUNDS - HARDENERS AND SEALERS

.1 Chemical Hardener: Magnesium fluosilicate and zinc fluosilicate blend, dry powder type; manufactured by Stearns or approved equal.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 73 03: Verify site conditions.

.2 Verify that floor surfaces are acceptable to receive the work of this section.

3.2 FLOOR FINISHING

.1 Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.

.2 Wood float surfaces which will receive ceramic tile, with full bed setting system.

.3 Steel trowel surfaces which will receive carpeting, resilient flooring, or seamless flooring.

.4 Steel trowel surfaces which are scheduled to be exposed.

.5 In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot or as indicated on drawings.

3.3 FLOOR SURFACE TREATMENT

.1 Concrete curing agents, surface hardeners and similar products should not be used on the subfloor unless the manufacturers of these products guarantee that they will not affect the bonding process with the vinyl floor adhesive.

3.4 TOLERANCES

.1 Maximum Variation of Surface Flatness For Exposed Concrete Floors: 1/8 inch in 10ft

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Design, labour, Products, equipment and services necessary for the miscellaneous and metal fabrication Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.2 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.4 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.5 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.

.6 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

.7 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

8 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.9 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.10 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.11 CSA W48, Filler Metal and Allied Materials for Metal Arc Welding.

.12 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.13 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

.14 CGSB 85-GP-16M, Painting Galvanized Steel.

.15 Steel Structures Painting Council (SSPC), Steel Structures Painting Manual, Vol. 2.

1.3 DESIGN REQUIREMENTS

.1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1. Comply with OBC for design of all stressed members.

1.4 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings for fabrication and erection of miscellaneous and metal items in accordance with Section 01 00 00 indicating:
  - .1 Materials, core thicknesses, class of finish (AMP 555), connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
  - .2 Ensure shop drawings are of one uniform size and based on field measurements.

1.5 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in Work of comparable complexity and scope, to perform the following services as part of the Work of this Section:
- .1 Design metal fabrication items that are required to resist live, dead, lateral, wind, or seismic loads.
- .2 Review, stamp, date and sign shop drawings.

.2 Workmanship: Fabricate Work of this Section to meet the required class of workmanship indicated below in accordance with AMP 555, Section 8.
- .1 Class 1: for use on direct exposed to view fabricated items:
  - .1 Exposed surfaces are finished smooth with pitts, mill marks, nicks, burrs, sharp edges, and scratches filled or ground off. Defects should not show when painted, polished, or finished.
  - .2 Welds should be concealed where possible. Exposed welds are ground to small radius with uniform sized cove unless otherwise noted.
  - .3 Distortions should not be visible to the eye.
  - .4 Exposed joints are fitted to a hairline finish.

.3 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.

Part 2 Products

2.1 MATERIALS

.1 General:
- .1 All materials under Work of this Section, including but not limited to, primers and paints are to have low VOC content limits.
- .2 Unless detailed or specified herein, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
- .3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of Work of this Section.

.4 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.

.2 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W. Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.

.3 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.

.4 Welding materials: CSA W48 and CSA W59-M.

.5 Fasteners: Conforming to ASTM A307, Grade A, in areas not exposed to view, use unfinished bolts with hexagon heads and nuts. In areas exposed to view, use bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts Z275 zinc coated in accordance with ASTM A653/A653M. Supply bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.6 Finish coating: Epoxy Polyester coating where indicated on drawings, conforming to AAMA 2603 with gloss, satin, matt or texture finish. Colour to later selection by Consultant. 'D1000 Series' by Akzo Nobel Powder Coatings Ltd. or approved alternative. Provide manufacturers recommended primer.

.7 Primer paint: CPMA 1.73a.

.8 Galvanized primer paint: Inorganic zinc rich primer. For use on galvanized fabrications where touch up is to remain unpainted in finished work; Carbozinc 11WB by Carboline Company, Catha-Coat 305 by Devoe Coatings or Zinc Clad XI by Sherwin Williams.

.9 Drilled inserts: Mega by ITW Construction Products or HSL by Hilti Inc. heavy-duty anchors, sizes as shown.

2.2 FABRICATION

.1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to the Consultant.

.2 Fit and assemble Work in shop where possible. Execute Work in accordance with details and reviewed shop drawings.

.3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use screws for interior metal work. Use welded connections for exterior metal Work unless otherwise found acceptable by the Consultant.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.

.5 Execute shop welding to requirements specified.

.6 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to the Consultant's acceptance.

.7 Assemble members without twists or open joints.

.8 Correctly size holes for connecting Work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.

.9 Draw mechanical joints to hairline tightness and seal countersunk screw and access holes for locking screws with metal filler where these occur on exposed surfaces.

2.3 FABRICATED ITEMS

.1 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.

.2 Where work is required to be built into work of other Sections supply such members to respective Sections.

.3 Provide metal fabrication items indicated below and items not indicated to be supplied under other Sections. The following items includes miscellaneous and metal fabrication including but not limited to the items listed below.

.4 Miscellaneous steel brackets, plates, supports and angles:

.1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.

.2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.

2.4 ANCHORS AND FASTENING

.1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.

.2 Use self-drilling expansion type concrete anchors for attaching to masonry and concrete.

.3 Do not secure items to steel deck.

.4 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

2.5 WELDING

.1 Perform welding by electric arc process.

.2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
- .1 CSA W48 - for Electrodes. If rods are used, only coated rods are allowed.
- .2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.
- .3 CAN/CSA W117.2-M - for safety.

.3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish paint.

.4 Test welds for conformance and remove Work not meeting specified standards and replace to Consultant's acceptance.

2.6 SHOP PAINTING

.1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.

.2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.

.3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.

.4 Clean but do not paint surfaces being welded in field.

.5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.

.6 Do not prime steel to be fireproofed or to receive intumescent paint coating.

.7 Do not prime machine finished surfaces, but apply an effective anti-rust compound.

.8 Take precautions to avoid damage to adjacent surfaces.

2.7 HOT DIP GALVANIZING

.1 After fabrication, hot dip galvanize specific miscellaneous steel items as indicated. After galvanizing, plug relief vents air tight with appropriate aluminum plugs as suitable and required for intended metal fabricated item. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.

.2 Hot-dip galvanize members in accordance with requirements of the following ASTM, with minimum coating weights or thicknesses as follows:

.1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/metre of actual surface, for 4.8 mm and less thickness members 600 g/m^2 for 6 mm and heavier members 640 g/m^2.

.2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153,Table 1 for the various classes of materials used in the Work.

Part 3 Execution

3.1 EXAMINATION

.1 Examine previously installed Work, upon which this Section depends, verify dimensions and condition of existing Work, and coordinate repairs, alterations, and rectification if necessary. Commencement of Work of this Section is deemed to signify acceptance of existing, prior conditions.

.2 Obtain Consultant's written approval prior to field cutting or altering of structural members.

3.2 ERECTION

.1 Install metal fabrications in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

.3 Perform drilling of concrete and steel as required to fasten Work of this Section.

3.3 TOUCH UPS

.1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for rough carpentry Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.

.3 ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.

.6 CAN/CSA O80 Series M, Wood Preservation.

.7 CSA O121-M, Douglas Fir Plywood.

.8 CAN/CSA O141, Softwood Lumber.

.9 CSA O151-M, Canadian Softwood Plywood.

.10 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority

1.3 QUALITY ASSURANCE

.1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: Grade mark in accordance with applicable CSA standards.

.3 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.

.4 Moisture Content of wood at time of construction shall be 19% maximum.

.5 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80-M.

6. Dimensions of lumber shall conform to dressed sizes specified in CAN/CSA-0141 unless actual dimensions are otherwise indicated or specified.

7. Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions shall be dry size.

.8 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Consultant for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.

1.4 ENVIRONMENTAL REQUIREMENTS

1. When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Store materials in a dry area. Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.

Part 2 Products

2.1 MATERIALS

.1 General: All materials under Work of this Section, including but not limited to, adhesives are to have low VOC content limits.

.2 Lumber: Softwood, G4S, moisture content 19% or less at time of installation, in accordance with the following:
- .1 Lumber shall be of same species and grade, equally seasoned and shall be processed and stamped at same mill.
- .2 CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.
- .3 Board quality: Construction or better.
- .4 Dimension quality:
  - .1 Structural joists, planks, and framing: No. 1 Select Structural.
  - .2 Light framing: Construction.

.3 Plywood: CSA O121-M, G1S, T & G, standard construction, laminated with waterproof adhesive, exterior grade, Thickness as indicated on drawings.

4. Sheathing: Douglas Fir, CSA 0121-M or CSA O151-M; Select-Tight Face, exterior grade, T&G.

.5 Roof lumber: NLGA, Construction grade light framing, Jack Pine, S4S, pressure treated to CAN/CSA-O80 series using copper based waterborne preservative treatment, impregnated to a net retention of 4 kg/ m^3 of preservative unless otherwise specified by preservative manufacturer.

.6 Surface applied wood preservative: Green coloured copper napthenate or 5% pentachlorophenol solution, water repellant preservative or same copper based preservative as used for shop impregnation, in accordance with CAN/CSA O80.

.7 Fire retardant treatment of lumber and plywood (interior and protected locations): 'Dricon FRT' fire retardant treatment by Biewer Lumber or approved alternative, conforming to ASTM E84, to provide a flame spread rating of 25 or less.

.8 Rough hardware: Conforming to ASTM F1667; Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:

.1 Nails, spikes and staples: Spiral type.

.2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.

.3 Screws: Countersunk head, full thread type.

.4 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.

.5 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere.

.9 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in pressure treated wood.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 GENERAL

.1 Lay out work carefully and to accommodate work of others. Cut and fit accurately: erect in position indicated by Drawings.

.2 Install rough carpentry to allow for expansion and contraction of the materials.

.3 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.

.4 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.

.5 Provide anchors, bolts, and inserts required for attachment of the work of this Section, to those performing the work of other Sections and who are responsible for their installation.

.6 Do not attach work by wood plugs or blocking in concrete or masonry. Use lead shields, expansion shields, or similar methods only as approved by Consultant.

3.3 MISCELLANEOUS WOODWORK

.1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for Work under other Sections. Do not assume that Drawings show required work exactly or completely. Anchor wood members securely in place.

.2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other Work.

.3 Except where steel supports are specifically shown, provide continuous wood blocking and supports in metal stud partitions for fastening of item such as casework and all wall mounted components and wall mounted accessories. Have respective trades approve the location of such wood blocking.

.4 Bolt wood blocking or nailing strips to steel framing.

.5 Align and plumb faces of furring and blocking to tolerance of 1:600.

.6 Use fire retardant lumber for blocking/framing in ceiling\ spaces, partitions and bulkheads.

.7 Secure wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.

3.4 ROOF WOODWORK

.1 Install continuous wood nailers around roof perimeters, curbs and roof openings larger than 150 x 150 mm, and at edges of insulation as detailed. Install inorganic fibrous cants and continuous nailers on copings and curbs as detailed.

.2 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation and roof hopper.

.3 Secure roof sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing. Use sheathing clips between sheets between roof

framing members. Provide solid edge blocking between sheets. Fully engage tongue and groove edges.

3.5 BACKBOARDS

.1 Install plywood backboards full sheets vertically, sanded grade, solid both sides, primed and painted white on both sides, with wood preservative and fire-retardant paint.

.2 Use minimum 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

3.6 FASTENERS

.1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.

.2 Use hot dipped galvanized fasteners for exterior Work and Work below grade.

.3 Countersink bolts and bolt heads as required for clearance of other Work.

.4 Size fasteners to penetrate base member by half of fastener length minimum. Minimize splitting of wood members by staggering nails in direction of grain.

.5 For plywood use spiral, annular or resin coated nails and staples.

3.7 SURFACE-APPLIED WOOD PRESERVATIVE

.1 Treat raw surfaces, drilled holes and cut ends of pressure treated wood with 2 coats of wood preservative immediately after cutting.

.2 Apply preservative by dipping, by brush or by pouring into plugged holes to completely saturate surface.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products equipment and services necessary for the finish carpentry work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ANSI A208.1, Particleboard.

.2 ANSI/HPVA HP-1, Hardwood and Decorative Plywood.

.3 ANSI A208.2, Medium Density Fibreboard for Interior Use.

.4 ANSI/NEMA LD 3, High-Pressure Decorative Laminates.

.5 APA - The Engineered Wood Association.

.6 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.

.7 Architectural Woodwork Manufacturers Association of Canada (AWMAC).

.8 North American Architectural Woodwork Standards (NAAWS).

.9 CAN/CSA O141, Softwood Lumber.

.10 CSA O151-M, Canadian Softwood Plywood.

.11 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress.

.12 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber.

1.3 SUBMITTALS

.1 Shop drawings: Submit shop drawings of finish carpentry work in accordance with Section 01 00 00 indicating:

- .1 Materials, thicknesses, sizes, finishes, wood species, grades, profiles, connection attachments, shop jointing, field jointing, reinforcing, anchorage, fastener types and sizes, location of exposed fastenings, mechanical and electrical service routes, service outlets, cutout locations, and sizes.
- .2 Include erection drawings, plans, elevations, sections, and details as applicable.

.2 Samples: Submit samples of the following in accordance with the requirements of Section 01 00 00:
- .1 Two of each colour, pattern, gloss, and texture of plastic laminate/thermofoil, in manufacturer's standard tag size.
- .2 Two samples of laminated plastic joints, edging, cutouts and postformed profiles.
- .3 Two of each solid surface, in 100 x 75 x 12 mm samples.
- .4 Two samples of melamine surfaced board, edging and postformed profiles.
- .5 One of each item of finish carpentry hardware.

1.4 QUALITY ASSURANCE

.1 Execute work of this Section by member of AWMAC, with 5 years experience in finish carpentry work of comparable complexity and scope. Submit proof of experience upon Consultant’s request.

.2 Fabricate finish carpentry work in accordance with NAAWS, Premium Quality materials and installation unless otherwise indicated. Perform work in accordance with the definition of Good Workmanship as defined in the NAAWS.

.3 Remove and replace finish carpentry work which does not conform to the NAAWS or as amended by these Specifications.

.4 Mock-up:
- .1 Shop fabricate one mock-up of a base cabinet, wall cabinet, and counter top for each type of surfacing specified, complete with hardware and shop applied finishes, installed in location acceptable to Consultant.
- .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle finish carpentry in accordance with the NAAWS. Control the temperature and humidity in accordance with the NAAWS recommendations, before, during, and after finish carpentry delivery, and also during storage and installation.

.2 Cover finished plastic laminated work with heavy kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove until immediately before final inspection.

1.6 EXTENDED WARRANTY

.1 Submit an extended warranty for plastic laminate work of this Section in accordance with General Conditions, except that warranty period is extended to 2 years from date of Substantial Performance of the Work.
- .1 Warrant against defects in material and workmanship including but not limited to opening of joints, cracking, shrinkage, warpage, and delamination of plastic laminate.
- .2 Coverage: Complete replacement including affected adjacent Work.

Part 2 Products

2.1 MATERIALS

.1 General: All materials under work of this Section, including but not limited to, adhesives and mastics, are to have low VOC content limits.

.2 Concealed framing lumber and plywood:
- .1 Eastern Spruce, Balsam Fir, or Jack Pine, to CAN/CSA O141, NLGA, and NAAWS Custom Grade, S4S, average moisture content 7% +/- 2% at installation.
- .2 Softwood plywood: CSA O151-M; 19 mm unless indicated otherwise, (G2S).

.3 Hardwood lumber: NHLA and NAAWS Premium Grade, S4S, average moisture content 7% +/- 2% at installation.

.4 Hardwood plywood:
- .1 Hardwood plywood conforming to ANSI/HPVA HP-1.
- .2 Multi-ply, veneer throughout, APA plywood, Grade A-D, in sizes, thickness and shapes as indicated.
- .3 Wood veneer:
  - .1 Conforming to ANSI/HPVA HP-1 having finishes and meeting grades as follows:
    - .1 Opaque finish, Grade B.
    - .2 Transparent finish, Grade AA.
  - .2 Face veneer cut: As indicated.
  - .3 Sizes, thickness, and shapes as indicated.

.5 Veneer core plywood (substrate): APA plywood, Grade A-D, in sizes, thickness and shapes as indicated.

.6 Wood veneer:
- .1 Conforming to ANSI/HPVA HP-1 having finishes and meeting grades as follows:
  - .1 Opaque finish, Grade B.
  - .2 Transparent finish, Grade AA.
- .2 Face veneer cut: [Random match] [Slip match][Book match][As indicated].
- .3 Sizes, thickness, and shapes as indicated.

.7 Plastic laminate: Provide plastic laminates conforming to ANSI/NEMA LD 3 as follows:
- .1 Flatwork face sheet: 1.2 mm thick, heavy wear resistance.
- .2 Vertical interior face sheets: 0.8 mm thick.
- .3 Postformed face sheet: 0.8 mm thick.
- .4 Backing sheet: thickness to match face sheet, high pressure laminate, manufactured by same manufacturer as face sheet.
- .5 Plastic laminate: As manufactured by Arborite, Formica, Forbo, Nevamar, Pionite and Wilsonart.
- .6 Colours: To the later selection of the Consultant from manufacturer's standard colour range.

.8 Melamine Surfaced Particleboard: ANSI A208.1, Grade M2 particleboard with a melamine impregnated decorative paper thermofused onto the surface. Edging to be done in minimum 0.5 mm thin PVC to match melamine colour. 'Panval Thermofused Melamine Panels' by Uniboard Canada Inc. or approved alternative. Colours as follows:
- .1 Interior millwork surfaces: White.
- .2 Exterior millwork surfaces: Colour and pattern as selected by Consultant.

.9 Thermofoil surfaced particleboard: Particleboard with a decorative paper thermofused onto the surface. Edging to be done in colour to match. As manufactured by Normac or approved alternative in finish to be selected by Consultant.

.10 Solid surfacing:
- .1 12 mm thick sheet stock, provide with bullnose edge and all cutouts as required. 'Corian' solid surfacing by DuPont or approved alternative in colour selected by Consultant.
- .2 Installation and seam adhesives to be as recommended by solid surfacing manufacturer, colour matched to solid surfacing.

.11 Medium Density Fibreboard (MDF), core or panel: ANSI A208.2; omnidirectional, light coloured with uniform density throughout 'Superior MDF' by G-P Flakboard Ltd. or 'Panfibre Excel MDF' by Uniboard Canada Inc., meeting the following minimum criteria:
- .1 Density: 740 kg/m^3.
- .2 Internal bond: 0.8 N/mm^2.
- .3 Modulus of rupture: 30 N/mm^2.
- .4 Modulus of elasticity: 3400 N/mm^2.
- .5 Face screw holding: 1450 N.
- .6 Core screw holding: 1300 N.
- .7 Moisture content: 4-7%

.12 Particle board core: ANSI A208.1, Grade M2 of thickness indicated. Particleboard to be bound with waterproof adhesive and meeting the following minimum criteria:
- .1 Density: minimum 705 kg/m^3.
- .2 Internal bond: 0.45 N/mm^2.
- .3 Modulus of rupture: 14.5 N/mm^2.
- .4 Modulus of elasticity: 2250 N/mm^2.
- .5 Face screw holding: 1000 N.

.13 Laminating adhesive: CSA O112 Series, water resistant type, low VOC content, selected by laminate manufacturer for intended end use.

.14 Draw bolts and splines: Type as recommended by fabricator.

.15 Nails and staples: Conforming to ASTM F1667; Size and type to suit application, galvanized for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.16 Bolts, nuts, washers, blind fasteners, lags and screws: Size and type to suit application. Stapling is not acceptable.

.17 Adhesive and bituminous mastic: Selected by the millwork fabricator with low VOC content.

.18 Miscellaneous metals: In accordance with Section 05 50 00.

.19 Glass and glazing materials: In accordance with Section 08 80 00.

.20 Finishing: In accordance with Section 09 91 00.

2.2 HARDWARE

.1 The following hardware is the minimum quality standard for the work of this Section. Alternatives may be considered provided they are approved by Consultant prior to ordering of products.

.2 Drawer slides: Galvanized steel construction, call bearings separating tracks, full extension type.

.3 Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 25 mm centres; satin.

.4 Shelf Brackets: Formed steel brackets, formed for attachment with lugs; satin finish.

.5 Cabinet hinges: Heavy duty, concealed, steel with satin finish.

.6 Drawer and cabinet pulls: Extruded aluminum U shaped pull, aluminum with satin finish, 100 mm

.7 Magnetic catches: Model 918 by Knape & Vogt or similar.

.8 Locks: Cam locks/deadbolt locks complete with lock core by Hafele, type to suit application and installation. Two keys per lock, steel with satin finish.

2.3 PLASTIC LAMINATE WORK

.1 Perform plastic laminate work in accordance with NAAWS and ANSI/NEMA LD 3.

.2 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.3 Laminate plastic laminates to core materials in accordance with manufacturer's instructions.

.4 Fabricate core surfaces and profiles with continuous support and bond over entire surface to receive plastic laminate.

.5 Apply plastic laminate backing sheets to balance shrinkage stresses induced by plastic laminate face sheets.

.6 Joints:
- .1 Install joints in accordance with reviewed shop drawings.
- .2 Jointing shall be placed at logical locations in intended millwork item and shall meet the overall aesthetic intent of the Consultant.
- .3 Minimize joints in plastic laminate work.
- .4 Do not install joints in plastic laminate work in less than 2400 mm o.c.
- .5 Locate joints minimum 610 mm from cut-outs.
- .6 Offset core and plastic laminate facing joints.

.7 Form shaped profiles and bends as indicated, using postformed grade laminate to laminate manufacturer's instructions.

.8 Edging to be done using straight self-edging laminate strip to match adjacent colour, finish, gloss, and pattern to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.9 Apply laminated plastic liner sheet to interior of cabinetry and where indicated.

.10 Fabricate units by solid surfacing manufacturer's certified or approved fabricator/ installer.

.11 Fabricate built-up profiles as indicated.

2.4 FABRICATION

.1 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other sections.

.2 Coordinate locations of concealed supports and blocking with other parts of work. Provide cutouts for outlet boxes and other fixtures.

.3 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections in wherever possible.

.4 Set nails and countersink screws, apply wood filler to indentations, sand smooth and leave ready to receive finish.

.5 Mitre exposed corners, no end grain shall be visible in completed installation.

.6 Fabricate thermofoil units by manufacturer's certified or approved fabricator/ installer.

.7 Finish millwork in accordance with Section 09 91 00. Finished millwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity of colour, grain and texture.

.8 Shelving to cabinetwork to be adjustable unless otherwise noted.

.9 Recess shelf standards, unless noted otherwise. Stagger recessed shelf standards on opposite sides of divider.

.10 Do not exceed maximum 760 mm unsupported span for 19 mm thick shelving. House fixed shelving into gables and divisions.

.11 Shop assemble finish carpentry to accommodate delivery and handling and to ensure passage through building openings.

.12 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.13 Fabricate base from MDF 100 mm high x 16 mm thick, finished in accordance with Section 09 91 00.

.14 Fabricate frames and benches to profiles shown.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install finish carpentry work in accordance with NAAWS and tolerances for architectural woodwork and reviewed shop drawings.

.2 Set and secure finish carpentry in place, rigid, plumb, square, and level.

.3 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate columns, fixtures, outlets, or other projecting, intersecting or penetrating objects leaving a 1 mm gap maximum. Do not use additional overlay trim for this purpose.

.4 Coordinate cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures, in finish carpentry. Round internal corners of cut-outs and seal exposed cores.

.5 Form joints to conceal shrinkage.

.6 Install draw bolts and splines in laminated plastic counter top joints at maximum spacing 450 mm o.c., and 75 mm from edge. Make joints flush, hairline butt joints.

.7 Install finishing hardware accurately and securely in accordance with manufacturer's directions, adjust and clean.

.8 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

.9 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.

.10 Melamine panels: Assemble melamine millwork using dowelled/wafered-and-glue construction. Installed melamine panels shall not show any exposed fasteners on finished/exposed surfaces.

.11 Solid surfacing:
- .1 Install solid surfacing in accordance with manufacturer's instructions.
- .2 Align work plumb and level.
- .3 Seal perimeter of fabrication to adjacent construction in accordance with Section 07 92 00.

.12 Door frames:
- .1 Butt and cope internal joints of door frames to make snug, tight, joint. Cut right angle joints with mitred joints.
- .2 Fit backs of frames snugly to wall surfaces to eliminate cracks at junction of frame with walls.

.13 Fastening:
- .1 Coordinate wall securement, anchorage, and blocking for finish carpentry items. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- .2 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .3 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .4 Provide heavy duty fixture attachments for wall mounted cabinets.
- .5 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.14 Remove and replace damaged, marked, or stained finish carpentry.
.15 Test installed work for rigidity and ability to support loads
.16 Adjust moving or operating parts to function smoothly and correctly.
.17 Clean casework, counters, shelves, hardware, fittings and fixtures.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products equipment and services necessary for spray applied waterproofing work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM D41 - Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

ASTM D449 - Asphalt Used in Dampproofing and Waterproofing.

.2 ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

.1 Product data:
- .1 Submit manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Materials list of items to be provided under this Section.
  - .2 Manufacturer's specifications and other data needed to ensure compliance with the specified requirements including but not limited to installation details and physical properties.
  - .3 Manufacturer's current recommended installation procedures.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 00 00 indicating:
  - .1 Adjacent construction and typical details, dimensions, thickness, crack and joint treatment, method of attachment, protection and penetration details.
  - .2 Location of each membrane penetration.

.3 Certificates:
- .1 Submit certifications for items required at least 4 weeks prior to installation of work of this Section.
- .2 Submit manufacturer's certification that waterproofing system materials and accessories supplied are compatible, meet Specification requirements and that installer is licensed/approved by membrane manufacturer.
- .3 Submit manufacturer's certification that waterproofing components are approved for use as complete waterproofing system.
- .4 Submit Contractor's certification that waterproofing installers and quality control supervisors meet Specification requirements. Submit names of successful membrane installations in which certified personnel have performed tasks of comparable complexity and scope within preceding 5 years.
- .5 Submit inspection reports and certification by manufacturer confirming that installations are in accordance with manufacturer's requirements.

.4 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.4 QUALITY ASSURANCE

.1 Perform work of this Section by company, approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

.2 Applicator qualifications:
- .1 Applicator shall have at written approval from the manufacturer as recommended for the installation of spray-applied waterproofing.
- .2 Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

.3 Mock-up:
- .1 Construct one 3 m^2 mock-up of waterproofing system in a location acceptable to the Consultant. Show stages of application and crack and joint preparation and treatment.
- .2 Obtain Consultant's acceptance. Accepted mock-up may become part of the Work. Mark mock-up to Consultant's acceptance and match remainder of work to accepted mock-up. Remove unacceptable mock-up.

.4 Pre-installation meeting: Arrange with Consultant and manufacturer's representative to inspect substrates and review drawings and specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work minimum 48 hours in advance of installation.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

.2 Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

.3 Comply with pertinent provisions of Section 01 00 00.

1.6 SITE CONDITIONS

.1 Maintain air and substrate temperature at waterproofing installation area above 5C for 24 h before, during and 4 hrs after installation.

.2 Do not apply waterproofing in wet weather.

1.7 EXTENDED WARRANTY

.1 Submit an extended written warranty for fluid applied waterproofing in accordance with the General Conditions, except that warranty period is extended to 5 years from date of Contract Documents.
- .1 Warrant work against defects including adhesive failure, cohesive failure, waterproofing failure, and water leakage.
- .2 Coverage: Complete replacement including effected adjacent Work.

Part 2 Products

2.1 MATERIALS

.1 Asphalt Emulsion: Conforming to ASTM D3747, Asphalt Primer: ASTM D41, compatible with substrate, Asphalt Cement: ASTM D2822 Type I.

.3 Concrete repair, mastic, backer rod, sealants, primers, elastomeric sheet, protection boards and other accessory materials: As recommended by manufacturer.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition of previously installed Work upon which this Section depends. Verify conformance with manufacturer's requirements. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUBSTRATE PREPARATION AND PROTECTION

.1 Allow concrete substrates to cure 24 to 48 hours prior to surface preparation.

.2 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and foreign matter detrimental to the adhesion of the damp proofing system.

.3 Clean all surfaces to receive membrane system in accord with manufacturer's instructions; vacuum clean or blow clean with oil-free compressed air all surfaces to receive waterproofing membrane and accessories. Protect adjacent surfaces not being waterproofed.

.4 Rout, clean, prepare and detail surface cracks form tie holes, honeycombed areas, and other voids and holes which may impair performance of waterproofing membrane in accord with manufacturer's instructions; install backer rod where required.

.5 Clean metal surfaces to bright metal by wire brushing or mechanical etching; scuff-sand lead flashing and plastic surfaces.

.6 Verify items which penetrate surfaces to receive damp proofing are securely installed.

.7 Install detail cants, detail coats, joint and crack treatments, and liquid flashings in accord with manufacturer's instructions.

.8 Allow detail applications to cure in accord with manufacturer's instructions prior to general application of membrane.

.9 Prime surfaces in accordance with manufacturer's instructions.

.10 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.

3.3 APPLICATION

.1 Prime surfaces in accordance with manufacturer’s instructions.

.2 Seal items projecting through damp proofing surface with mastic. Seal watertight.

.3 Apply waterproofing in accordance with manufacturer's instructions.

.4 Continue membrane up wall to a minimum of 150 mm above final grade line or previously determined elevation.

.5 Ensure complete coverage to substrate, around flashings and protrusions and at changes in direction of surface. Re-apply thin spots and voids to obtain proper thickness. Work material into any fluted rib forming indentations.

.6 Immediately backfill against damp proofing to protect from damage.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for the thermal insulation Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.2 CGSB 71-GP-24M, Flexible Adhesive for Bonding Cellular Polystyrene Insulation.

.3 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.4 CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

1.3 SUBMITTALS

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 00 00 indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.

.2 Certification: Submit installer's certification verifying compliance with specification requirements.

1.4 QUALITY ASSURANCE

.1 Qualifications: Execute Work of this Section by company specializing in thermal insulation Work with minimum of three years, recent, documented experience, on Work of comparable complexity and scope.

Part 2 Products

2.1 MATERIALS

.1 All materials under Work of this Section, including but not limited to, adhesives are to have low VOC content limits.

2. Batt insulation:
   .1 Batt insulation (non-rated): CAN/ULC-S702, Type 1, friction fit; ‘Unfaced Thermal and Sound Control Batts’ by Johns Manville, ‘EcoTouch Pink Fiberglas Insulation’ by Owens Corning Canada or ‘ComfortBatt’ by Rockwool.

.2 Batt insulation (fire-rated/acoustic): ASTM C665, Paperless, semi-rigid, spun wool fibre mats, of thickness as indicated on Contract Drawings, 'MinWool SAFB' by Johns Manville, 'EcoTouch QuietZone' by Owens Corning Inc. or 'Roxul AFB' by Rockwool.

.3 Rigid insulation: CAN/ULC-S701, Type 4; Minimum RSI of 0.87 per 25 mm, Extruded polystyrene, ship-lapped edges. Thickness: As indicated on Drawings.
- .1 Styrofoam SM by Dow Chemical Canada Inc.
- .2 Foamular C-300 by Owens Corning Canada Inc.

.4 Adhesive for polystyrene insulation: CGSB 71-GP-24M, Type 2, Class A, and approved by air/vapour barrier manufacturer when adhesive is in direct contact with air/vapour barrier membrane.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Ensure substrate surfaces are dry, clean, suitable to receive adhesive and free from other deleterious substances.

3.2 INSTALLATION

.1 Install thermal insulation in longest panel sizes possible in accordance with manufacturer's instructions.

.2 Butt insulation with moderate contact and, cut and fit them tightly around other construction elements. Offset single layer vertical joints and both vertical and horizontal joints in multiple layer applications.

.3 Make thermal insulation continuous, maintain thermal protection continuity and secure to prevent displacement. Ensure that insulation is tight to substrate without air gaps.

.4 Cut and fit thermal insulation tightly around electrical boxes, plumbing and heating pipes and ducts, exterior doors and windows, and other protrusions.

.5 Leave 75 mm separation between thermal insulation and heat emitting devices such as recessed light fixtures.

.6 Cut and trim thermal insulation neatly to fit spaces; do not excessively compress insulation to fit. Install only thermal insulation boards which are free from chipped or broken edges.

.7 Pack miscellaneous cavities with insulation to maintain continuity of thermal barrier.

.8 Arrange for Consultant to review thermal insulation before it is enclosed.

.9 Ensure continuous insulation on face and back of roof parapets.

.10 Place insulation under slabs on grade after base for slab has been compacted.

.11 Prevent insulation from being displaced or damaged while placing vapour retarder and placing slab.

3.3 SECUREMENT

.1 Batt insulation: Install batt insulation in partitions, between studs, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions. Fill stud cavities to full height of partitions and carefully cut and fit batt insulation around services and protrusions.

.2 Rigid insulation (adhesive attachment):

.1 Apply adhesive to thermal insulation foam boards in accordance with manufacturer's recommendations.

.2 Omit adhesive bonding of foam board insulation over expansion and control joints.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Design, labour, Products, tools, equipment and services necessary for fire rated exterior insulation and finish system (EIFS) and soffit work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM B117, Test Method of Salt Spray (Fog) Testing.

.3 ASTM C67, Method of Sampling and Testing Brick and Structural Clay Tile.

.4 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.

.5 ASTM C920, Specification for Elastomeric Joint Sealants.

.6 ASTM D968, Test Method for Abrasion Resistance of Organic Coatings by the Falling Abrasive.

.7 ASTM D5034, Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test).

.8 ASTM D5035, Test Method for Breaking Force and Elongation of Textile Fabrics (Slip Test).

.9 ASTM E695, Method for Measuring Relative Resistance of Wall, Floor, and Roof Constructions to Impact Loading.

.10 CSA A3000, Cementitious Materials Compendium.

.11 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.12 CSA A82.56, Aggregate for Masonry Mortar.

.13 CAN/CGSB-1.162, Stucco and Masonry Coating, Emulsion Type.

.14 CAN/ULC S702, Thermal Insulation, Mineral Fibre, for Buildings.

.15 CAN/ULC-S716.1, Standard for Exterior Insulation and Finish Systems (EIFS) – Materials and Systems.

.16 ULC-S716.2, Standard for Exterior Insulation and Finish Systems (EIFS) – Installation.

.17 ULC-S716.3, Standard for Exterior Insulation and Finish Systems (EIFS) – Design Practices Guide.

.18 CAN/ULC-S741, Standard for Air Barrier Materials - Specification.

1.3 SYSTEM DESCRIPTION

.1 Provide a complete drained exterior insulation and finish system consisting but not limited to the following components: Metal flashings, vapour retarder, mechanically fastened insulation, reinforcing fabric, base coat, drained joint system, and finish coat.

1.4 DESIGN REQUIREMENTS

.1 Design EIFS in accordance with ULC-S716.3 and EIFS Best Practice Guide and to withstand live, dead, lateral, wind, seismic, handling, imposed and other loads.

.2 Design EIFS assembly and panel design shall meet the provision of the Ontario Association of Architects (OAA) Wall Exclusions and Endorsements.

.3 Design EIFS to accommodate expansion and contraction of system elements without causing buckling, failure of joints, undue stress on fasteners or other effects detrimental to appearance or performance.

.4 Design EIFS to conform to the following performance properties:

- .1 Abrasion resistance, falling sand method to ASTM D968, no deleterious effects.
- .2 Salt spray resistance to ASTM B117, after 1000 hours exposure to 5% salt spray solution - no effects.
- .3 Freeze-thaw resistance: to ASTM C67, 50 cycles of 20 hours of freezing at -9°C and 4 hours of thawing in water at 24°C +/- 6°C, no visible damage, negligible weight gain.
- .4 Accelerated weathering: to CAN/CGSB-1.162, 2000 hours - no effect.
- .5 Impact resistant to ASTM E695, 13.6 kg. weight, twelve impacts, pendulum swing from 152 mm to 1800 mm, drop heights at 152 mm increments.
- .6 Bond strength: to CAN/CGSB-1.162.
- .7 Permeability to CAN/CGSB-1.162.

.5 Design EIFS using two stage drained seals and to Include sealant joints and air barrier connections at penetrations through EIFS.

.6 Design EIFS to connect to specified air barrier systems to ensure a continuous air barrier system.

.7 Design EIFS to ensure higher impact resistance of system to 1.8 metres minimum above grade and in locations Indicated on Drawings.

1.5 SUBMITTALS

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, performance characteristics, physical properties, water infiltration, structural performance and system limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 00 00 indicating:
  - .1 Wall layout, elevations, details, sections, dimensions, tolerances, connections, terminations, expansion and control joints, reveals, drained joints, finish system, installation sequence, including interface with doors, windows, and other components, edge treatment at discontinuous edges of insulation, and accessories and other pertinent information required for proper and complete installation.
  - .2 Complete design data to confirm that EIFS meet design requirements specified.

.3 Samples: Submit two 300 x 300 mm samples of complete EIFS and of each colour of finished wall system in accordance with Section 01 00 00.

.4 Reports: Submit written inspection reports within 5 working days after each inspection.

.5 Closeout submittals: Submit products used, finish coat, batch colours, and maintenance and cleaning instructions for EIFS for incorporation into Operations and Maintenance Manuals in accordance with Section 01 00 00.

.6 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.6 QUALITY ASSURANCE

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience installing EIFS of similar size and nature and that is approved by system manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.2 EIFS manufacturer shall conduct Site inspections for on site verification of installation procedures and methods during the installation of EIFS system and shall prepare and submit written inspection reports. Perform inspections after installation of the air/vapour retarder, installation of base coat and at completion of EIFS system. All associated costs of these inspections are the responsibility of the Contractor.

.3 Mock-up:

.1 Construct one 3 m^2 mock-up minimum of EIFS in location acceptable to Consultant. Mock-up to include all materials to be installed, tie into adjacent construction, and to demonstrate quality of work.

.2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.

.3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.4 Pre-installation meeting: Arrange with manufacturer's representative, EIFS Subcontractor, and Consultant to inspect substrates, review installation procedures, tie-ins to adjacent construction, construction sequencing, and site specific details minimum 5 working days in advance of installation.

1.7 SITE CONDITIONS

.1 Do not install work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:

.1 Ambient air and surface temperature: 5^0C to 35^0C

.2 Precipitation: None.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 24 hours before, during, and 24 hours after installation. Provide heat and protection to both interior and exterior sides of walls.

.3 Do not proceed with application of materials immediately prior to, during or immediately after inclement conditions, or if wet weather is anticipated within 24 hours after application. Do not apply materials to wet, frozen, or frosted surfaces.

.4 Protect applied coatings from rapid evaporation during dry and hot weather.

1.8 EXTENDED WARRANTY

.1 Provide an extended single source warranty for EIFS work in accordance with the General Conditions, except that the warranty period is extended to 5 years from date of Substantial Performance of the Work.

.1 Warrant against failure to meet the design criteria and requirements such as failure to stay in place (both insulation and lamina), failure to drain cavity and joints, peel, flake, chip, cracking, warping, leakage, finish degradation, and sealant failure.

.2 Coverage: Complete replacement including affected adjacent Work.

Part 2 Products

2.1 MATERIALS

.1 All materials under work of this Section, including but not limited to, coatings, sealants, primers, and sealers are to have low VOC content limits, shall be compatible, and from a single manufacturer.

.2 This specification is written on the basis of Equalite System by Durabond. Specified

manufacturer's system establish the minimum acceptable standards for the work of this Section. EIFS systems from Adex Systems, Dryvit Canada, or DuRock Alfacing International shall meet or exceed specified manufacturer's requirements.

.3 Water: Potable.

.4 Metal flashings: In accordance with Section 07 62 00.

.5 Flexible flashings: 1.0 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film compatible with air barrier adhesive and EIFS system.

.6 Air barrier: Flexible copolymer water resistive/air barrier to meet the following:
- .1 Water vapour permeance: Minimum 136 ng/Pa.s.m^2 to ASTM E96.
- .2 Air permeance: <0.002 L/s m2 to CAN/ULC S741.
- .3 Thickness: As recommended by manufacturer.
- .4 Acceptable manufacturers: 'Durex AirStop' by Durabond or approved alternative.

.7 Insulation: Mineral fibre to CAN/ULC-S708, minimum density of 128 kg/m^3, minimum RSI value of 0.71 per 25 mm, thickness as shown of Contract Drawings.

.8 Fasteners: Recommended by EIFS manufacturer for attaching insulation minimum 25 mm penetration into substrate, complete with insulation plates. Corrosion resistant coated.

.9 Reinforcing mesh: balanced, open weave, glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, both standard and high-impact types. Use high-impact mesh below top of door frames and standard mesh everywhere else.

.10 Base coat: Acrylic based, non-combustible cementitious coating system of Portland cement, silica sand aggregate, acrylic liquid admixture, colour grey.

.11 Primer coat: Acrylic based primer tinted to match finish coat.

.12 Finish coat: Waterproof, air cured, self bonding acrylic resin plaster material containing silica aggregate, integral mineral pigmentation and additives, colour selected by Consultant from manufacturer's full colour range. Finish coat primer, if required, as recommended by EIFS manufacturer.

.13 Vent Strip: Pre-coloured vent strip mesh with a minimum weight of 320 grams/sq.m. Colour as selected by consultant.

.14 Sealant and sealant primer: ASTM C920, Type S, Grade NS; 'Dowsil 790' by Dow Consumer Solutions or 'Spectrem 3' by Tremco Limited complete with primer recommended by manufacturer.

.15 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 - 200 kPa, outsized 30 to 50%.

2.2 MIXES

.1 Measure and batch materials by either volume or weight only, to accurately control and maintain proportions. Mix and prepare materials in accordance with manufacturer's written instructions.

.2 Do not add any additional additives, rapid binders, antifreeze, accelerators, fillers or pigments without the written approval of the EIFS manufacturer and Consultant.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that substrate conditions and previously installed work upon which this Section depends meet design tolerances in accordance with CAN/ULC-S716.2 and are acceptable for product installation in accordance with manufacturer's written instructions. Inform Consultant in writing of unacceptable conditions upon discovery. Proceed with installation only after all unacceptable conditions have been rectified.

3.2 PREPARATION

.1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, and other foreign matter detrimental to performance. Ensure environmental and site conditions are suitable for installation of system.

.2 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.

.3 Prepare surfaces in accordance with CAN/ULC-S716.2 and manufacturer's written instructions.

.4 Protect finished work at end of each day or on completion of each section of work from water penetration. Protect top of walls, and openings until flashings and trim are installed. Protect completed installation from moisture for 48 hours minimum.

3.3 FLASHINGS

.1 Install flexible flashings at all openings and penetrations in substrate and in locations indicated to drain any moisture entering EIFS system to the exterior. Install flexible flashing in accordance with CAN/ULC-S716.2 and manufacturer’s written instructions.

.2 Install metal flashings in locations indicated in accordance with Section 07 62 00. Fasten flashings to substrate at 450 mm o.c. minimum.

3.4 AIR BARRIER

.1 Prior to installation, tape and seal all joints in substrate with air barrier and mesh reinforcing prior to installation of air barrier and drainage layer

.2 Install minimum 1.5 mm air barrier in accordance with manufacturer's written instructions to provide a continuous Class 3 air barrier.

.3 Do not start installation of insulation until air barrier has been inspected and approved in writing by inspection and testing agency approved by EIFS manufacturer.

3.5 INSULATION

.1 Install insulation in accordance with CAN/ULC-S716.2 and the manufacturer's written instructions.

.2 Install insulation in running bond pattern with long edge oriented horizontally. Stagger and interlock edges at corners. Butt joints tight except at control joints. Pre-cut to fit openings, corners and projections prior to installation. Mechanically fasten insulation in place maximum 300 mm o.c. vertically and 400 mm o.c. horizontally and within 150 mm of the edge and spaced not more than 200 mm o.c. at terminations, as recommended by exterior insulated wall system manufacturer.

.3 Provide reveals in insulation boards as indicated. Ensure reveals are true to size and straight and level throughout. Ensure all reveals are in accurate alignment over entire wall surface.

.4 Fill all gaps in insulation boards and around projections with mineral fibre batt insulation.

3.6 VENT STRIP

.1 Install vent strip at bottom of EIFS system to provide free draining 25 mm wide strip. Block out standard reinforcing fabric and corner mesh prior to applying base and scratch coats.

3.7 FINISH SYSTEM

.1 Install EIFS in accordance with CAN/ULC-S716.2 and reviewed shop drawings and manufacturer's written instructions. Comply with system manufacturer's requirements regarding terminations at end of each days work and resumption of work.

.2 Install starter strips behind insulation boards and returning onto the face of insulation boards. Mechanically fastened to insulation boards with plastic fasteners prior to installation of reinforcing fabric over exterior faces of insulation panels.

.3 Install reinforcing mesh to cover full extent and height of previously installed starter strips and balance of insulation. Apply mesh to be continuous at corners, along both edges of expansion/control joints, with fabric end and edge joints lapped 100 mm minimum. Secure reinforcing mesh to insulation in accordance with manufacturer's instructions.

.4 At discontinuous insulation board edges, terminate fabric along line even with bottom of insulation board.

.5 Apply base coat to a minimum total dry film thickness of 1.6 mm continuously over insulation. Maintain wet edge and avoid cold joint or staging marks. Embed the reinforcing mesh into the base coat. Ensure that trowelling process fills all voids in the fabric.

.6 Apply a second base coat once first base coat has dried to obtain an overall base coat thickness of not less than 3 mm.

.7 Final surface shall be smooth, straight and true to a tolerance of not more than 3 mm in 3000 mm. Surface shall be free of trowel marks, irregularities and visible mesh pattern.

.8 Allow 24 hours minimum for curing and drying, protect base coat from contamination and other damage detrimental to system appearance and performance.

.9 Prior to installation of finish coat, prime and seal joints at abutting building components, at expansion/control joints, and at through wall flashings with specified sealant in accordance with manufacturer's instructions. Sealing of finish coat will not be accepted. Leave 25 mm gaps in sealant at through wall flashings at 600 mm o.c.

.10 Apply primer and finish coat continuously in one operation with levelling and texturing occurring simultaneously. Maintain wet edge and avoid cold joints or staging marks. Achieve final colour and texture free from defects detrimental to appearance and performance to match accepted sample.

.11 Protect finish coat from weather, contaminants, and other damage detrimental to system appearance and performance.

3.8 CONTROL JOINTS

.1 Unless otherwise indicated on drawings, install 12.7 mm control joints to divide wall area into maximum 20 m² panels with maximum 10 m horizontally and 3 m vertically in any direction, at dissimilar substrates, and at masonry wall joints as indicated on drawings.

.2 Caulk all control joints and joints between EIFS system and adjacent construction in accordance with manufacturer's written instruction.

3.9 CLEANING

.1 Clean any spots or blemishes from surface of work and leave system in clean condition. Re-apply stucco finish to damaged surfaces only if approved by Consultant, and to no additional cost to the Owner.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for vapour retarders Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM E1643, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.2 ASTM E1745, Standard Specification for Water Vapour Retarders used in contact with Soil or Granular Fill under Concrete Slabs.

.3 CAN/CGSB 19.21-M, Sealing and Bedding Compound, Acoustical.

.4 CAN/CGSB-51.34-M, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.3 SUBMITTALS

.1 Product data:

.1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:

.1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.

.2 Product transportation, storage, handling and installation requirements.

1.4 QUALITY ASSURANCE

.1 Submit in writing, a document stating that the applicator of the primary air/vapour barrier membranes specified in this section is recognized by the manufacturer as suitable for the execution of the Work.

.2 Perform Work in accordance with the manufacturer’s written instructions of the air/vapour barrier membrane and this specification.

.3 Maintain one copy of manufacturer’s written instruction on site.

.4 At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the air/vapour barrier membrane manufacturers’ representative.

.5 Components used in this section, used in the same assembly shall be sourced from one manufacturer, including sheet membrane, air/vapour barrier sealants, primers, mastics and adhesives and shall be compatible.

1.5 SITE CONDITIONS

.1 Do not install the Work of this Section outside of environmental ranges as recommended by manufacturer without Consultant's and Product manufacturer's written acceptance.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.

Part 2 Products

2.1 MATERIALS

.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Where indicated, primary water resistive air/vapour barrier for wall assemblies with cavity sprayed insulation shall be the insulation as specified in Section 07 21 19.

.3 Membrane air/vapour retarder and transition membrane:

.1 Membrane vapour retarder and transition membrane: 1.0 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film.

.1 ‘CCW 705' by Carlisle Coatings & Waterproofing.
.2 ‘Blueskin SA’ by Henry Company Canada Inc.
.3 ‘Sopraseal Stick 1100 T' by Soprema.
.4 ‘Exo-Air 110' by Tremco.
.5 ‘Air-Shield” by W. R. Meadows.

.2 Primer:

.1 ‘Cav-Grip Primer’ by Carlisle Coatings & Waterproofing.
.2 ‘Blueskin Adhesive' by Henry Company Canada Inc.
.3 ‘Sopraseal Stick Primer' by Soprema.
.4 ‘ExoAir Primer’ by Tremco.
.5 ‘Mel-Prime’ by W.R. Meadows.

.3 Mastic:

.1 ‘CCW 704 Mastic’ by Carlisle Coatings & Waterproofing.
.2 ‘Polybitume 570-05’ by Henry Company Canada Inc.
.3 ‘Sopramastic' by Soprema.
.4 ‘Acoustical Sealant’ by Tremco.
.5 ‘Sealtight Pointing Mastic' by W.R. Meadows.

.4 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.

.5 Fasteners: As specified herein or manufacturer’s recommended fastener for attaching to Substrate

.6 Sheet vapour retarder: ‘Super Six' Polyethylene film to CAN/CGSB-51.34, 0.15 mm (6 mil) thick

.1 Joint sealing tape: Air resistant pressure sensitive adhesive tape, type recommended by sheet vapour retarder manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere

.2 Sealant: CAN/CGSB 19.21; One-part, non-sag, non-bleeding, non-drying, non-hardening, sealant shall remain tacky for permanent bonding to all surfaces; 'Tremco Acoustical Sealant' by Tremco Ltd. or approved alternative

.7 Vapour retarder (under slab): ASTM E1745, Class A, minimum 0.38 mm (15 mil) thick; 'Stego Wrap Vapor Barrier' by Stego Industries or 'Perminator' by W.R. Meadows.

.1 Joint sealing tape: High density polyethylene tape with pressure sensitive adhesive with minimum width 100 mm. Type recommended by sheet vapour retarder manufacturer. Pipe and conduit boots: Construct pipe and conduit boots from vapour retarder material and pressure sensitive tape as recommended by manufacturer.

Part 3 Execution

3.1 EXAMINATION AND COORDINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Verify that existing substrates to receive vapour retarder are clean, dry, sound, smooth, and continuous.

.3 Coordinate installation of vapour retarders with work of other Sections to achieve a vapour tight building envelope.

3.2 SHEET VAPOUR RETARDER INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on the warm side of exterior wall, roof, and ceiling assemblies, prior to installation of roof insulation or interior finishes to form a continuous vapour retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

.5 At exterior surface openings, cut vapour retarder to form openings and ensure material is lapped and sealed to frame.

.6 Ensure continuity of vapour retarder is maintained at junctures with other materials.

.7 Supply labour, materials and equipment to complete the Work as shown on the Drawings and as specified herein to bridge and seal the following air leakage pathways and gaps:

.1 Connections of the walls to the roof air barrier.
.2 Connections of the walls to the foundations.
.3 Seismic and expansion joints.

.4 Openings and penetrations of window and door frames, store front, curtain wall.
.5 Piping, conduit, duct and similar penetrations.
.6 Fasteners, screws, bolts and similar penetrations.
.7 All other air leakage pathways in the building envelope.

.8 Provide slip sheets between top and bottom of studs in framed walls.

.9 At perimeter seals, seal perimeter of sheet vapour retarder as follows:
.1 Apply continuous bead of sealant to substrate at perimeter of sheets.
.2 Lap sheet over sealant and press into sealant bead.
.3 Install fasteners through lapped sheets at sealant bead into substrate.
.4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

.10 Seal lap joints of sheet vapour retarder as follows:
.1 Attach first sheet to substrate.
.2 Apply continuous bead of sealant over solid backing at joint.
.3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
.4 Install fasteners through lapped sheets at sealant bead into substrate.
.5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

.11 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:
.1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
.2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.3 UNDER SLAB VAPOUR RETARDER INSTALLATION

.1 Install sheet vapour retarder under the floor slab prior to installation of floor slab, to form a continuous vapour retarder in accordance with ASTM E1745 and manufacturer’s written instructions.

.2 Lap vapour barrier over footings and seal to foundation walls or waterproofing transition.

.3 Overlap joints 150 mm and seal with manufacturer approved sealing tape.

.4 Seal all penetrations (including conduits and pipes) with manufacturer's pipe boot.

.5 Use sheets of largest practical size to minimize joints.

.6 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

.7 Ensure continuity of vapour retarder is maintained at junctures with other materials.

.8 Tie horizontal blind side waterproofing with under slab vapour retarder.

3.4 SELF-ADHERING MEMBRANE VAPOUR RETARDER INSTALLATION

.1 Install vapour retarder and associated components in accordance with manufacturer's instructions in locations indicated.

.2 Mastic and primer:

.1 Install mastic where required to ensure integrity of vapour retarder installation at protrusions and other complex details.

.2 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for vapour retarder is achieved.

.3 Prime substrate surfaces to receive vapour retarder, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.

.4 Prime surfaces. Re-prime surfaces if not covered with vapour retarder within 4 hours.

.3 Lap vapour retarder ends and edges 50 mm minimum. Roll vapour retarder and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.

.4 Extend vapour retarder as required to connect to roof parapets, windows, doors frames, aluminum work and other components of Work comprising vapour retarder system.

.5 Ensure vapour retarder is upturned and tied to vertical surface of roof parapet with transition membrane.

.6 Provide end-dams and terminations fabricated from same material as membrane vapour retarder or material recommended by membrane manufacturer at sills, lintels, openings, and where horizontal surfaces intersect with vertical surfaces to ensure moisture is shed to exterior.

.7 Cut and fit and seal continuously vapour retarder as required for passage of protrusions, ensuring continuous adherence to substrate.

.8 Cut, fit and seal vapour retarder continuously as required around cast-in and pre-installed fasteners, sleeves, firestopping.

.9 At end of days' Work, trowel mastic water cut-off along uppermost edge of incomplete vapour retarder assembly, to prevent loss of adhesion and damage vapour retarder.

.10 Supply and install continuous mechanical fastening bar to clamp vapour retarder both sides of unfilled gaps, cracks, and joints.

3.5 FIELD QUALITY CONTROL

.1 Inspect vapour retarder continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.

.2 Where punctures and tears are extensive, replace entire damaged section.

.3 Do not cover or permit to be covered any portion of vapour retarder until it has been reviewed by Consultant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products equipment and services necessary for air barrier Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM C920, Specification for Elastomeric Joint Sealants.

.2 ASTM C1193, Standard Guide for Use of Joint Sealants.

.3 ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.

.4 ASTM E2178, Standard Test Method for Air Permeance of Building Materials.

.5 Perform design work in accordance with ANSI A58.1.

1.3 SUBMITTALS

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 00 00 indicating installation details, physical properties and detailed application and installation instructions.

1.4 QUALITY ASSURANCE

.1 Installer's qualifications: Perform Work of this Section by company, approved by Product manufacturer and having 3 years recent experience in Work of comparable complexity and scope.

.2 Perform Work in accordance with SWRI - Sealant and Caulking Guide Specification requirements for materials and installation.

.3 Pre-Installation Meeting: Arrange meeting on Site to be attended by Consultant, Contractor, and air barrier manufacturer’s representative to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect the surfaces to receive the air barrier, and installation procedures one week in advance of installation.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect materials from direct exposure to sunlight and physical damage.

1.6 SEQUENCING

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

1.7 COORDINATION

.1 Coordinate the work of this section with all sections referencing this section.

1.8 WARRANTY

.1 Provide a 1 year warranty.

.2 Warranty: Include coverage of installed sealant and sheet materials] which fail to achieve air tight seal, exhibit loss of adhesion or cohesion, or do not cure.

Part 2 Products

2.1 MANUFACTURERS

.1 Tyvek Commercial Wrap"; DuPont Company
.2 Or approved equal.

2.2 SHEET MATERIALS

.1 High-performance, flash spun-bonded olefin, non-woven, non-perforated, secondary weather barrier

2.3 SEALANTS

.1 Refer to section 07 92 00 Joint Sealants.

2.4 ADHESIVES

.1 Provide adhesive material recommended by air barrier manufacturer.

2.5 ACCESSORIES

.1 Thinner and Cleaner - As recommended by sheet material manufacturer.

.2 Flashing Tape: Tyvek Flashing Tape (or equivalent approved by the sheet air barrier manufacturer.

.3 Seam Tape: As recommended by sheet material manufacturer.

.4 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap fasteners.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 APPLICATION

.1 Ensure surfaces to receive membrane are sound, dry, clean, and free from oil, grease, dirt, excess mortar or other contaminates.

.2 Fill substrate voids, gaps, depressions, cracks, and joints with mastic or other approved fill material until continuous, smooth, substrate for air barrier is achieved.

3.3 INSTALLATION

.1 Install materials in accordance with manufacturer's instructions.

.2 Install air barrier prior to installation of windows and doors

.3 Start air barrier installation at a building corner, leaving 6-12 inches of air barrier extended beyond corner to overlap

.4 Install air barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain air barrier plumb and level

.5 Sill Plate Interface: Extend lower edge of air barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by air barrier manufacturer

.6 Window and Door Openings: Extend air barrier completely over openings

.7 Overlap air barrier: Exterior Corners minimum 12 inches. Seams Minimum 6 inches.

.8 Air Barrier Attachment

Attach air barrier to studs through exterior sheathing. Secure using air barrier manufacturer recommend fasteners, space 6 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally

.9 Apply 4 inch by 7 inch piece of additional membrane to air barrier membrane prior to the installation cladding anchors in accordance with manufacturer recommendations.

3.4 PROTECTION OF FINISHED WORK

.1 Do not permit adjacent work to damage work of this section.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for asphalt shingles work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.2 ASTM D3018, Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.

.3 ASTM D3161, Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).

.4 ASTM D3462, Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules.

.5 ASTM D7158, Standard Test Method for Wind-Resistance of Sealed Asphalt Shingles (Uplift Force/Uplift Resistance Method).

.6 CAN3-A123.51-M, Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.

.7 CAN3-A123.52-M, Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3.

.8 CAN/CGSB-37.4-M, Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing.

.9 CAN/CGSB-37.5-M, Cutback Asphalt Plastic Cement.

.10 CSA B111, Wire Nails, Spikes and Staples.

.11 CRCA, Canadian Roofing Contractor’s Association.

1.3 SUBMITTALS

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Samples:
- .1 Submit two of the following samples in accordance with Section 01 00 00 indicating:
  - .1 300 x 300 mm samples of shingles, eave protection, and underlayment.

.2 300 mm long sample of ridge vent.
.3 300 mm long sample of intake vent.
.4 Any additional accessories required in a complete installation.

.3 Close-out submittals:
.1 Submit close-out submittals in accordance with Section 01 00 00.
.2 Submit manufacturer's certificate that membrane has been installed in accordance with Contract Documents.
.3 Submit extended warranties.

.4 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.4 QUALITY ASSURANCE

.1 Qualification: Perform work of this Section by a company that is a member in good standing of Canadian Roofing Contractors Association (CRCA) and has a minimum of 5 years proven, acceptable roofing experience on installations of similar complexity and scope.

.2 Perform roofing work in accordance with CRCA Roofing Specifications Manual.

.3 Pre-installation meetings: Arrange meeting on Site to be attended by Consultant, Contractor, and roofing manufacturer's representative to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.5 SITE CONDITIONS

.1 Install roofing on dry deck, free of snow and ice, use only dry Products and apply only during weather that will not introduce moisture into roofing system.

.2 Apply roofing only when air and surface temperatures are above 4^0C, have been so for at least 48 hours and are not likely to go below 4^0C, until work is completed.

.3 Proceed with work when temperatures are below 4^0C only with mutual documented agreement between Contractor and Consultant.

1.6 EXTENDED WARRANTY

.1 At completion of this work, provide a signed CRCA warranty to the Owner covering defects of workmanship and materials for a period of 2 years commencing from Contract Documents. Agree to make good promptly any defects which occur or become apparent within the warranty period in conjunction with the shingle manufacture’s warranty. Defects shall include but not be limited to leakage, failure to stay in place, lifting, and deformation.

.2 At completion of this work, provide a signed non-prorated warranty from the roofing shingle manufacturer to the Owner covering defects in materials for a period of 25 years commencing from Contract Documents.
.1 Warranty against delamination, breakage, curl, and loss of aggregate surfacing.
.2 Coverage: Complete replacement including affected adjacent parts.

Part 2 Products

2.1 MATERIALS

.1 Provide all primary roofing products, including but not limited to shingles, eave protection, underlayment, ventilation, etc. by a single manufacturer.

.2 Laminated shingles: ASTM D3018, Type 1, ASTM D3161, Type 1 and Class F, ASTM D7158, Class H, self sealing granulated heavy duty laminated shingles, colour and texture to be selected by Consultant. Acceptable Manufacturer's: 'Marathon Plus' by IKO or approved alternatives by CertainTeed Corporation, GAF or Owens Corning.

.3 Eave protection membrane: Minimum 1.5 mm thick, single-ply, self adhering, self sealing, fibreglass reinforced, rubberised asphalt membrane; As manufactured by IKO or approved alternatives by CertainTeed Corporation (Winterguard), GAF or Owens Corningm or Ice and Water Shield by Grace.

.4 Underlayment: Water repellant, breathable polypropylene, U.V. stable; As manufactured by IKO or approved alternatives by CertainTeed Corporation (Diamond Deck), GAF (FeltBuster) or Owens Corning.

.5 Flashings, saddles, valleys, drip edge, etc.: In accordance with Section 07 62 00.

.6 Continuous ridge vent: 305 mm wide, low profile, rigid high density polypropylene with U.V. inhibitors and tab connecting features: 'Cobra Snow Country Advanced Ridge Vent' by GAF or approved alternatives by CertainTeed Corporation, Duraflo, or Lomanko Vents. Ridge vent to come complete with required fasteners.

.7 Eave vent: Low profile, flexible, rigid plastic with U.V. inhibitors; 'Cobra Intake Pro Rooftop Intake Vent' by GAF or approved alternative by CertainTeed Corporation. Ridge vent to come complete with required fasteners.

.8 Cement:
.1 Plastic cement: to CAN/CGSB-37.5.
.2 Lap cement: to CAN/CGSB-37.4.

.9 Nails: to CSA B111, 2.0 mm to 2.5 mm diameter shank, galvanized, barbed shank, sufficient length to penetrate 19 mm into deck with 9 mm to 11 mm diameter heads.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

.1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, projections and any other foreign matter detrimental to performance.

.2 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.

.3 Cover with sheet metal, all holes over 25 mm in diameter, cracks over 12 mm in width, loose knots and excessively resinous areas.

3.3 INSTALLATION

.1 Install eave protection, underlayment, and shingles in accordance with manufacturer's written instructions.

.2 Install drip edge along eaves, overhanging 12 mm, with minimum 50 mm flange extending onto roof decking. Nail to deck at 400 mm o.c. and seal with plastic cement or high quality urethane sealant.

.3 Install bottom step flashing (soaker base flashing) interleafed between shingles at vertical junctions. Seal with plastic cement or high quality urethane sealant.

.4 Install eave protection up the slope from eaves edge a minimum 914 mm beyond the interior "warm wall". Lap ends 152 mm and bond.

.5 Install eave protection in valleys at least 914 mm wide and centered on valley. Lap ends 152 mm and bond.

.6 Install underlayment over the entire area not protected eave protection at the eaves or valley. Install sheets horizontally so water sheds and nail in place. Lap underlayment minimum 76 mm at side laps and 152 mm at end laps.

.7 Do shingle work in accordance with CAN3-A123.51, CAN3-A123.52, Ontario Building Code, and CRCA except where specified otherwise.

.8 Install ridge and intake vents in accordance with manufacturer’s written instructions.

.9 Install asphalt shingles on roof slopes 1:3 and steeper in accordance with CAN3-A123.51.

.10 Install asphalt shingles on roof slopes 1:6 to less than 1:3 in accordance with CAN3-A123.5.

.11 Install flashings in accordance with CRCA requirements and Section 07 62 00.

3.4 PROTECTION

.1 Protect installed products from foot traffic until completion of the project.

.2 Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for wood siding and soffit system work in accordance with the Contract Documents.

1.2 REFERENCES

.1 CSA B111, Wire Nails, Spikes and Staples.

.2 CAN/CGSB-11.6-M, Installation of Exterior Hardboard Cladding.

.3 CAN/CGSB-51.32-M, Sheathing, Membrane, Breather Type.

.4 NLGA Standard Grading Rules for Canadian Lumber.

1.3 DESIGN REQUIREMENTS

.1 Design siding and soffit system to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.2 Design siding and soffit system in accordance with following Climatic Design Data for Minden Hills contained in Ontario Building Code.
- .1 Design Temperature: January 1%, July 2 ½%.
- .2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.
- .3 Earthquake: Seismic Data as listed.

.3 Prevent rain penetration through siding and soffit system. Incorporate means of draining to the exterior.

.4 Design siding system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design siding system to prevent vibration when subject to the effects of wind.

.5 Design soffit system to accommodate expansion and contraction of soffit elements without causing buckling, failure of joints, undue stress on fasteners or other effects detrimental to appearance or performance.

1.4 SUBMITTALS

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:

.1 Submit shop drawings in accordance with Section 01 00 00 indicating:

.1 Elevations, details, sections, profiles, dimensions, thickness of materials, finishes, methods of joining, arrangement of sheets, joints, and seams, special shapes, methods of anchoring, anchor and clip details, types of sealants and gaskets, waterproof connections to adjoining work, details of other pertinent components of the work (i.e. windows, penetrations, membranes, etc), and compliance with design criteria and requirements of related work.

.2 Complete design data to confirm that soffit system meet design requirements specified.

.3 Samples: Submit two 300 x 300 mm samples of siding and soffit in accordance with Section 01 00 00.

1.5 QUALITY ASSURANCE

.1 Mock-up:

.1 Construct one 3 m^2 mock-up of wood siding in location acceptable to Consultant indicating as a minimum one exterior corner, one inside corner, and one window or door interface.

.2 Construct one 3000 mm minimum mock-up of soffit system in location acceptable to Consultant.

.3 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.

.4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Do not store siding in heated building. Keep siding on manufacturer’s supplied pallets.

Part 2 Products

2.1 MATERIALS

.1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.

.2 Prefinished siding and soffit: Canadian softwood, Premium Canadian Lodgepole Pine, sustainably harvested from 100% PEFC certified forests in British Columbia, horizontal or vertical pattern as indicated on drawings. Kiln-dried to +/- 15% humidity. ‘Neo’ profile as manufactured by Fraser Wood Siding or approved alternative. Colour to be selected by Consultant.

.3 Accessories: Starter strips, mouldings, exposed trim, closures, cap and corner pieces of manufacturer's standard.

.4 Wood strapping and sheathing: In accordance with Section 06 10 00. Double strapping required for vertical siding application. Refer to Installation Guide for wood siding.

.5 Air/vapour barrier: In accordance with Section 07 26 00.

.6 Fasteners: nails to CSA B111, hot galvanized steel, sized as required by siding installation guide. (Double hot-dip “Split-less” / Stainless Steel “Slim-Jim”wood siding nails.) Nails for prefinished siding to incorporate plastic nailing cap colour match to siding.

.7 Sealant: ASTM C920, Type S, Grade NS; One-part, low modulus, moisture curing silicone sealant, Dymonic FC by Tremco Ltd. Or approved alternative by Dow Corning. Colour: As selected by Consultant.

.8 Sealant primer: Moisture curing primer. Tremco Primer #1 by Tremco Ltd. or approved alternative by Dow Corning.

.9 Joint backing: Product as recommended by siding sealant manufacturer.

.10 Ventilation strips: 50% open pattern in colour and finish to match siding, in sizes, shapes, and profiles indicated on drawings.

.11 Underlayment system: Cedar Breather System by Benjamin Obdyke or approved alternative.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install siding and soffit in accordance with CGSB 11-GP-6-M, reviewed shop drawings and manufacturer's written instructions.

.2 Install wood sheathing and strapping in accordance with Section 06 10 00. Refer to Installation Guide for wood siding.

.3 Install air/vapour barrier in accordance with Section 07 26 00.

.4 Install underlayment system in accordance with manufacturer's written instructions.

.5 Install furring strips, vertically and/or horizontally depending on direction of siding, and nail into wall studs at 400 o.c., over the full height of the wall. Furring strips must not be less than 6 mm thick.

.6 Level and install sill flashings, starter strips, inside corner flashings, edgings and flashings over openings.

.7 Fasten wood siding in straight, aligned lengths to strapping at 400 mm o.c. maximum using two nails at each fixing location. Stagger butt joints not less than 800 mm and distribute evenly over wall faces. Cut butt joints at 45° and for vertical siding slope to outside. Seal cut surfaces.

.8 Align joints between adjacent siding pieces over the strapping. Fasten on each side at the top nailing line.

.9 In vertical installation, end match tongues must face up (toward the top of the wall) in vertical installations or all warranties will be void. (Fraser Wood Siding Neo Evolution Type)

.10 Space nails 200 mm o.c. along edge of siding over and under doors and windows: shim where necessary. Do not force or spring siding into place. Always leave a 3 mm space wherever siding butts against trim or other materials and seal.

.11 Butt siding to inside and outside corners leaving a 3 mm gap. Apply inside and outside corners before siding.

.12 Install ventilation strips in accordance with manufacturer’s written instructions.

.13 Touch up prefinished siding and soffit with colour matched paint provided by manufacturer.

.14 Joint backing and sealant:
- .1 Prime substrate surface and mask as recommended by sealant manufacturer.
- .2 Install joint backing and sealant at penetrations, joints and perimeter for weathertight installation. Tool sealant to concave profile.

3.3 SOFFIT SYSTEM

.1 Install soffit system in accordance with reviewed shop drawings and manufacturer's written instructions. Comply with system manufacturer’s requirements regarding terminations at end of each days work and resumption of work.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for flashing and sheet metal Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM C920, Specification for Elastomeric Joint Sealants.

.3 OIRCA, Ontario Industrial Roofing Contractors Association.

1.3 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 00 00 indicating:
  - .1 Proposed method of shaping, forming, jointing.
  - .2 Fastening, and application of flashing and sheet metal Work.

.2 Samples:
- .1 Submit following samples in accordance with Section 01 00 00:
  - .1 50 x 50 mm samples of sheet metal material, colour and finish.
  - .2 Representative sample section of prepainted metal flashing illustrating S locking jointing method, minimum 600 mm long.

Part 2 Products

2.1 MATERIALS

.1 Prepainted sheet steel: ASTM A653/A653M; Classification LFQ, Grade A, Z275 zinc coating designation, 0.60 mm minimum base steel thickness, commercial quality, prefinished with Perspectra Series coating system by ArcelorMittal Dofasco or WeatherXL by Vicwest Steel. Colours as selected by Consultant from manufacturer's standard range.

.2 Aluminum: Painted finish. Heavy gauge for downspouts.

.3 Plastic cement: Trowel grade asphalt mastic.

.4 Sealant: ASTM C920, Type S, Grade NS, minimum Class 25; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. 'CWS' by Dow Corning, 'Silpruf' by General Electric Company or approved alternative.

.5 Cleats and starter strips: Starter strips to be continuous, of same material as flashing used, 1.2 mm thick.

.6 Fasteners: Weatherguard hex head galvanized screws with 13 mm dome of length, type and thickness suitable for metal flashing application.

.7 Washers: of same material and finish and colour as sheet metal, 1 mm thick with rubber packings and neoprene washers.

.8 Touch-up paint: Same colour and material as prepainted sheet steel, as recommended by prefinished coating manufacturer.

.9 GUTTERS & DOWNSPOUTS
Approved Manufacturers:

.1 Alu-Pro (905) 330-8697 Square Eavestroughs and Downspouts. Ivan Maric, ivan@alu-pro.ca

.2 Approved substitution.

Materials:

Seamless, continuous, gutters to be minimum 032" thick, downspouts to be minimum .024" thick, sheet aluminum conforming to requirements of ASTM B209, Alloy 3003, Temper H14, finish to be thermo-setting acrylic enamel conforming to AAMA 603.8

Color: To match adjacent metal cladding / or masonry.

Gutter: **Style A Box Gutter**, Minimum nominal 5” x 5” Square Gutter

Gutter Accessories:
- End caps
- Hangers: Concealed
- Non-corrosive leaf screens at gutters

Box Downspouts: Minimum 3" x 4" rectangular shape Downspout.
Accessories:
- Elbows
- Straps: Minimum two per downspout. Colour to match Downspout.
- Strainers
- Provide splash-blocks where required. Units shall be concrete, minimum 3,000 psi at 28 days with 5% air entrainment. Size and profile to suit application.

.9 MEMBRANE WALL FLASHING
Approved Manufacturers:

.1 "Perm-A-Barrier" wall flashing and "Perm-A-Barrier" primer and stainless steel drip edge. W.R. Grace & Company (800-778-2880).

.2 Hyload SA with Stainless Steel Drip Edge”; Hyload Flashing (800-457-4056)

.3 “Flex Flash SA with Stainless Steel Drip Edge” Hohman and Bernard, Inc. (800-645-0616)

.4 Approved substitution

.10 DOOR & WINDOW OPENING FLASHING SYSTEM
Approved Manufacturers:

.1 Tyvek FlexWrap" and "Tyvek StraightFlash";
DuPont Company (800-448-9835)

.2 Elasticized Flexible Flashing Tape complying with the following:

- Face Material composition: Elasticized polyethylene laminate
- Face color: White
- Adhesive composition; Butyl adhesive containing non-halogen fire retardant additive
- Thickness: > 60 mils
- Release liner: 2 part siliconized paper
- Elastic Elongation, MD (length @ Full Extension / Length @ Relaxed): >230% @ 70 F
- Dimension: 8 or 10 inch width

.3 Straight Polyethylene Laminate Flashing Tape complying with the following:

- Face Material composition: Polyethylene laminate
- Face color: White
- Adhesive Composition: Butyl adhesive with fire retardant additive
- Thickness: 30 mils
- Release liner: 1 piece siliconized paper
- Dimension: 4 inch width.

.4 Accessories:

.1 Sealing Type:

- Material: Pressure sensitive, polypropylene substrate with acrylic based adhesive. Provides permanently elastic, nonsag, nontoxic, nonstaining tape, which is compatible with Tyvek Weatherization Systems products.
- Finish Product Brand Name: DuPont Tyvek Contractor Tape

.2 Fasteners:

- Material: Pressure sensitive, polypropylene substrate with acrylic based adhesive. Provides permanently elastic, nonsag, nontoxic, nonstaining tape, which is compatible with Tyvek Weatherization Systems products
- Finish Product Brand Name: DuPont Tyvek Wrap Caps

.3 Sealants:
ASTM C 920, elastomeric polymer sealant, of type, grade, class, and use classifications required to seal joints and remain watertight and are compatible with DuPont Tyvek.

- OSI Quad Pro-Series; solvent release kraton rubber sealant.
- DAP DynaFlex 230™.

- Other products as approved and recommended by the flashing tape manufacturer.

.4 Primer:

- 3M High Strength 90
- Other products as approved and recommended by the flashing tape manufacturer.

.11 THRU-WALL FLASHING
Approved Manufacturers:

.1 "5 oz. Copper Flashing with Stainless Steel Drip Edge".
York Manufacturing, Inc. (800-551-2828

.2 "Flex Flashing with Stainless Steel Drip Edge" Hohman and Bernard, Inc. (800-645-0616)

.3 "Perm-A-Barrier" wall flashing and "Perm-A-Barrier" primer and stainless steel drip edge as manufactured by
W.R. Grace & Company (800-778-2880)

.4 "Hyload SA with Stainless Steel Drip Edge", Hyload Flashing (800-457-4056)

Provide primers and mastic by manufacturer, as required

.12 MISCELLANEOUS MATERIALS AND ACCESSORIES

.1 Bituminous Paint: Acid and alkali-resistant type; black color; FS TT-C- 494 or SSPC-Paint 12 solvent type, nominally free of sulfur, compounded for 15-mil dry film thickness per coat

.2 Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened

.3 Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 07 Section " Joint Sealants"

.4 Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints

.5 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal

.6 Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance

2.2 FABRICATION

.1 Fabricate copings, cap flashings, flashings, curb counter flashings, starter strips, and miscellaneous flashings in accordance with OIRCA and to details shown.

.2 Form prepainted sheet material at shop to shapes shown. Make end joints where adjacent lengths of metal flashing meet, in accordance with jointing method specified.

.3 Form pieces in 2400 mm maximum practical lengths. Make allowance for expansion at joints.

.4 Hem exposed edges 13 mm minimum on underside for appearance and stiffness. Mitre clean and tight and seal corners with sealant. All joints to be crimped cleanly.

.5 Reglets and Cap flashing: Form flashings of as detailed and in accordance with OIRCA. Provide slotted fixing holes and steel/plastic washer fasteners.

.6 Fabricate corners minimum 18 in/450mm mitred, soldered, or welded, and sealed as one piece.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install coping flashings, curb counter flashings, starter strips, and miscellaneous flashings to details shown on the Contract Drawings and in accordance with OIRCA.

.2 No visible fasteners for counter flashed joints.

.3 Exposed fasteners such as pop rivets are not allowed.

.4 Install continuous starter strips to present a true, non-waving, leading edge. Anchor to back-up for a rigid, secure installation.

.5 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.

.6 Make end joints using an S lock joint. Execute by inserting end coping length in 25 mm deep S lock formed in end of adjacent length. Extend concealed portion of S lock 25 mm outwards and nail to substrate. Face nailing of joints will not be permitted.

.7 Seal where necessary to form weathertight seal between flashing and adjoining surfaces and between flashing and other Work. Sealing Work consists of bedding between members where possible. Tool sealant to concave profile where exposed.

.8 Insert metal flashing under cap flashing to form weathertight junction.

.9 Caulk flashing at cap flashing with sealant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for firestopping and smoke seals Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board–Type Thermal Insulation.

.2 ASTM C920, Standard Specification for Elastomeric Joint Sealants.

.3 ASTM C1104, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

.4 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops.

.5 ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops.

.6 ASTM G21, Standard Test for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.7 CAN/CGSB 19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing.

.8 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

.9 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.10 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.

.11 CAN/ULC S129, Standard Method Of Test For Smoulder Resistance Of Insulation (Basket Method).

.12 CAN/ULC S702, Thermal Insulation, Mineral Fibre for Buildings.

1.3 DEFINITIONS

.1 Fire Separation: A construction assembly, plane or device, either vertical or horizontal, which is required to prevent the passage of fire and smoke for a prescribed period of time. Proof of compliance to required time rating shall be by ULC, Warnock Hersey (or similar approved) certification or shall be as listed in the Ontario Building Code Supplementary Standard SB-2.

.2 Smoke Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time but is required to prevent the passage of smoke. A "Smoke Separation" is also known as a "Fire Separation with No Rating" or a "Zero Hour Rated Separation".

.3 Non-Rated Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time and is not required to prevent the passage of smoke.

1.4 SYSTEM DESCRIPTION

.1 Firestopping and smoke seals: ULC or Intertek Testing Services listed Products and systems in accordance with CAN/ULC S115 suitable to actual application and installation conditions.

.2 Firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.

.3 Firestop and smoke seal system shall achieve a fire resistance rating and smoke seal rating equal to that of assemblies into which they are installed.

.4 Provide smoke sealants over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.

.5 Firestopping and smoke seals located at movement joints shall be designed with movement capability.

.6 Provide penetration firestoppping with mould and mildew resistance rating of 0 in accordance with ASTM G21.

.7 Firestopping and smoke seals within mechanical and electrical assemblies shall be provided as part of the work of Divisions 22, 23, and 26 respectively.

1.5 SUBMITTALS

.1 Product data:

.1 Submit copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:

.1 Performance criteria, compliance with appropriate cUL or ULC reference standard, characteristics, limitations.

.2 Product transportation, storage, handling and installation requirements.

.3 Submit firestop and smoke seal manufacturer's Product data for materials and prefabricated devices, including manufacturer's printed installation instructions.

.2 Shop drawings:
.1 Submit shop drawings in accordance with Section 01 00 00 indicating:
.1 Fire rated and smoke sealed systems for each typical application.
.2 Construction details, accurately reflecting actual job conditions.
.3 ULC or Intertek Testing assembly listing.
.4 Each floor and wall assembly requiring firestop system with each corresponding ULC firestop system.
.5 Professional engineered stamped engineer judgement for system assemblies with no available listing, complete with authorities having jurisdiction and review prior to Consultant review approval.

.3 Certification:
.1 Submit certified documentation from manufacturer for each worker performing Work of this Section.
.2 Submit installer's and Product manufacturer's certification for each firestop and smoke seal system verifying compliance with the Contract Documents and conformance with ASTM E814 and CAN/ULC S115.

1.6 QUALITY ASSURANCE

.1 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in the installation of firestopping and smoke seal Work of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.2 Manufacturer's direct representative and/or fire protection specialist shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures conforming to manufacturer's written recommendations published in their literature and drawing details.

.3 Pre-construction meetings: Arrange with manufacturer's representative, Contractor, Consultant and Field Engineer to determine responsibility for handling such issues as FT rated partitions, firestop custom details, compatibility, mixed penetrations, and to review installation procedures 48 hours in advance of installation.

.4 Identify proposed engineer judgements from manufacturer’s within 1 week from award of contract.

1.7 DELIVERY STORAGE AND HANDLING

.1 Deliver materials to Place of Work in manufacturer’s unopened containers, containing classification label with labels intact and legible at time of use.

.2 Do not use damaged or adulterated materials exceeding their expiry date.

1.8 SITE CONDITIONS

.1 Conform to manufacturer's requirements and maintain a minimum temperature of 5^0 C for a minimum period of 24 h before application, during, and until application is fully cured.

.2 Maintain sealant at a minimum 18 C for best workability.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Acceptable manufacturers of rated systems include:
- .1 AD Fire Protection Systems Inc.
- .2 Hilti Canada Corporation.
- .3 3M Canada Inc.
- .4 Tremco Ltd.
- .5 Substitutions with prior approval by Owner and Consultant.

2.2 GENERAL SYSTEM REQUIREMENTS

.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Do not use Products containing asbestos.

.3 Firestopping components shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

.4 Provide smoke seal sealant in following colours:
- .1 Grey or white in finished areas.
- .2 Red in unfinished areas.

.5 Smoke sealant for overhead and vertical joints for floor to be self-levelling and non-sagging sealant.

.6 Smoke sealant at vertical through penetrations in areas with floor drains shall be waterproof type.

2.3 MATERIALS

.1 Following materials have been provided for convenience. Contractor shall provide complete system with all components and accessories as required for fire resistant and smoke seal installation. Ensure FH and FT ratings are in conformance with OBC requirements.

.2 Firestop sealant: single component, low modulus, silicone rubber, moisture curing sealant to ASTM C920, ULC labelled to CAN/ULC S115.

.3 Pre-Installed firestop devices for use with non-combustible and combustible pipes, conduit and/or cable bundles penetrating concrete floors and walls.
- .1 Cast-in place firestop device complete with aerator adaptor when used in conjunction with aerator system. Model CP 680-P by Hilti or approved alternative.
- .2 Cast-in place firestop device for use with noncombustible penetrants. Model CP 680-M by Hilti or approved alternative.
- .3 Speed sleeve for use with cable penetrations. Model CP 653 by Hilti or approved alternative.
- .4 Firestop block. Model CFS-BL by Hilti or approved alternative.

.4 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating walls:
- .1 Speed sleeve with integrated smoke seal fabric membrane. Model CP 653 by Hilti or approved alternative.
- .2 Firestop Sleeve. Model CFS-SL SK by Hilti or approved alternative.
- .3 Retrofit sleeve for use with existing cable bundles. Model CFS-SL RK by Hilti or approved alternative.
- .4 Gangplate for use with multiple cable management devices. Model CFS-SL GP by Hilti or approved alternative.
- .5 Gangplate Cap for use at blank openings in gangplate for future penetrations. Model CFS-SL GP CAP by Hilti or approved alternative.

.5 Firestop insulation: to CAN/ULC S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.
- .1 Density: Minimum 64 kg/m^3 when tested to ASTM C303.
- .2 Combustibility: Noncombustible to CAN/ULC S114.
- .3 Melt temperature: >1175 degrees C.
- .4 Surface burning characteristics: to CAN/ULC S102, maximum flame spread of 0, smoke developed of 0.
- .5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.
- .6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC S129.

.6 Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of authorities having jurisdiction.

.7 Primer: As recommended by firestopping sealant manufacturer.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Verify that substrates and surfaces to receive firestopping and smoke seals are clean, dry, and frost free.

3.2 PREPARATION

.1 Prepare, modify, and adjust void sizes, proportions, and conditions to conform to fire rated and smoke sealed assembly requirements such as assembly opening size and dimensional restrictions.

.2 Clean surfaces to remove material detrimental to bond including dust, paint, rust, oil, grease, moisture, frost and other foreign matter to manufacturers recommendations.

.3 Mask adjacent surfaces to avoid spillage and over-coating of adjacent surfaces. Remove stains from adjacent surfaces.

3.3 INSTALLATION

.1 Install firestopping and smoke seal systems in accordance with reviewed Shop Drawings, manufacturer's instructions and fire rated assembly to establish continuity and integrity of fire separations.

.2 Install firestop insulation in compacted thicknesses required by ULC design. Compress insulation approximately 50 percent.

.3 Install primers as recommended by firestop and smoke seal Product manufacturers.

.4 Install temporary forming, damming, back-up as required, remove after materials have achieved initial cure and will resist displacement.

.5 Install firestop and smoke seal filler in horizontal joints providing 25% compression fit.

.6 Use resilient, elastomeric firestopping and smoke seal systems in following locations:
- .1 Openings and sleeves for future use.
- .2 Penetration systems subject to vibration or thermal movement.
- .3 Penetration systems in acoustical containment enclosures.

.7 Trowel and tool exposed firestop and smoke seal. Product surfaces to uniform, smooth finish.

.8 Seal joints to ensure an air and water resistant seal capable of withstanding compressions and extensions due to thermal wind or seismic joint movement.

.9 Taped joints will not be acceptable.

.10 Repair damaged firestopped and smoke sealed surfaces to acceptance of Consultant, manufacturer and Authorities having jurisdiction.

.11 Identify each firestop and smoke seal penetration assembly with permanent label listing following:
- .1 Assembly and all applicable ratings in hours.
- .2 Date of installation.
- .3 Installing company's name and telephone number.

.12 Do not cover materials until full cure and all required reviews and approvals have taken place.

3.4 INSPECTION AND TESTING

.1 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E2174 to ensure that firestopping and smoke seals have been installed in accordance with Contract documents and to tested and listed firestop system.

3.5 CLEAN-UP

.1 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

.2 Remove excess materials and debris immediately after application.

3.6 SCHEDULE OF FIRESTOP AND SMOKE SEAL LOCATIONS

.1 Following firestop and smoke seal location schedule is included for convenience only and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of Work of this Section. Generally provide systems with required fire and smoke ratings at following locations:
- .1 Gaps at intersections of fire-resistance rated walls and partitions.
- .2 Control and sway joints in fire-resistance rated walls and partitions.
- .3 Gaps at top of fire-resistance rated partitions and walls.
- .4 Penetrations through fire-resistance rated walls and partitions including mechanical and electrical services and openings and sleeves for future use.
- .5 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.
- .6 Gaps at edge of floor slabs at exterior walls.
- .7 Perimeter of retaining angles on rigid ducts greater than 0.012 m^2, firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
- .8 Where indicated on drawings.
- .9 At non-rated assemblies that require a smoke seal.
- .10 Where required by Ontario Building Code.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for sealant Work in accordance with the Contract Documents.

.2 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.

.3 Work of this Section does not include sealant work identified in individual specification sections.

1.2 REFERENCES

.1 ASTM C834, Specification for Latex Sealants.

.2 ASTM C920, Specification for Elastomeric Joint Sealants.

.3 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

.1 Product data: Submit copies of Product data in accordance with Section 01 00 00 describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.

.2 Samples:

.1 Submit following samples in accordance with Section 01 00 00.

.1 Two samples of sealant/caulking standard colour range, for colour selection.

.2 Two samples of back-up material and primer for physical characteristics.

1.4 QUALITY ASSURANCE

.1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

1.5 SITE CONDITIONS

.1 Do not install materials when ambient air temperature is less than 5C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 EXTENDED WARRANTY

.1 Submit an extended warranty for Sealant Work in accordance with General Conditions, except that warranty period is extended to two (2) years from date of Substantial Performance of the Work.
- .1 Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces.
- .2 Coverage: Complete replacement including affected adjacent Work.

Part 2 Products

2.1 MATERIALS

.1 General:
- .1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.

.2 Sealant **Type A**: ASTM C920, Type S, Grade NS, Class 25; One-part, non-sag type, silicone sealant, in standard and custom colours selected.
- .1 'DC CWS' by Dow Corning Inc.
- .2 'Sikasil 305CN' by Sika.
- .3 'Tremsil 400' or 'Dymonic FC' by Tremco.

.3 Sealant **Type B**: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone, in standard colours selected.
- .1 '786 Mildew Resistant Silicone Sealant' by Dow Corning Inc.
- .2 'Sikasil GP Mildew Resistant' by Sika.
- .3 'Tremsil 200 Silicone Sealant' by Tremco Ltd.

.4 Sealant **Type C**: ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable).
- .1 '950A Siliconized Acrylic Latex Caulk' by Sherwin Williams.
- .2 'Tremflex 834 Silconized Sealant' by Tremco Ltd.

2.2 ACCESSORIES

.1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

.2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.

.3 Bond breaker: Type recommended by material manufacturers.

.4 Void filler around the window frames to be one part expanding polyurethane foam.

.5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 MIXING

.1 Follow manufacturer's instructions on mixing, shelf, and pot life.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

.1 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.

.2 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.

.3 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.

.1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.

.2 Ensure recess is dry.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.

.4 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.

.5 Depth of recess: Maintain depth to ½ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.

.6 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.

.7 Prime sides of recess, in accordance with sealant manufacturer's instructions.

.8 Condition products for use in accordance with manufacturer’s recommendations.

3.3 INSTALLATION

.1 Apply sealant immediately after adjoining Work is in condition to receive such Work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.

.2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth surface, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.

.1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

.2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.

.3 Make sealant bead uniform in colour.

.4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.

.5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces.
Remove defective sealant.

.6 Clean recesses and re-apply sealant.

.7 Remove masking tape immediately after joints have been sealed and tooled.

.8 Exterior joints greater than ½” Two-part non-sag, polyurethane type, meeting ASTM

C920, Type M, Grade NS, Class 50, Use NT, with 20 year life expectancy. Colors: Match sealant material to colors of adjacent materials, as selected by Consultant from manufacturer's standard colors.

3.4 ACOUSTICAL SEALANT

.1 Install acoustical sealant to acoustically insulated partitions in accordance with the manufacturer's instructions and Contract Drawings.

.2 Install acoustical sealant under floor runner track, at partition perimeter both sides and at openings, cut-outs, and penetrations, concealed from view in the final installation.

.3 Install firestop fill material behind fire rated acoustical sealant and provide firestop identification tag.

.4 Smooth acoustical sealant with trowel prior to skin forming.

3.5 CLEANING

.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.6 SCHEDULE OF LOCATIONS

.1 Coordinate sealant Work in other sections with subtrades.

.2 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of Work of this Section. Generally seal following locations:

- .1 Concrete and wood to metal.
- .2 Wood to concrete.
- .3 Metal to metal.
- .4 Concrete to Concrete.
- .5 All dissimilar materials.
- .6 Where ‘sealant’ or ‘caulking’ in indicated on drawings.

.3 Sealant **Type A**:

- .1 Exterior joints between steel and concrete.
- .2 Interior and exterior control joints, except in floors.
- .3 Door and window frames, interior and exterior side.
- .4 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
- .5 Seal thresholds.

.4 Sealant **Type B:**

.1 Control joints in tiled areas.
.2 Between vanity and tile.
.3 Between vanity and mechanical fixtures/fittings.
.4 Joints at countertops and vanities
.5 Between access panels and tile.
.6 Between tiles and adjacent materials.
.7 Joints between plumbing fixtures and adjoining walls, floors and counters.

.5 Sealant **Type C:**

.1 Perimeter of firehose cabinets.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for the metal doors and frames work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ANSI A208.1, Particleboard.

.2 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.3 ASTM A568/A568M, Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.

.4 AWMAC, Architectural Woodwork Manufacturers' Association of Canada. Quality Standards for Architectural Woodwork.

.5 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.

.6 CAN/CSA O132.2 Series, Wood Flush Doors.

.7 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.8 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

1.3 SUBMITTALS

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 00 00 indicating door and frame construction.

.2 Shop drawings:

.1 Submit shop drawings in accordance with Section 01 00 00 for wood doors and metal frames indicating:

.1 Thickness and type of steel and steel stiffeners and location of them within the door.

.2 Detail thicknesses, core construction and door sizes,

.3 Quantities, fastenings and finishes.

.4 Location of mortises, reinforcement, anchorages, joining, welding, sleeving, exposed fasteners, openings and arrangement for hardware.

1.4 QUALITY ASSURANCE

.2 Perform work in accordance with requirements of AWMAC, Quality Standards for Architectural Woodwork, Premium Grade and CSA O132.2-M, except as indicated otherwise. The AWMAC standard governs over the CSA standard.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle wood doors in accordance with the AWMAC Quality Standards amended as follows:
- .1 Wrap wood doors individually in protective wrapping for shipment and Site storage.
- .2 Handle wood doors carefully to prevent damage; replace damaged doors.
- .3 Store doors flat on a dry, level surface. Ventilate and maintain recommended relative humidity before, during and after installation.

Part 2 Products

2.1 MATERIALS

.1 Adhesives - Urea-formaldehyde-free glues.

.2 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.

.3 Steel: ASTM A568/A568M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF075 satin coat finish. Minimum base steel thickness:

.1	Frames	1.6 mm
.2	Lock/strike reinforcements	1.6 mm
.3	Hinge reinforcements	2.7 mm
.4	All other reinforcement	1.6 mm
.5	Top and bottom channels	1.2 mm
.6	Glazing stops	0.9 mm
.7	Guard boxes	0.9 mm
.8	Jamb spreaders	0.9 mm

.4 Wood doors (hollow core):

.1 5 ply hollow core doors as manufactured by Baillargeon Doors Inc. or Lambton Doors, or equal.

.2 Rails:
- .1 Top: 38 mm 1-1/2" hardwood\
- .2 Bottom: 1-1/2" hardwood

.3 Stiles:
- .1 Hinge: 1-1/2" hardwood edge strip to match veneer face
- .2 Lock: 1-1/2" hardwood edge strip to match veneer face
- .3 Perimeter of glazing: 1-1/2" hardwood
- .4 Edge detail: AWMAC No.2
- .5 Crossbanding: Minimum 2.2 mm thick HDF composite.

.4 Door facing: Hardwood Veneer Facing (Flush Interior Doors): AWMAC Custom Quality, Maple

Wood, rotary cut, with transparent finish. Stain finished in accordance with Section 09 91 00.

.5 Adhesive: CAN/CSA O132.2, Type I; Waterproof.

.6 Screws: Stainless steel screws with countersunk flat head.

.7 Frame anchors: 0.9 mm minimum steel anchors of suitable design securely welded inside each jamb.

.8 Tempered glass: CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear, minimum 6 mm thick for use at glazed screens.

2.2 FABRICATION

.1 General
- .1 Fabricate doors and frames in accordance with reviewed shop drawings.
- .2 Form profiles accurately to details shown on Contract Drawings.

.2 Metal Frames and Screens:
- .1 Fabricate interior frames as welded unit for gypsum board slip on type.
- .2 Blank, reinforce, drill and tap frames for mortised, templated hardware. Protect mortised cut-outs with guard boxes.
- .3 Fabricate frames with hardware reinforcement plates welded in place.
- .4 Terminate door stops 150 mm above finished floor. Cut stop at 45 degree angle and close.
- .5 Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- .6 Reinforce frames where required for surface mounted hardware.
- .7 Reinforce frames over 1200 mm wide with roll formed steel channels or hollow structural sections specified in Section 05 50 00 and as indicated on drawings.
- .8 Install 2 channel or angle spreaders per frame, to ensure correct frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting in place.
- .9 Form channel glazing stops minimum 16 mm height, accurately cut, mitred, fitted and fastened to frame sections with stainless steel counter-sunk, flat head screws spaced at maximum 450 mm throughout and 50 mm from each end.
- .10 Configure exterior frames with special profile to receive recessed weatherstripping.
- .11 Attach fire rated label to each fire rated door unit.

.3 Finish:
- .1 Steel Sheet: Galvanized to ASTM A653/A653M Z180
- .2 Primer: Air Dried

.4 Wood Doors:

.1 Fabricate doors square, true, and free from distortion waves, ridges or core ghost lines. Factory machine doors for finish hardware and flooring.

.2 Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.

.3 Fabricate doors using hot press construction technology. Bond stiles and rails to core using adhesive. Sand for uniform thickness. Laminate door facing and trim, to assembled core in hot press.

.4 Cut and bevel stile edges as follows:

.1 Lock side: 3 mm in 50 mm.

.2 Hinge side: 1.5 mm in 50 mm.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 HOLLOW METAL FRAME AND SCREEN INSTALLATION

.1 Install hollow metal frames and screens plumb, square, level, secure and at correct elevation.

.2 Coordinate with masonry and gypsum board wall construction for anchor placement. Secure anchorages and connections to adjacent construction. Brace frames rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at third points of frame rebate height to maintain frame width. Supply and install vertical supports as indicated on drawings for openings over 1200 mm in width. Remove wood spreaders after frames have been built-in.

.3 Allow for structural deflection and prevent structural loads from being transmitted to hollow metal frames.

.4 Touch-up areas where galvanized coating has been removed or damaged with primer.

3.3 WOOD DOOR INSTALLATION

.1 Install doors plumb, rigid, square, clear of floor finishes, and with correct rebate opening for door installation.

.2 Conform to requirements of AWMAC Quality Standard, for wood door installation.

3.4 ADJUSTING AND CLEANING

.1 Replace the following wood doors:

.1 Warped more than 3 mm, measured at any point on door, relative to perfectly flat surface.

.2 Core telegraphing visible at 1500 mm distance, under final Site lighting conditions.

.2 Adjust doors for smooth and balanced door movement.

.3 Clean doors, frames and screens.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Non-rated, fire rated and thermally insulated steel doors and panels.

1.2 REFERENCES

.1 ANSI A117.1 - Accessible and Usable Buildings and Facilities.

.2 ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM C1363 - Method for Thermal Performance of Building Assemblies by Means of a Hot-Box Apparatus.

.4 ASTM E2074 - Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

.5 ASTM E413 - Classification for Rating of Sound Insulation.

.6 CSDFMA (Canadian Steel Door and Frame Manufacturers Association).

.7 DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

.8 NFPA 80 - Fire Doors, Fire Windows.

.9 NFPA 252 - Fire Tests for Door Assemblies.

.10 SDI-100 - Standard Steel Doors and Frames.

.11 UL 10B - Fire Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

.1 Conform to requirements of CSDFMA and ANSI A117.1

.2 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years' experience.

1.4 REGULATORY REQUIREMENTS

.1 Fire Rated Door and Panel Construction: Conform to NFPA 252.

.2 Installed Door and Panel Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.5 DELIVERY, STORAGE, AND PROTECTION

.1 Accept doors on site in manufacturer's packaging. Inspect for damage.

.2 Break seal on site to permit ventilation.

1.6 PROJECT CONDITIONS

.1 Coordinate frame installation with size, location, and installation of service utilities.

.2 Coordinate the work with door opening construction, door frame, and door hardware installation.

.3 Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

Part 2 Products

2.1 DOOR MANUFACTURERS

.1 Exterior Doors (Thermally Isolated): CSDFMA

.2 Interior Doors (Non-rated): CSDFMA.

.3 Interior Doors (Fire Rated): CSDFMA.

2.2 DOOR CONSTRUCTION

.1 Face: ASTM A653/A653M, steel sheet in accordance with SDI-100.

.2 End Closure: Channel, 0.047 inches thick, flush.

.3 Core: Cardboard honeycomb or as called for on drawings.

.4 Thermal Insulated Door: Total insulation R value of 12, measured in accordance with ASTM C1363.

2.3 FABRICATION

.1 Astragals for Double Doors: Steel shaped, specifically for double doors.

.2 Fabricate doors with hardware reinforcement welded in place.

.3 Attach fire rated label to each fire rated door unit.

.4 Configure exterior doors with special profile to receive recessed weatherstripping.

2.4 FINISH

.1 Steel Sheet: Galvanized to ASTM A653/A653M .
.2 Primer: Air dried.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

.1 Install doors in accordance with CSDFMA.

.2 Coordinate installation of glass and glazing.

.3 Install door louvres, plumb and level.

.4 Coordinate installation of doors with installation of frames specified in Section 08 12 13.

.5 Touch-up factory finished doors.

3.3 ERECTION TOLERANCES

.1 Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

.1 Adjust door for smooth and balanced door movement.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Non-rated, thermally insulated and acoustic steel entry doors and panels.

.2 Glass and glazing.

1.2 RELATED SECTIONS

.1 Section 08 71 00 - Door Hardware - General.

.2 Section 08 80 50 - Glazing: Glass for doors.

.3 Section 08 88 11 - Laminated Glass: Glass for doors.

1.3 REFERENCES

.1 ANSI A117.1 - Accessible and Usable Buildings and Facilities.

.2 ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A591/A591M - Steel Sheet, Electrolytic Zinc-Coated, For Light Coating Weight (Mass) Applications.

.4 ASTM C1363 -Method for Thermal Performance of Building Assemblies by Means of a Hot-Box Apparatus.

.5 ASTM E413 - Classification for Rating of Sound Insulation.

.6 ASTM E2074 - Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

.7 DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

.8 HMMA 802 - Manufacturing of Hollow Metal Doors and Frames.

.9 HMMA 810 - Hollow Metal Doors.

.10 HMMA 830 - Hardware Preparation and Locations for Hollow Metal Doors and Frames.

.11 HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.

.12 HMMA 850 - Fire Rated Hollow Metal Doors and Frames.

.13 AAMA/WDMA/CSA 101/I.S.2/A440 – Windows, Doors and Unit Skylights

□

.14 WDMA I.S.4 – Water Repellant Preservative Treatment for Millwork

.15 CS2 Hallmark Program Procedural Guide for Side Hinged Exterior Door Systems

.16 NFPA 80 - Fire Doors and Windows.

.17 NFPA 252 - Fire Tests for Door Assemblies.

.18 UL 10B - Fire Tests of Door Assemblies.

1.4 PERFORMANCE REQUIREMENTS

.1 Doors shall have a certified rating of DP 30 CW in accordance with WDMA C52 Hallmark Program Guide.

.2 Door Unit Air Leakage. ASTM E 283, 1.57 psf (25 mph): 0.30 cfm per square foot of frame or less

.3 Door water penetration: No water penetration through door unit when tested in accordance with ASTM E 331 with water applied at rate of 5 gallons per hour per square foot. Doors with standard sill shall have water resistance performance level up to 7.5 psf and low sill Barrier Free shall have performance level of 0 psf.

.4 Door manufacture to certify level of performance achieved.

1.5 SUBMITTALS FOR REVIEW

.1 Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.

.2 Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, and finishes.

.3 Samples: Submit two samples of door face metal, 6x6 inch in size illustrating factory finished door colours and surface texture.

1.6 SUBMITTALS FOR INFORMATION

.1 Manufacturer's Installation Instructions: Indicate special installation instructions.

.2 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Accept doors on site in manufacturer's packaging. Inspect for damage.

□

.2 Break seal on site to permit ventilation.

1.9 PROJECT CONDITIONS

.1 Coordinate the work with door opening construction, door frame and door hardware installation.

.2 Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

Part 2 Products

2.1 DOOR MANUFACTURERS

.1 Masonite, Model: Sta-Tru HD Prefinished Steel Entry Doors.

.2 Stanley: Model: Steel Entry door.

.3 Pella Corporation: Model: In and Out Swing Entry Doors.

.4 Substitutions: Equal steel or fiberglass system with prior approval of Owner and Architect

2.2 DOORS [AND PANELS]

.1 Exterior Doors (Thermally Isolated): HMMA Constuction Type D. door type F or FG per drawings, thermally broken or

.2 1 ¾" side hinged steel or fibreglass doors systems manufactured by Masonite or meeting Masonite Specifications.

.3 Steel Door Panels:

1. -24-gauge galvanized steel skins on exterior and interior surfaces with CFC-free injected foam.
2. Rails and Stiles: Wood top rail and styles and wood plastic composite bottom rails secured with structural adhesive between skins at perimeter.
3. Lock Block 12-inches or greater solid wood.
4. Panel thickness 1-11/16 inches or greater.

.4 Fiberglass Door Panels:

1. 0.072-inch minimum fibreglass skins on exterior and interior surfaces with CFC-free injected foam.

□

2. Rails and Stiles: Wood top rail and styles and wood plastic composite bottom rails secured with structural adhesive between skins at perimeter.
3. Lock Block 12-inches or greater solid wood.
4. Panel thickness 1-11/16 inches or greater.

2.3 DOOR AND PANEL CONSTRUCTION

.1 Face: Steel, galvanized sheet in accordance with ASTM A653/A653M electrolytic zinc-coated in accordance with ASTM A591/A591M, manufactured and fabricated in accordance with HMMA 802 and 810. or

.2 Sta-Tru HD 2 Panel Door wood edge steel doors with Vent Lite (where shown) with Low-E Glass (clear glass with easy-open lower sash and insect screen) 36”x84” unless otherwise noted on drawings.

.3 Core: foam.

.4 Door Edge Design: Rabbeted.

.5 Thermal Insulated Door: U-Factor of 0.13 without glazing and SHGC of 0.

.6 Sound Rated Door: STC of 22, measured in accordance with ASTM E413, for door without glass insert.

2.4 ACCESSORIES

.1 Primer: Zinc chromate type.

2.5 FABRICATION

.1 Astragals for Double Doors: Steel T shaped, recessed at face edge, specifically for double doors.

.2 Fabricate doors with hardware reinforcement welded in place.

.3 Configure exterior doors with special profile to receive recessed weather stripping.

2.6 FINISH

.1 Exterior Units: ASTM A653/A653M Z180 G60.

.2 Primer: Baked.

.3 Factory Finish: Manufacture’s standard pre-finish or baked enamel colour as selected by architect.

□

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 33 00: Verification of existing conditions before starting work.

.2 Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

.1 Install doors in accordance with HMMA 840 and HMMA 830 DHI for hardware installation.

.2 Pre-install glass and glazing.

.3 Coordinate installation of doors with installation of frames specified in Section 08 12 14 and hardware specified in Section 08 71 00.

.4 Touch-up factory finished doors.

3.3 ERECTION TOLERANCES

.1 Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

.1 Adjust door for smooth and balanced door movement.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Design, labour, Products, equipment and services necessary for window work in accordance with the Contract Documents.

1.2 REFERENCE

.1 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.

.2 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.3 CAN/CGSB-19.13-M, Sealing Compound, One-Component, Elastomeric, Chemical Curing.

.4 CAN/CGSB 79.1-M, Insect Screens.

.5 NFRC 100, Procedure for Determining Fenestration Product U-factors.

.6 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 DESIGN REQUIREMENTS

.1 Design windows to meet requirements of AAMA/WDMA/CSA 101/I.S.2/A440, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.

.2 Design complete window systems, including glazing, to meet the following performance criteria:

.1 **U-factor: Maximum .28**
.2 **Energy Rating: 25**

.3 Design windows in accordance with following Climatic Design Data for Minden Hills contained in Ontario Building Code:

.1 Design Temperature: January 1%, July 2 1/2%.
.2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.

.4 Design windows to accommodate following without detrimental effect:

.1 Cyclic 40 degrees C daily, thermal swing of components.
.2 Cyclic, dynamic loading and release of loads such as wind loads.
.3 13 mm vertical deflection in the supporting structure and movement of supporting structure due to live, dead load, and creep or deflection, seismic load, sway displacement and similar items.

.5 Design windows in accordance to AAMA/WDMA/CSA -101/I.S.2/ A440, to the following performance levels:
- .1 Performance class: CW.
- .2 Minimum performance grade (PG): 35.
- .3 Minimum positive design pressure: 1680 Pa.
- .4 Minimum negative design pressure: - 1680 Pa.
- .5 Minimum water penetration test pressure: 290 Pa.
- .6 Minimum air infiltration/exfiltration: A3.
- .7 Condensation resistance: I57
- .8 Temperature Index: I57.

.6 Design and detail controlled drainage path to discharge water, which enters into, or forms within windows, to exterior. Prevent accumulation or storage of water within the windows.

.7 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to L/175 maximum (under uniformly distributed positive load) and 10 mm maximum regardless of span.

.8 Design anchorage inserts for installation as part of other Sections of the Work. Design anchorage assemblies to accommodate construction and installation tolerances.

1.4 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 00 00 indicating:
  - .1 Plans, elevations, sections, and details.
  - .2 Products and glazing types.
  - .3 Section reinforcement, anchorage, assembly fixings.
  - .4 Anchorage inserts, system installation tolerances
  - .5 Detailing, locations, and allowances for movement, expansion, contraction.
  - .6 Path of cavity drainage and air pressure equalization.
  - .7 Clearly indicate materials and assemblies in large scale details for head, jamb, sill, top and bottom rails, stiles, and muntin bar conditions.

.2 Project close-out submittals: Submit data for windows incorporated into Operation and Maintenance Manual as part of Section 01 00 00.

.3 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 QUALITY ASSURANCE

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance. Submit proof of experience upon Consultant's request.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Protect windows during delivery and store in a dry, well ventilated place indoors and protect from injury.

.2 Cross-brace large units. Package or crate units for shipment and storage before installation.

.3 Provide methods for lifting units into place without causing damage.

.4 Protect finish surface by sturdy protective wrappings.

1.7 EXTENDED WARRANTY

.1 Submit an extended warranty for windows work in accordance with General Conditions, except that the warranty period is extended to 5 years.

- .1 Warrant against failure to meet the design criteria and requirements such as interior leakage, loosening of whole or of parts of units, insulating glass unit failure, finish degradation, frame condensation.
- .2 Coverage: Complete replacement including affected adjacent work.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Fibreglass windows: As manufactured by Inline Fibreglass Ltd.
.2 Woodframed, Aluminum Clad windows: As manufactured by Andersen Windows Inc. Standard exterior colour, clear coat pine interior.
.3 Approved substitute that matches performance, size, and operability.

- Finishes to be selected from standard finishes from each manufacturer

2.2 MATERIALS

.1 Unless detailed or specified herein, standard products in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 will be acceptable if construction details and installation meet intent of Drawings and Specifications.

.2 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.

.3 Incorporate only new materials that are free from defects which impair strength, durability, or which are visible.

.4 Fibreglass material: Pultruded fibreglass with a nominal wall thickness of 2.5 mm with minimum glass content of 60%.

.5 Glass and glazing materials: Triple glazed thermal units with low E coatings, argon fill and warm spacer as recommended by window manufacturer for cold climates. Double glazed units will be acceptable if the U-values meet the design criteria.

.6 Airseal sealant: CAN/CGSB-19.13-M; One part silicone neutral cure low modulus sealant. Verify compatibility with insulating glass unit manufacturer's secondary sealant.

.7 Frame sealant: Type as recommended by the window manufacturer.

.8 Window sealant: In accordance with Section 07 92 00.

.9 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304. Aluminum; screws and bolts, AS2024 or 6061, and nuts AS6262.

.10 Window hardware: Manufacturer’s standard heavy-duty type.

.11 Screens: Fiberglass yarn 14 X 18 mesh screen, conforming to CAN/CGSB 79.1-M, in an extruded aluminium frame finish to match window frame. **All operable windows to have screens.**

.12 Foam insulation: One component polyurethane foam-in-place moisture cured caulking sealant insulation, 16 kg per m^3 to 32 kg per m^3 density; injected from prepackaged pressurized containers for installation within closures and fillers; foam shall be CFC free. Enerfoam by DuPont de Nemours. or approved alternative.

2.3 FABRICATION

.1 Take site measurements of all openings for windows, frames and sash.

.2 Fabricate generally to dimensions and profiles indicated on Drawings and to meet specified requirements. Maintain sight lines indicated and clearances to other construction components.

.3 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well-defined corners.

.4 Fabricate window and sash true and square, to component sizes to match existing, and overall sizes to suit existing frames or new openings.

.5 Fabricate, fit and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Seal frame with sealant at joints for weatherproof seams.

.6 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.7 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing. Fabricate filler and closure pieces as necessary for a complete and weathertight installation.

.8 Except where shipping makes impossible, fabricate units in shop and ship completely assembled.

.9 Do not expose manufacturer's identification labels on window assemblies.

.10 Certify windows as complying with the AAMA/WDMA/CSA 101/I.S.2/A440 design criteria and requirements using an easily removable label located on the inside face of glazing.

.11 Fabricate frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.

.12 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections wherever possible.

.13 Fabricate window flashings, closures and trim to profile shown. Make weathertight.

.14 Secure weatherstripping in place by mechanical means only, and in a manner to enable its removal and replacement without special tools.

.15 Install window hardware in accordance with reviewed shop drawings.

.16 Ensure that continuity of weatherstripping is maintained around openings.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, reviewed shop drawings and manufacturer's instructions.

.2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.3 Install reinforcing and supporting members as specified or indicated as part of the work of this Section.

.4 Do not force units into place, nor subject them to loads for which they were not designed.

.5 Install window flashings, closures, and trim pieces.

.6 Provide for thermal movement to take place between units and adjacent construction.

.7 Conceal anchors, clips, blocking, and all other attachments. Provide all fastenings or anchors to be built in under other Sections.

.8 Fill voids between framing and adjacent construction with foam insulation.

.9 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.

.10 Install units with consideration for finish variations. Abrupt variations of appearance or colour in adjacent components will not be acceptable without approval of Architect before installation.

.11 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.3 ERECTION TOLERANCES

.1 Tolerances: Non-cumulative.

.2 Maximum variation from plumb: 1.5 mm/3 m non-cumulative.

.3 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.

.4 Vertical and horizontal positions: +/- 3 mm.

.5 Racking of face: 6 mm, nil in elevation.

.6 Maximum perimeter sealant joint between window and adjacent construction: 13 mm.

.7 Deviation from true plumb over full height of building; maximum 6 mm.

.8 Deviation from true straightness in plane over full length of each building face; maximum 6 mm.

.9 Joint width between base and sill panels; maximum 3 mm and of uniform width. Do not apply sealants to joints between panels.

3.4 GLAZING PERIMETER AIRSEAL

.1 Install glazing perimeter airseal at entire perimeter of each insulating glass unit to achieve an airseal from insulating glass unit to frame. Do not obstruct path of cavity drainage and air pressure equalization.

3.5 JOINT BACKING AND SEALANT

.1 Prepare substrate surface, mask as recommended by sealant manufacturer.

.2 Install joint backing and frame sealant at window system joints and perimeter for weathertight installation in accordance with window sealant manufacturer's instructions. Remove excess sealant.

.3 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in sealant. Seal between sill upstand and window-frame. Seal butt joints in continuous sills.

3.6 ADJUSTING

.1 Adjust operable units to move smoothly, with proper tension, throughout their full range of motion and to fit tightly when closed and locked.

.2 Lubricate hardware in accordance with manufacturer's instructions.

.3 Ensure that weatherstripping makes weathertight contact and does not cause binding to affect closing and locking.

3.7 CLEANING

.1 Maintain windows, inside and outside, in clean condition throughout duration of work.

.2 Remove protective material, and glass presence markers from surfaces.

.3 Remove AAMA/WDMA/CSA 101/I.S.2/A440 certification labeling when directed by Consultant, in writing.

.4 Wash windows with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for finish hardware Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 BHMA, Builders Hardware Manufacturing Association.

.2 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 SUBMITTALS

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 00 00 indicating compliance with reference standards, transportation, storage, handling and installation requirements.

.2 Shop Drawings:

- .1 Submit Shop Drawings and 3 complete hardware lists in accordance with Section 01 00 00 indicating:
  - .1 Door locations, sizes, hardware manufacturer's catalogue numbers, finish symbols and quantities required.
  - .2 Locations and mounting heights of each type of hardware.
- .2 Supply templates and required information to door and frame manufacturer to enable accurate sizes, locations of cut-outs and reinforcement for hardware.
- .3 Submit templates to required trade to arrange for provisions for accurate setting and fitting of hardware.

.3 Samples:

- .1 Submit 2 samples in accordance with Section 01 00 00 of each item that is different from hardware specified and include manufacturer's parts lists and installation instructions.
- .2 Submit hardware component samples illustrating style, colour and finish. Tag samples identifying applicable Specification article number, brand name and number, finish, building location, date and catalogue number.
- .3 Do not order hardware until samples have been accepted. Submit new samples to replace rejected samples. Supply hardware and finishes identical to each accepted sample.

.4 Closeout submittals:

Prior to Substantial Completion, furnish to the owner, two (2) copies of an owner’s operation and maintenance manuals in a three ring binder with the following information:

1. Name of hardware distributor, address and contact name
2. Copy of final “as-built” finish hardware schedule
3. Wiring diagrams, elevations, risers, point to point
4. Copy of final keying schedule

5. Copies of floor plans with keying nomenclature assigned to door numbers as per the approved keying schedule
6. Catalogue cut sheets and product specifications for each product
7. Parts list for each product
8. Installation instructions and templates for each product.

.5 Keying Schedule

Submit three (3) copies of keying schedule for review prepared and detailed in Reference 1.5.5. Include special keying notes and stamping instructions. Locks and cylinders are not to be ordered until the key schedule has been approved by the owner.

.6 Wiring Diagrams

Co-ordinate with related trades, meet with the owner and security provider and submit a written description of the functional use (mode of operation) of electrical hardware products specified. Include operation for ingress, egress, fire alarm, and after hours use where applicable. Include door and frame elevations showing the location of each item of electrical hardware to be installed, mode of operation including a diagram showing number and size of conductors. Indicate on elevation drawing items provided by related trades, include for back boxes, and 120V power sources. Provide point to point drawings showing terminal connections necessary for a complete installation.

1.4 QUALITY ASSURANCE

.1 General:
- .1 Manufacturers: Companies specializing in manufacturing door hardware and registered with BHMA.
- .2 Hardware supplier: Company specializing in supplying commercial door hardware and acceptable to manufacturer.

.2 Certifications:
- .1 Employ an Architectural Hardware Consultant to inspect completed installation and certify that hardware has been installed in accordance with manufacturer's printed instructions, Authorities having Jurisdiction and as specified.
- .2 Submit manufacturer's certificate that finish hardware and fire rated hardware meets specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Be responsible for packaging of hardware, on a set by set basis. As material is received from various manufacturers identify it to correspond to Hardware List symbols.

.2 Label packages legibly, indicating manufacturer's number, types, sizes, opening number and Hardware List reference number. Wrap hardware and include in package, screws, bolts and fastening necessary for correct installation. If hardware package is not complete, pay additional charges incurred by installer. Mark cartons with heading number, door number, and key-set symbol where applicable in original packaging provided by the manufacturer.

.3 Deliver hardware to Site packaged, labelled and cross-referenced to hardware list for each item and its scheduled installation location.

.4 Accept Products of this Section on Site and ensure that each item is undamaged.

.5 Catalogue and store hardware in secure area.

Part 2 Products

2.1 GENERAL

.1 Carefully check and verify Hardware List against Contract Drawings to ensure that hardware listed can be used as specified. Inform Consultant of concerns regarding quality, quantity, operation or function of hardware selected:

- .1 Verify hand of doors, examine details on Contract Drawings and at Site to ensure hardware supplied can be correctly installed and is correct for Work as constructed.
- .2 Select hardware in accordance with applicable codes and regulations and to approval of local Fire Marshal.
- .3 Replace and pay for defective hardware including hardware which was incorrectly selected, and remedial and installation costs.

.2 Ensure that hardware selected will function correctly, meets Contract requirements and Ontario Building Code and authorities having jurisdiction.

.3 Ensure that door operators are compatible with “Wave-to-Open” touchless technology.

.4 Ensure that each hardware item is of same type, design and by same manufacturer.

.5 Manufacturer's names or trade marks are not permitted on exposed surfaces of hardware.

.6 Include in packing slip a list of parts, name of supplier and door number in which lock is to be installed.

.7 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.

.8 Fire rated assemblies:

- .1 Hardware: Selected and installed in accordance with applicable codes and regulations, NFPA-80 and to approval of Ontario Fire Marshal.
- .2 Fire rated doors: ULC labelled hardware. Submit written certification of conformance to ULC requirements for each type of hardware prior to delivery.
- .3 Locksets and latchsets on fire rated doors: 19 mm throw minimum.

2.2 MANUFACTURERS

Products listed in the hardware groups are from the manufacturers listed below:

ITEM	MANUFACTURER NAME
Full Mortise Hinges	Ives
Locksets, Latchsets	Schlage
Deadlocks	Schlage
Exit Devices	Falcon
Door Closers	LCN
Door Pulls/Flatware	Canadian Builders Hardware
Wall/Floor Stops	Ives

Weather/Smoke/Sound Seals	KN Crowder
Door Sweeps/Thresholds	KN Crowder

2.3 ACCESSORIES

Items to be attached to masonry or concrete with expandable shields, lag screws, bolts or other fastening devices as required. Exposed screws: Stainless steel, Phillips or Robertson heads.

2.4 MATERIALS

.1 **Screws and Fasteners**
Screws to be matching finish to their product and to be manufacturer's standard. Door closers, door holders and exit devices installed on fire rated wood doors and hollow metal doors to be attached with the appropriate fasteners to meet code requirements.

.2 **Materials-Acceptable Manufacturers (Note: Supply products in a given category from the same manufacturer):**

.1 **Mortise Hinges**

Furnish five knuckle bearing hinges with NRP option on all reverse bevel doors with locking hardware. Hinge width to accommodate door closer projection, door trim and allow for 180-degree swing. Doors up to 2286mm in height, supply 3 hinges, doors greater than 2286mm in height add one hinge for every additional 760mm of door height. Doors 915mm wide and less furnish 114 mm high hinges, doors greater than 915mm wide furnish 127mm high hinges, heavy weight or standard weight as specified. Supply ferrous (steel), stainless steel material for all interior and/or fire-rated doors and stainless steel for exterior doors.

.2 **Surfac**

e/Flush Bolts/Co-Ordinators:

Manual Flush Bolts-Metal Doors:
Manual flush bolt for metal doors to be cUL listed for 3-hour fire doors with ½" diameter bolt tip with ¾" throw. Standard rod length to be 12", supply longer length rods to suit higher door heights. Provide dustproof strikes with flushbolts.

.3 **Locksets:**

.4 **Deadbolt:**
To be Stanley- BEST 8T2 (Cylinders to be supplied by the client)

.5 **Exit Devices:**

Exit Device touch pad design:
ANSI A156.3, Grade 1, cUL listed for panic hardware and fire exit hardware. Device chassis cover, pushbar, device body and exterior trim to be of brass, bronze or stainless steel throughout and finished in accordance with BHMA 1301 and ANSI A156.3. All

mounting fasteners to be concealed. All devices to be non- handed or easily field reversible, including lever trim. Fire rated rim chassis to be investment cast stainless steel. Other moving parts to be investment cast stainless steel or forged brass. Chassis backplate and locking assembly to be 12 gage wrought plated steel.

.6 **Door Closers:**

Door closers to have the following features (see separate closer sections below for further information):

- Fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons.
- Include high efficiency, low friction pinion bearings.
- Hydraulic fluid of a type requires no seasonal adjustments, ULTRA X TM fluid has constant temperature control from -35o C to +49o C.
- Hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.
- Separate adjustments for backcheck, general speed and latch speed.
- Door closers with special template (ST-) numbers include required associated product, information sheets and instructions
- Size 1 manual door closers to provide less than 5 pounds opening force on a 900mm door leaf.
- Door closer with Pressure Relief Valves are not accepted.
- Door closer bodies, arms, covers to be powder coated
- Closers with powder coat finishes to exceed a minimum 100-hour salt spray test, as described in ANSI A156.18 and ASTM B117.
- Closers detailed with plated finishes to include plated covers (or finish plates), arms and visible fasteners.

Mechanical (Multiple Applications):
Non-sized (1-6) and non-handed cast iron cylinder body to have 1 1/2" piston diameter with 3/4" journal double heat-treated pinion shaft with 5/8" full complement bearings. XP closer hydraulic regulation controlled by tamper-proof, non critical screw valves, abrasion resistant Vitron "O" ring, adjustable with a hex wrench.

Closer to have "FAST" Power Adjust speed dial to show spring size power. Track closers non-sized 1-4. Closers to have forged steel main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever forged arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

.7 **Door Trim:**

Door Pull

Kickplates 40mm less door width single door and 25mm less door width double doors

.8 **Wall Stops:**

Wall Stops (No Button on Locking Hardware):
Wall stops to be constructed of stainless-steel base with special retainer cup that makes the rubber stop tamper resistant. Convex design of rubber bumper.

.9 **Weather/Smoke/Sound Seals:**

Installed as per manufactures instructions.

.10 **Thresholds/Door Sweeps:**

Installed as per manufactures instructions.

.11 **Door Contact:**

Provide recessed or surface mounted type door position switches as specified. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.5 FINISHES

Unless otherwise specified, finishes to be brushed chrome (BHMA 626/652).

ITEM	BHMA#	DESCRIPTION	BASE MATERIAL
Hinges	652	satin chrome plated	steel
Hinges	630	satin stainless-steel	stainless-steel
Lock Trim	626	satin chrome plated	brass/bronze
Exit Devices	626	satin chrome plated	Brass/bronze
Door Closer	689	powder coat aluminum	steel
Door Pulls	630	satin stainless-steel	stainless-steel
Thresholds	628	anodized aluminum	aluminum
Weatherstrip	628	anodized aluminum	aluminum

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

.1 Hardware Installers must have a minimum of five (5) years experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. Installers to attend review meetings conducted by the hardware distributor.

.2 Install hardware in accordance with reviewed Shop Drawings, manufacturer's installation instructions, and applicable Codes and regulations.

.3 Ensure locksets / latchsets / deadlocks / exit devices are of the correct hand before installation to ensure that the cylinder is in the correct position. **Handing is part of installation procedure.**

.4 Install hardware in accordance with hardware templates.

.5 Adjust fixed and operable hardware for correct clearances and function.

.6 Mount hardware measured from finished floor to centre of hardware, unless indicated otherwise or required by Code:
- .1 Top hinge: 250 mm from head of door to top.
- .2 Bottom hinge: 265 mm from finished floor to bottom of hinge.
- .3 Intermediate hinge: Equal distance between top and bottom hinge.
- .4 Locksets, latchsets: 1000 mm.
- .5 Panic device crossbar: 1000 mm.
- .6 Push plates: 1100 mm to bottom of plates.
- .7 Guard bars: 1100 mm.
- .8 Door pulls: 1100 mm to bottom of pulls.
- .9 Blank strike: 1450 mm.
- .10 Blank fronts: 1450 mm.

.7 Include for supply and installation of wiring for electric strikes from electrical junction box to electric strike hardware.

.8 Locate door stops to contact doors 75 mm from latch edge.

.9 Install hardware and trim square and plumb to doors.

.10 Replace wrappings for hardware provided by manufacturer after installation.

.11 Safeguard keys to keep them out of unauthorized hands, tag them with door number, and deliver them to Owner.

3.3 FIELD QUALITY CONTROL

.7 Have hardware inspected after installation by hardware supplier's representative, obtain certification in writing that hardware has been supplied and installed in accordance with Specifications and hardware manufacturer's instructions and is functioning correctly.

.8 Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements and Authorities having Jurisdiction.

.9 Test access control system and electrified hardware devices for proper operation. Verify electric door release hardware operates properly upon activation of fire alarm system.

3.4 ADJUSTING

.1 Verify under work of this Section, that installed hardware functions properly.

.2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by manufacturer's instructions.

.3 Adjust doors with self closing devices or automatic closing devices for proper operation after the HVAC system is balanced and adjusted. Verify spring power of non sized door closers is properly adjusted.

.4 Check locked doors against approved keying schedule.

3.5 CLEANING

.1 Remove wrappings at completion of the Project and clean hardware in accordance with manufacturer's instructions.

Protect hardware from damage during construction. Wrap locks, panic hardware, fire exit hardware, door pull trim with kraft paper or plastic bubble materials to protect finish from damage until date of substantial completion. Remove and reinstall or where necessary, use temporary hardware to maintain finish in new condition and maintain manufacturer’s warranty

3.6 HARDWARE GROUPS/SCHEDULE

.1 Hardware groups/schedule: To follow.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Design, labour, Products, tool, equipment and services necessary for automatic door equipment work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ANSI/BHMA A156.19, Power Assist and Low-Energy Power-Operated Doors.

1.3 DESIGN REQUIREMENTS

.1 Design handicap door system comprising of low energy power operator with optional push and go door system as defined in ANSI/BHMA A156.19.

.2 Design system operator to activate if one push button from either side of door is pushed. Actuated door shall open slowly to back check (80^o) in 3 to 6 seconds and to full open position in 4 to 7 seconds. Door shall remain open for period set to suit requirements (period of 5 to greater than 30 seconds as approved by the Owner to accommodate residents using assistive devices). After time delay door shall close by spring in door operator from 90^o to 10^o in 3 to 6 seconds from 10^o to fully closed in 1-1/2 to 2 seconds.

.3 Design handicap door system to operate both doors, of a set of double doors, with the push of a single push button. Coordinate opening of doors so that one door is almost completely closed before the other door starts opening.

1.4 SUBMITTALS

.1 Product data: Submit duplicate copies of manufacturer's Product data in accordance with Section 01 00 00 indicating performance criteria, compliance with appropriate reference standard(s), characteristics, limitations, trouble-shooting protocol, transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings in accordance with Section 01 00 00 indicating all connections, attachments, reinforcing, anchorage and location of exposed fastenings.

1.5 EXTENDED WARRANTY

.1 Submit an extended warranty for automatic door equipment in accordance with General Conditions, except that warranty period is extended to five (5) years from date of Substantial Performance of the Work.

.1 Warrant against failure to meet design criteria and requirements.

.2 Coverage: Complete replacement including affected adjacent Work.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)

.1 Heavy Duty Door Operator: Design is based on self contained, low pressure electro-hydraulic power. Operator to be as manufactured by one of the following:
- .1 PowerSwing by Besam of Canada.
- .2 Magic Force by Stanley Canada Inc.
- .3 Senior/Middle/Astro Swing by Dor-O-Matic.

.2 Door operating equipment shall be complete with electro mechanical motor gear box. Provide 3 position (off-on) switch. System shall operate between -30 deg C and 50 deg C.

2.2 REQUIREMENTS

.1 Functional Requirements:
- .1 Equipment shall be designed to operate swing doors up to weight of 100 kg.
- .2 Opening Speed:
  - .1 Door shall be field adjusted to back check as required in Table 1 of ANSI/BHMA A156.19.
  - .2 Opening speed to fully open shall be not less than 5 seconds or longer to be site adjusted to suit application.

.2 Hold Open: Door shall be field adjusted to remain fully open for not less then 5 seconds or more than 30 seconds and as approved by Owner to accommodate elderly residents in walkers and similar assistive devices.

.3 Closing Speed:
- .1 Doors shall be field adjusted to close 90^{o} to 10^{o} in 3 seconds or longer as required in Table 1 of ANSI/BHMA A156.19.
- .2 Doors shall close from 10^{o} to fully closed in not less than 1.5 seconds.
- .3 Force required to prevent door from opening or closing shall not exceed 7 kg applied 25 mm from latch edge of door at any point in opening or closing cycle.
- .4 During power failure, doors shall open with manual pressure not exceeding 11.3 kg at point 25 mm from latch edge of door.
- .5 Doors shall be equipped with signs visible from either side, instructing user as to operation and function of door.
- .6 Please provide for delayed action door closers in locations as indicated.

.4 Requirements:
- .1 Provide header complete with full housing, finish shall match door frame finish.
- .2 Locations of automatic door operators to conform to requirements of the Ontario Building Code (OBC).
- .3 Operator shall be activated by 150 mm diameter stainless steel push button switches on either sides as indicated.
- .4 Switches shall bear universal handicap logo visible to all types of traffic.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install automatic door operators, controls and accessories for doors indicated in accordance with reviewed shop drawings and manufacturer written instructions.

.2 Installation of automatic door operators to be in accordance with requirements of the Ontario Building Code (OBC).

.3 Doors shall operate manually as though equipped with manual door closers, without damage to automatic door components, in event of power failure or in event of power termination.

.4 Co-ordinate this work with applicable door Sections.

.5 Power supply to each door operator and wiring shall be provided by Division 26 - Electrical. Make connections at operators and at control panel and supply and install each electrical work between operators and activating controls. Comply with requirements of Division 26 - Electrical. All wiring shall be concealed and where exposed shall be run in conduit. Location of exposed wiring shall be subject to Consultant's approval.

.6 Coordinate wiring with universal we package.

3.3 ADJUSTMENT AND CLEANING

.1 Test and adjust operators and controls smooth and proper operation.

.2 Upon completion of Work of this Section, remove from Site all debris, equipment and excess material resulting from Work of this Section.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Design, labour, Products, equipment and services necessary for gypsum board work.

1.2 REFERENCES

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C645, Specification for Nonstructural Steel Framing Members.

.4 ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.5 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board.

.6 ASTM C834, Standard Specification for Latex Sealants.

.7 ASTM C840, Specification for Application and Finishing of Gypsum Board.

.8 ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.9 ASTM C1178, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.10 ASTM C1278, Specification for Fiber-Reinforced Gypsum Panel.

.11 ASTM C1396, Specification for Gypsum Board.

.12 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 DESIGN REQUIREMENTS

.1 Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.

.2 Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.1 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation

of light fixtures.

.2 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.

.3 Design wall framing system for wall assemblies with a height greater than 3000 mm.

1.4 REGULATORY REQUIREMENTS

1. Provide fire separations and fire protection exactly as specified in test design specification that validates the specified rating. Verify that work specified in other Sections, as a part of the entire assembly, meets applicable validating test design specification.

1.5 SUBMITTALS

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop Drawings:
- .1 Submit Shop Drawings in accordance with Section 01 00 00 indicating:
  - .1 Wall assemblies, suspension systems, adjacent construction, elevations, sections and details, dimensions, thickness, finishes and relationship to adjacent construction.
  - .2 Framing and blocking for items being supported of wall systems.

.3 Certifications: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.6 QUALITY ASSURANCE

.1 Qualifications: Execute the work of this Section by skilled, qualified, and experienced workers trained in the installation of the work of this Section.

.2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in work of comparable complexity and scope, to perform following services as part of work of this Section:
- .1 Design of wall systems with height greater than 3000 mm.
- .2 Design of suspended gypsum board assemblies.
- .3 Review, stamp, and sign Shop Drawings and design calculations.

.4 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed Shop Drawings.

1.7 SITE CONDITIONS

.1 Do not begin work of this Section until:
- .1 Mechanical and electrical work above the ceiling is complete.
- .2 Substrate and ambient temperature is above 15°C.
- .3 Relative humidity is below 80 %.
- .4 Ventilation is adequate to remove excess moisture.

.2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and 24 h after installation.

Part 2 Products

2.1 MATERIALS

.1 General: All materials under work of this Section, including but not limited to, sealants, adhesives, and primers are to have low VOC content limits.

.2 Steel framing: ASTM C754; ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
- .1 Bailey Metal Products Limited
- .2 Corus Metal Profiles

.3 Steel studs and track runners: ASTM C645; Galvanized steel studs and runners, 32 mm wide x depth as indicated on Contract Drawings. Formed from galvanized steel sheet, thicknesses as follows:
- .1 Studs less than 3000 mm: Minimum 0.53 mm (25 ga.).
- .2 Studs greater than 3000 mm and non-standard assemblies: Minimum 0.91 mm (20 ga.), unless stud thickness of greater thickness is required to accommodate intended loading, spans, or conditions.
- .3 Track runners and ancillary components to match stud thickness.

.4 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, 38 x 19 mm cold rolled, channels.

.5 Resilient channel: ASTM C645; 0.5 mm thick galvanized metal, 57 mm wide x 12 mm deep for walls and ceiling to reduce sound transmission.

.6 Furring channels: ASTM C645; Formed from galvanized steel sheet, 22 mm winged flange type, cold rolled.

.7 Furring channels (hat type): ASTM C645; 0.5 mm base steel thickness, galvanized. 70 mm wide x 22 mm deep hat shaped channel.

.8 Heavy duty furring channels: ASTM C645; 0.9 mm steel thickness, galvanized hat shaped channel with a wider and deeper size as required by manufacturers.

.9 Hanger wires: 4.1 mm minimum diameter galvanized pencil rod.

.10 Tie wire: 1.6 mm thick minimum diameter, soft annealed, galvanized steel wire.

.11 Corner bead, casing bead, and special shapes: Formed from 0.6 mm thick minimum, galvanized steel sheet, designed to be concealed by joint compound.

.12 Deflection track: ASTM C 645 top runner with 50.8-mm- deep flanges, in thickness indicated for studs and in width to accommodate depth of studs.

.13 Deflection track (fire rated): Provide 25 mm deep leg deflection track where indicated on rated walls. 'Fire Trak Shadowline' by Fire Trak Corporation or approved alternative.

.14 Ceiling clips: Hot dip galvanized partition attachment clips, in square and reveal edge; 'PAC 15 Series' to match grid system by CGC Inc. or approved alternative.

.15 Gaskets (acoustic partitions): Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3.2 mm thick, in width to suit steel stud size.

.16 Control joint strip: Roll formed from galvanized steel sheet, with a tape protected recess, 6 mm wide x 11 mm deep.

.17 Screw fasteners: ASTM C1002 Type S; Corrosion resistant.

.18 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.

.19 Batt insulation: In accordance with Section 07 21 00.

.20 Standard sealants:

.1 Acoustic sealant (non-rated): Non-hardening acoustic sealant for use at non-rated assemblies, ASTM C834; Acrylic, mould resistant sealant, paintable. 'Smoke and Acoustic Sealant CP506' by Hilti or approved alternative.

.2 Standard sealants: In accordance with Section 07 92 00.

.21 Fire rated seal: Provide one of the following for use at fire rated assemblies:

.1 Fire-rated sealant: Non-hardening sealant for use at fire-rated assemblies: ASTM E84; Acrylic based firestop sealant, colour: red or white as selected by Consultant. 'Flexible Firestop Sealant CP606' by Hilti or approved alternative.

.2 Fire-rated seal: Non-hardening seal for use at fire-rated assemblies: ASTM E84; Flexible seal for installation between top track and substrate. 'Firestop Top Track Seal CFS-TTS' by Hilti or approved alternative.

.22 Gypsum board: ASTM C1396; gypsum board 12.7 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Board by Certainteed Gypsum Canada, CGC Inc., or Georgia-Pacific Canada LP.

.23 Fire rated gypsum board: ASTM C1396; gypsum board 15.9 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Type X Board by Certainteed Gypsum Canada, CGC Inc., or Georgia-Pacific Canada LP.

.24 Moisture and mould resistant board: 12.7 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise; 'M2Tech Moisture and Mould Resistant' by Certainteed Gypsum Canada, 'Sheetrock Mold Tough' by CGC Inc. or 'DensArmor Plus High Performance Interior Panel' by Georgia-Pacific Canada LP.

.25 Tile Backer: Water resistant tile backer board meeting ASTM C1178 or ASTM C1278, thickness as indicated. 'Diamondback Tile Backer' by Certainteed Gypsum Canada, 'Fiberock Aqua-Tough Underlayment' by CGC Inc. or 'Dens Shield' by Georgia-Pacific Canada LP.

.26 Shaftwall gypsum system:

.1 Steel J-Runner: ASTM C645; Rolled formed sheet steel, 25 gauge, by CGC, Gypsum Corporation or approved alternative.
.2 C-H stud: hot-dipped galvanized by CGC, Gypsum Corporation or approved alternative.
.3 Liner Panel: ASTM C1396; Gypsum wallboard panel, Thickness: 25.4 mm, Width: 610 mm. 'M2Tech Shaftliner Type X' by Certainteed Gypsum Canada, or approved alternative by CGC or Gypsum Corporation.
.4 Face Panel: ASTM C1396; Gypsum wallboard panel, 1 layer, Thickness: 15.9 mm, Width: 1219 mm. 'GlasRoc Shaftliner Type X' by Certainteed Gypsum Canada, or approved alternative by CGC or Gypsum Corporation

.27 Gypsum Board Materials – EXTERIOR (if required)

.1 Exterior Gypsum Soffit Board: ASTM C1396/C1396M, moisture resistant fire rated type where indicated, 16 mm (5/8 inch) thick, maximum available length in place; inorganic coated glass fiber mat faces, ends square cut, square edges. Manufacturer: CGC "AquaTouch Interior Panels"

.2 Gypsum Sheathing Board: ASTM C1396/C1396M, moisture resistant (and fire resistant where indicated) type; 13 mm (1/2 inch) thick, maximum available size in place; ends square cut, square edges; inorganic coated glass fiber mat faces. Manufacturer: CGC "Securock" or "Fiberock AquaTough Sheathing" or GP "Densglas Gold"

.28 Primer: Where indicated by board manufacturer, provide primer as required to achieve finishes as defined in ASTM C840.

.29 Joint reinforcing tape:
1. Standard gypsum board: ASTM C475; 50 mm wide x 0.25 mm thick, perforated paper, with chamfered edges.
2. Moisture resistant and tile backer boards: ASTM C475; fibreglass mat joint tape as recommended by board manufacturer to suit location.

.30 Bonding adhesive: Type for purpose intended and as recommended and approved by manufacturer

.31 Joint and patching compound: ASTM C475; Asbestos-free, supplied by manufacturer of gypsum board used.

.32 Fast setting patching compound: ASTM C475; Asbestos-free, Sheetrock or Durabond by CGC Inc., 'Moisture and Mold Resistant Setting Compound with M2Tech' by Certainteed Gypsum Canada or approved alternative.

.33 Access doors: Supplied by other Sections for installation as part of the work of this Section.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUSPENSION FRAMING

.1 Install ceiling systems in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.3 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.

.4 Install additional hangers at lighting fixture and ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.

.5 Install main carrying channels transverse to structural framing members. Lap main carrying channels 200 mm minimum at splices and wire each end with two loops and prevent clustering or lining-up of splices.

.6 Install furring channels at 400 mm o.c., not less than 25 mm, and not more than 150 mm from perimeter walls, at openings, at interruptions in ceiling continuity, and at change in plane. Install furring channels to a tolerance of 3 mm maximum in 3600 mm.

.7 Install additional main carrying and furring channels to frame and to reinforce openings such as recessed lighting fixtures, access hatches, ceiling grilles, outlet boxes, ventilating outlets and similar items.

3.3 STEEL STUDS AND FURRING

.1 Install steel studs and furring in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Install steel stud partitions to underside of structure unless indicated otherwise.

.3 Install track runners at floors, ceilings, and underside of structure; align track runners accurately and secure to structure at 600 mm centres maximum.

.4 Install double top track runner assembly to prevent the transmission of structural loads to steel studs.

.5 Install steel studs vertically at 400 mm o.c., unless otherwise indicated, and not more than 50 mm from abutting walls, at openings, and at each side of corners. Install studs securely to track runners.

.6 Schedule and coordinate steel framing installation with mechanical and electrical services installation.

.7 Install full height, double studs at door and service openings, fastened together and stiffened back to the structure to prevent vibration when doors close.

.8 Provide double studs boxed together at all openings, sill, head and jambs and at door jambs, fastened together and stiffened back to the structure to prevent vibration. At each opening exceeding 900 mm in width, double studs shall be 20 ga. extending to structure above, and adequately anchored at each end. Provide steel studs above and below openings spaced at 400 mm oc maximum. All metal stud partitions above doors and screens over 1220 mm wide shall be secured to structure over and reinforced with sway bracing to stabilize walls to prevent lateral movement.

.9 Erect three studs at corner and intermediate intersections of partitions. Space 50 mm apart and brace together with wired 19 mm channels.

.10 Stiffen partitions over 2440 mm high or 3000 mm long, or both, with horizontal bracing extended for full length of partitions. Provide one line of bracing in partitions. Space lines to provide equal unbraced panels. Provide bracing for portions of partitions over door openings in partitions over 3000 mm high, and bracing both above and below openings in partitions located no greater than 150 mm from top and bottom of opening, and extending two stud spaces beyond each edge of opening for both doors and windows. Wire tie or weld bracing to studs.

.11 Frame control joints using back to back double studs at abutting structural elements, at dissimilar backup interface, at dissimilar walls and ceilings, at structural expansion and control joints, at door and other openings, and at 9000 mm maximum spacing in continuous runs. Install control joint strips and secure in place.

.12 Install additional support framing at openings and cutouts for built-in equipment, upper cabinet support, access panels and similar items.

.13 Attach to framing adequate steel reinforcing members or an 1.2 mm (18 ga.) steel stud mounted horizontally and notched around furring members to support the load of, and to withstand the withdrawal and shear forces imposed by, items installed upon the work of this Section. Such items include, but are not restricted to, miscellaneous metals, coat hooks, washroom accessories, handrail anchors, rub rails, grab bars, guards, wall-hung cabinets and fitments, shelving, curtain and drape tracks, miscellaneous specialties; Owner supplied equipment; and minor mechanical and electrical work. Heavy mechanical and electrical equipment shall be self-supporting in Divisions 21, 22, 23 and 26.

.14 Provide for support and incorporation of flush-mounted and recessed mechanical and electrical equipment and fixtures only after consultation and verification of methods with those performing the work of Divisions 21, 22, 23 and 26.

.15 Install cross bracing in accordance with the steel stud manufacturer's recommendations.

3.4 FIRE RATED ASSEMBLIES

.1 Install Products in fire rated assemblies in strict accordance with applicable ULC tested and approved designs.

.2 Stiffen fire rated walls over 3.66 m high, where linear length of wall is greater than 2.44 m between perpendicular wall supports, with diagonal bracing above the ceiling extending perpendicular to wall at a 45□ angle to structure above. Locate diagonal bracing at maximum 2.44 m o.c.

.3 Where double layers of gypsum board are shown, and required for fire rating, screw first layer to studs and furring and laminate the second layer to the first using joint filler as an adhesive. Stagger joints between first and second layers.

3.5 BATT INSULATION

.1 Install non-rated and fire-rated/acoustic insulation as required for Work of this Project in accordance with Section 07 21 00.

3.6 ACOUSTICAL SEALANT

.1 Install acoustical sealant to acoustically insulated partitions in accordance with the manufacturer's instructions and Contract Drawings.

.2 Install acoustical sealant under floor runner track, at partition perimeter both sides and at openings, cut-outs, and penetrations, concealed from view in the final installation.

.3 Install firestop fill material behind fire rated acoustical sealant and provide firestop identification tag.

.4 Smooth acoustical sealant with trowel prior to skin forming.

3.7 GYPSUM BOARD

.1 Comply with ASTM C840. Install gypsum board in accordance with reviewed

Shop Drawings and manufacturer's written instructions.

.2 Install gypsum board vertically or horizontally, whichever results in fewer end joints. Locate end joints over supporting members.

.3 Install gypsum board in lightly butted contact at edges and ends and with 1.6 mm maximum open space between boards; do not force gypsum board into place. Do not install imperfect, damaged or damp boards.

.4 Install gypsum board butting paired tapered edge joints, and mill-cut or field-cut end joints; do not place tapered edges against cut edges or ends.

.5 Install vertical joints minimum 300 mm from the jamb lines of openings and stagger vertical joints over different studs on opposite sides of partitions.

.6 Do not locate joints within 200 mm of corners or openings, except where control joints occur at jamb lines or where openings occur adjacent to corners. Where necessary, place a single vertical joint over the centre of wide openings.

.7 Install gypsum board over concrete and concrete masonry units with adhesive as recommended by gypsum board manufacturer where indicated on Drawings.

.8 Cut, drill and patch gypsum board as may be necessary to accommodate the work of other trades.

9. Fire Separations:
   1. Construct gypsum board assemblies, where located, in accordance with tested assemblies to obtain required or indicated fire rated assemblies. As a minimum fire separations shall consist of metal framing covered on both sides by fire-rated gypsum board.
   2. Install assemblies tightly to enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges.

3.8 CORNER, CASING BEADS AND TRIM

.1 Corner reinforcing bead: Install along all external angles, erect plumb, level and with a minimum of joints. Secure with screws at 225 mm o.c. apply filler over flanges flush with nose of the bead and extending at least 75 mm onto surface of board each side of corner. When filler dries, apply a thin coat of topping cement and blend onto adjoining surfaces.

.2 Casing bead: Install where wallboard butts against a surface having no trim concealing the juncture and where shown on drawings. Erect casing beads plumb or level, with minimum joints, and secure with screws at 300 mm o.c. apply filler over flange flush with bead and extending at least 75 mm onto surface of board. When dry, apply a thin coat of topping cement and blend onto adjoining surfaces.

.3 Recess channels and trim: Install recess channels and special metal trim where shown. Secure to substrate. Provide casing beads full height on wallboard edges at recess channels and metal trim.

3.9 JOINT TAPING AND FINISHING

.1 Install reinforcing tape and a minimum of 3 coats of joint compound over gypsum board joints, metal trim and accessories, and screw fasteners in accordance with the gypsum board manufacturer's instructions.

.2 Fill gaps between ,and any imperfections in, gypsum boards with joint compound, allow to dry, and sand smooth ready for painting.

.3 Install finished gypsum board work smooth, seamless, plumb, true, flush, and with square, plumb, and neat corners.

.4 Finish gypsum board in accordance with ASTM C840 to the following grades:

1. Level 0: No taping, finishing, or accessories required. Use above suspended ceilings and within other concealed spaces, unless the assembly is fire rated, sound rated, sound or smoke controlled, or unless the space serves as an air plenum.
2. Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable. Use above suspended ceilings and within other concealed spaces if the gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or the space serves as an air plenum.
3. Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories. Use for water resistant gypsum board indicated for use as a substrate for ceramic tile.
4. Level 3: At joints and interior angles embed tape in joint compound with two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use where heavy grade wall coverings are the final decoration.
5. Level 4: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use for all locations except those indicated for other finish levels.
6. Level 5: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply a thin skim coat of joint compound, or a material manufactured especially for this purpose, to the entire surface. Leave surface smooth and free of tool marks and ridges. Use where semi-gloss or gloss finish coatings are the final decoration.

3.10 ACCESS DOORS

.1 Install access doors, supplied as part of other parts of the work, in accordance with manufacturer’s written instructions.

3.11 SITE TOLERANCES

.1 Install metal support systems to ensure that, within a tolerance of +3 mm and -1.5 mm for plaster thickness, finish surfaces will be flat within 3 mm under a 3 m straightedge,

and with no variation greater than 1.5 mm in any running 300 mm, and that surface planes shall be within 3 mm of dimensioned location.

3.12 REPAIR

1. Make good cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.

2. Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for resilient base work and accessories in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM F1861, Specification for Resilient Wall Base.

1.3 SUBMITTALS

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Samples: Submit two 250 mm long samples of resilient base in accordance with Section 01 00 00.

.3 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 00 00.

1.4 SITE CONDITIONS

.1 Maintain air temperature and structural base temperature at installation area above 20°C for 48 hr before, during and 48 hr after installation.

.2 Store materials for 2 days prior to installation in area of work to achieve temperature stability.

.3 Do not install base in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.

.4 Provide adequate ventilation during installation.

1.5 MAINTENANCE

.1 Submit extra 5% or to nearest full roll of each colour, pattern and type of base required for maintenance use. Identify each carton. Store where directed.

Part 2 Products

2.1 MATERIALS

.1 All materials under work of this Section, including but not limited to, primers, and adhesives are to have low VOC content limits.

.2 Vinyl base: ASTM F1861, Type TV, Group 2, vinyl wall base, approximately 100 mm high x 3 mm thick, coved profile, in lengths as long as possible including premoulded end stops and inner and outer corners. Colour: to match wall colour. 'Line Pinnacle Vinyl Base' by Roppe or approved alternative.

.3 Primers and adhesives: Low VOC, waterproof, recommended by base manufacturer for specific material on applicable substrate, above, at or below grade.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this Section.

3.2 RESILIENT BASE APPLICATION

.1 Install resilient base in accordance with manufacturer's written instructions.

.2 Lay out base to keep number of joints at minimum.

.3 Prior to installing base, fill cracks and irregularities with a filler recommended by base manufacturer.

.4 Set base in adhesive using a 3 kg hand roller, against wall and floor surfaces.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions.

.7 Cope internal corners.

3.3 CLEANING

.1 Forty-eight hours after installation, clean resilient base surfaces with a mild soap solution approved by finish manufacturer.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes: Provide vinyl composition tile flooring with accessories, as required for complete installation.
.2 Related Sections: Section 09.65.00: Resilient Wall Base

1.2 REFERENCES

.1 ASTM E 662: Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
.2 ASTM F 970: Standard Test Method for Static Load Limit
.3 ASTM F 710: Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring
.4 ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
.5 ASTM F 1066: Specification for Vinyl Composition Floor Tile.

1.3 SUBMITTALS

.1 Product Data: Furnish manufacturer's literature for each type of material to be provided for Project.
.2 Samples: Furnish each type of tile and edge strip required for Project.
.3 Color Charts: Upon request submit resilient tile selections showing full range of colors and patterns available.
.4 Certification: Furnish manufacturer’s certification based on independent testing laboratories indicating compliance with specified requirements.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Firm with minimum five years successful experience completing resilient tile installation similar to that required.
   a. Preinstallation Conference: Conduct meeting at site prior to commencing work related to resilient tile installation.
      i. Require attendance of parties directly affecting resilient tile installation.
      ii. Review site conditions, procedures, and coordination required with related work.
   b. Field Mock-Up: Provide mock-up of each type of installation using approved materials and specified methods of installation.
      i. Obtain Architect’s acceptance of mock-up prior to start of resilient tile installation.
      ii. Approved mock-up may be incorporated into Project.

1.5 SITE CONDITIONS

.1 Thorough inspection and preparation of subfloors is mandatory to ensure a satisfactory installation. No resilient flooring installation should be started before the installer is completely

familiar and satisfied with the subfloor conditions. Serious defects should always be reported immediately to the responsible authority.

.2 Ensure that heating, ventilation and/or air conditioning (HVAC) in the installation area is operative for a minimum of 7 days prior to, during and following the installation.

.3 The temperature must be kept between 18°C (65°F) and 29°C (85°F) for 48 hours before, during installation and 72 hours after installation. Ambient relative humidity must be maintained between 40 and 60%.

.4 Both flooring and adhesive must be acclimatized 48 hours prior to installation. Flooring should be removed from the pallet at least 24 hours prior to installation and stacked no more than 3 cartons high with at least 10 cm (4 inches) of airflow around the cartons.

.5 Avoid placing flooring in direct sunlight (windows or doors) before installation, as it could create shading.

.6 Loose-lay flooring in the room. Identify the different lots and place the flooring to ensure uniform color and overall appearance requirements are met.

.7 Flooring products with arrows on the back should be installed with the arrows all pointing in the same direction.

.8 Use the recommended adhesive as it will ensure the system is warrantied.

1.6 WOOD SUBFLOOR

.1 Installer to verify that the wood subfloor meets the requirements of ASTM F1482 “Standard Practice for Installation and Preparation of Panel-Type Underlayment to Receive Resilient Flooring”.

.2 Wood subfloors to have two layers of staggered construction grade plywood that is at least 2.5 cm (1 in) total thickness for the combined layers. The first layer must be a minimum of 1.6 cm (5/8 in) thick.

.3 Subfloor materials not acceptable: Particle board, luan, flake board, wafer board or chip board underlayments.

.4 The wood subfloor must be dry, smooth, and free from vertical movement and any foreign substance, such as, old adhesive, paint, oil, dirt, grease, and wax.

.5 The surface of the wood subfloor should be flat to within the equivalent of 4.75 mm over 3 m (3/16 in over 10 ft) and within the equivalent of 0.8 mm over 305 mm (1/32 in over 12 in).

.6 Lightly sand any surface roughness, particularly at joints and around nails.

.7 Use a Portland cement-based compound to level or patch wood subfloors.

1.7 CONCRETE SUBFLOOR

.1 Testing of existing and new concrete subfloors (on, below and above grades) using the protocols outlined below is required. New concrete slabs must be properly cured before any testing is undertaken. Depending on atmospheric conditions, type of concrete and/or possible excess water content, curing time may vary.

- ASTM F1869, Anhydrous Calcium Chloride test.
- ASTM F2170, Relative Humidity (RH) test using in situ probes.
- ASTM F710, pH level.

.2 ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

i. Purpose: this test is designed to measure the moisture emission at the surface of a concrete slab.
ii. Areas should be tested as follows: conduct 3 tests for the first 1,000 sq. ft. (93 sq. m), then 1 test for every additional 1,000 sq. ft (93 sq. m) as outlined in the most recent edition of ASTM F1869.
iii. Maximum allowable readings vary depending on the adhesive system chosen. Refer to Adhesive Quick Check Chart for the maximum allowable levels for each adhesive.

.3 ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

i. Purpose: this test is designed to measure the percentage of relative humidity in a concrete slab.
ii. Areas should be tested as follows: conduct 3 tests for the first 1,000 sq. ft. (93 sq. m), then 1 test for every additional 1,000 sq. ft (93 sq. m) as outlined in the most recent edition of ASTM F2170.
iii. Maximum allowable readings vary depending on the adhesive system chosen. Refer to Adhesive Quick Check Chart for the maximum allowable levels for each adhesive.

.4 ASTM F710, pH level.

i. Purpose: new concrete floors or where moisture is present may be susceptible to elevated pH levels due to excess alkaline salts. Adhesives are subject to deterioration resulting in bond failure in the presence of strong alkaline conditions.
ii. Conduct one pH test for every 1,000 sq. ft (93 sq. m) throughout the area.
iii. Maximum allowable readings vary depending on the adhesive system chosen. Refer to Adhesive Quick Check Chart for the maximum allowable levels for each adhesive.

.5 It is the responsibility of the flooring contractor to determine whether the concrete meets specification.

i. Record all measurements in the project log.
ii. Results of the test must be made available upon request to Consultant.

.6 Concrete subfloors must be dry, clean, smooth, level and structurally sound. They must be free from old adhesive, dust, solvent, paint, wax, oil, grease, asphalt, sealing and curing compounds and other foreign substances.

.7 The surface of concrete floor should be flat to within the equivalent of 4.75 mm over 3 m (3/16 in over 10 ft) and within the equivalent of 0.8 mm over 305 mm (1/32 in over 12 in).

.8 Do not use dry sweep oil-based material, as the oil in the sweeping compound will interfere with the adhesion of the material to the concrete.

.9 Fill or level cracks, grooves and other irregularities. Where filling or leveling is required, the use of a high strength Portland cement-based patching compound is recommended.

.10 Saw cuts must be cleaned carefully and flooring must not be installed over expansion joints.

.11 Follow ASTM F3191 “Standard practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring”

i. To test for porosity, place a 0.05 ml bead of water on concrete's surface and observe absorption. If water is not absorbed within one minute, the floor is considered non-porous.
ii. Depending of surface porosity, allow proper open time when applying the adhesive on the substrate. Further than surface porosity, open and working times are dependent on the air movement, ambient temperature, and humidity as well as subfloor humidity and temperature.

.12 Follow ASTM F3311 "Standard Practice for Mat Bond Evaluation of Performance and Compatibility for Resilient Flooring System Components Prior to Installation".
i. Perform the mat bond test with the flooring to be installed and specified adhesive as per Adhesive Quick Check Chart. Use flooring pieces that will cover approximatively 0.4 sq. m (4 sq. ft); by example, it represents two tiles of 45 cm x 45 cm (18 in x 18 in). When the flooring pieces are set into the adhesive, use duct tape to seal the edges of the flooring to the subfloor on all sides. The bond strength evaluation must be done after 72 hours in the absence of an adhesive cure time by lifting the sample from the subfloor.
ii. If an unsatisfactory bond test is obtained, it can be improved by mechanically abrading the concrete's surface.

.13 It is the responsibility of the flooring contractor to adjust installation in accordance to the open and working time of the adhesive to jobsite conditions.

Part 2 Products

2.1 MATERIALS

.1 Vinyl Composition Tile Manufacturer: American Biltrite Flooring, "Leaf" Vinyl Flooring, Colour: Urban Oak, Natural Beige, 6" x 48" #AMT3DO01. Available at Centura London, 993 Adelaide Street South, London, ON, 519-681-1961, centura@centuralondon.com.
.2 Related Sections: Section 09.65.00: Resilient Wall Base

i. Standards: Meet or exceed requirements of ASTM F 1066, Class 1 or 2, non-asbestos formulated
ii. Quality Assurance: Product manufacturing facility to be compliant with latest ISO 9000 Standard.
iii. Gauge: 2.00mm/0.079".
iv. Flammability: Provide materials with 1.0 CRF (critical radiant flux) or higher when tested in accordance with ASTM E 648, Flooring Radiant Panel Test.
v. Smoke Density: Provide materials with smoke density of less than 450 when tested in accordance with ASTM E 662.
vi. Static Load: Provide materials with static load limit of 150 psi or higher.
vii. Slip Resistance: Provide materials with minimum rating for floors of > 0.60.

.3 Edge Strips (Moldings): Homogeneous vinyl, tapered or bullnose edge.
i. Color: As selected by Architect to complement vinyl composition tile.

.4 Subfloor Filler: Hydraulic/Portland cement-based material designed for providing thin solid surface for leveling and for minor ramping of subsurface to adjacent floor finishes. Use material capable of being applied and feathered out to adjacent floor without spalling.
.5 Primers and Adhesives: Water and alkali resistant, zero regulated VOC types as recommended by flooring manufacturer for specific application.
.6 Floor Finish: Finish as recommended by flooring manufacturer for material type and location.

Part 3 Execution

3.1 EXAMINATION

.1 Verify conditions of substrate are suitable for installation of resilient tile in accordance with manufacturer recommendations.
   i. Concrete to comply with ASTM F 710, to be free of materials which could interfere with adhesion of resilient flooring, to be tested using the quantitative calcium chloride test as detailed under ASTM F 1869 with results of 5 lbs. or less of vapor transmission (MVER), surface alkali of 9 or less as measured by pH test paper, and free of carbonization and dust. (Adjust moisture & alkali limits, as detailed under Spray Smart system if selected)
   ii. Wood underlayment to have a smooth fully sanded face, free of irregularities, and to be free of substances, which could interfere with adhesion of resilient tile.

3.2 PREPARATION

.1 Comply with manufacturer recommendations for preparation of substrate. Concrete. Terrazzo, Latex Patching Compound Floors: Comply with ASTM F 710 in addition to manufacturer recommendations for preparation of substrate.
.2 Remove subfloor ridges and bumps; fill low spots, cracks, joints, holes, and defects with subfloor filler.
.3 Clean floor and apply, trowel, and float filler to leave smooth, flat hard surface. Prohibit traffic in area until filler is cured.

3.3 INSTALLATION

.1 Comply with manufacturer’s recommendations and installation instructions.
.2 Open floor tile cartons, enough to cover each area, and mix tile to ensure shade variations do not occur within any one area.
.3 Clean substrate.
.4 Spread cement evenly in quantity recommended by manufacturer to ensure adhesion over entire area of installation; spread only enough adhesive to permit installation of flooring before initial set.
.5 Set flooring in place, press with heavy roller to ensure full adhesion.
.6 Lay flooring with joints parallel to building lines to produce symmetrical pattern.
.7 Install minimum 1/2 tile at room and area perimeter.
.8 Terminate resilient flooring at centerline of door openings where adjacent floor finish is dissimilar.
.9 Install edge strips at unprotected and exposed edges where flooring terminates.
.10 Fit flooring to walls, columns, floor outlets and other appurtenances, to produce net joints.

.11 Consult with Architect for floor pattern desired in each area.

4.1 INSTALLATION

.1 Remove excess adhesive from floor, base, and wall surfaces without causing damage to surfaces due to cleaning operations, and repair damage to adjacent materials caused by resilient tile installation using methods recommended by adjacent material manufacturers.
.2 Clean floors taking care not to wash floors prior to adhesive set.
.3 Apply floor finish in accordance with manufacturer's recommendations.

5.1 PROTECTION

.1 Prohibit traffic from floor for 48 hours after installation recommendations.
.2 Protect floors from damage during remainder of construction operations; do not move heavy objects over resilient tile flooring, which could damage flooring; replace flooring damaged by subsequent construction operations.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for painting work in accordance with the Contract Documents.

1.2 REFERENCES

.1 Master Painters Institute (MPI), Painting Specification Manual.
.2 SSPC Steel Structures Painting Council, Standards.

1.3 SUBMITTALS

.1 Product data:
  .1 Submit copies of manufacturer's Product data in accordance with Section 01 00 00 indicating:
    .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
    .2 Product transportation, storage, handling and installation requirements.
  .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.

.2 Samples:
  .1 Submit following samples in accordance with Section 01 00 00.
    .1 Three 300 x 150 mm draw downs of each colour minimum 4 weeks before paints are required.
    .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.

.3 Certificates:
  .1 Submit certification from paint manufacturer, on company letterhead, indicating each product proposed for use is Manufacture's premium grade, first line Product.
  .2 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
  .3 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

1.4 REPORTS

.1 Submit written field inspection and test report results after each inspection.
.2 Submit Field Quality Control test result reports for alkali content, substrate moisture,

and dry film thickness.

.3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

1.5 QUALITY ASSURANCE

.1 Finishing work: Perform work to MPI requirements for premium grade.

.2 Supervision: Have work supervised by a full-time qualified foreperson who has 10 years minimum experience on Contracts of similar complexity and scope.

.3 Mock-up:

.1 Construct three $3m^2$ mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.

.2 Obtain Consultant's acceptance in writing before proceeding with the work of this Section.

.3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.

.4 Repaint over mock-ups which do not form part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.

.2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO_2 fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.

.3 Maintain storage enclosures at minimum 10^oC ambient temperature and to manufacturer's instructions.

1.7 SITE CONDITIONS

.1 Apply coatings under the following conditions:

.1 Exterior coatings (except Latex): 5^o C minimum.

.2 Exterior latex coatings: 10^oC minimum.

.3 24 hours minimum after rain, frost, condensation, or dew.

.4 When no condensation is possible (unless specifically formulated against condensation).

.5 Interior coatings: 7^oC minimum.

.6 Relative humidity: 85% maximum.

.7 Not in direct exposure to sun light.

.2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.

.3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

.4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of work not being painted including, but not limited to, the following:
- .1 Light fixtures, fire and smoke detectors.
- .2 Sprinkler heads.
- .3 Prepainted diffusers and registers.
- .4 Prepainted equipment.
- .5 Fire rating labels and equipment specification plates.
- .6 Finished surfaces.

1.8 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

1. Provide paint products meeting MPI "Green Performance Standard GPS-1-05".

1.9 MAINTENANCE

1. Deliver to Owner's place of storage on completion of work, sealed containers of each finish painting material applied, and in each colour. Label each container as for original, including mixing formula. Provide the following:
   - .1 1 L of extra materials when less than 50 L are used for Project;
   - .2 3.78 L of extra stock when 50 to 200 L are used;
   - .3 7.57 L of extra stock when over 200 L are used.

Part 2 Products

2.1 MATERIALS

.1 Paint:
- .1 All materials under work of this Section, including but not limited to, primers, stains, and paints are to have low VOC content limits.
- .2 Products in accordance with the MPI Painting Specification Manual, Exterior and Interior Systems;
  - .1 For each MPI paint code, manufacture's premium grade, first line Products is to be use.
  - .2 Uniform dispersion of pigment in a homogeneous mixture.
  - .3 Ready-mixed and tinted whenever possible.
- .3 Products within each MPI paint system code: From single manufacturer.
- .4 Acceptable manufacturers:
  - .1 Benjamin Moore.
  - .2 Dulux Paints/PPG.
  - .3 Para Painting & Coatings.
  - .4 Sherwin Williams.

2.2 COLOUR SCHEDULE

.1 Consultant will select choice of colours and gloss when compiling a Colour Schedule after award of Contract; allow for colour selection beyond paint manufacturer's standard colour range.

.2 Refer to Colour Schedule for selected colour references.

.3 Conform to gloss reflectance definitions listed in MPI Specification Manual.

2.3 PAINTING AND FINISHING SCHEDULE

.1 Refer to Table 1, MPI Painting and Finishing Schedule coded systems, comply with MPI Painting Specification Manual.

Table 1: Painting and Finishing Schedule

EXTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Structural steel and metal fabrications		EXT 5.1	EXT 5.1D	Alkyd
INTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Galvanized steel	Ducts, pipes, metal deck	INT 5.3	INT 5.3A	Latex
Galvanized metal	Door frames	INT 5.3	INT 5.3B	WB light industrial coating
Dressed lumber	Doors requiring stain finish	INT 6.3	INT 6.3E	Polyurethane varnish
Gypsum board,	Drywall, walls, ceilings	INT 9.2	INT 9.2A	Latex
Gypsum board,	Wet areas	INT 9.2	INT 9.2F	Epoxy-modified latex

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

.1 General:
- .1 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
- .2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool and sand paper marks, shallow gouges, marks, and nibs.
- .3 Clean, sweep, and vacuum floors and surfaces to be painted, debris and dust-free prior to painting.
- .4 Refer to MPI Painting Specification Manual for surface preparation requirements of substrates not listed here.

.2 Where finish hardware has been installed remove, store, re-install finish hardware, to accommodate painting. Do not clean hardware with solvent that will remove permanent lacquer finishes.

.3 Alkali Content tests and neutralization:
- .1 Test for ph level using litmus paper on dampened substrate.
- .2 Neutralize surfaces over 8.5 ph with 4% solution of Zinc Sulphate for solvent based systems and tetrapotassium pyrophosphate for latex based systems, to below 8.0 ph, and allow to dry.
- .3 Brush-off any residual Zinc Sulphate crystals.
- .4 Coordinate paint system primer / sealer to be alkali-resistant.

.4 Substrate moisture tests:
- .1 Test for moisture content over entire surface to be painted, minimum one test/ 2 m^2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
- .2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before paint system application. Install temporary drying fans if necessary.
- .3 Re-test employing same criteria.

.5 Mildew removal: Scrub with solution of trisodium phosphate and sodium hypochlorite (Javex) bleach, rinse with water, and allow to dry completely.

.6 Galvanized steel sheet:
- .1 Z275 (Satin & Spangled Sheet): SSPC SP7 brush blast.
- .2 ZF075 (Wiped Coat): Remove contamination, wash with Xylene solvent.
- .3 Touch-up damaged galvanized areas with organic zinc rich primer.

.7 Galvanized iron and steel: Prepare galvanized and ungalvanized metal surfaces as follows:
- .1 Unpassivated, unweathered and weathered: Remove contamination, wash with Xylene or Toluol solvent, allow to dry thoroughly. Make paint system primer/sealer an etching type primer.
- .2 Manufacturer pre-treated (including passivated): SSPC SP7.
- .3 Touch-up damaged galvanized areas with organic zinc rich primer.

.8 Structural steel and miscellaneous metal fabrications:
- .1 Coordinate the following with the responsible trades:
  - .1 Rust, mars, mill scale, and weld-burn touch-ups.
  - .2 Oil, grease, weld flux and other residue removal.
- .2 Prime paint items, not otherwise indicated to be primed as part of another Section.
- .3 Touch-up damaged galvanized areas with organic zinc rich primer.

.9 Wood and Millwork:
- .1 Wood surfaces to be clean and dry with a moisture content of less than 15%.
- .2 Remove foreign matter prior to prime coat; spot coat knots, pitch streaks and sappy sections with sealer.
- .3 Fill nail holes and fine cracks after primer has dried.
- .4 Backprime interior and exterior woodwork.

.10 Factory primed surfaces:
- .1 Touch up damaged areas.
- .2 Clean as required for top coat.

.11 Gypsum board:
- .1 Apply primer/sealer paint to reveal defects and deficiencies and to equalize absorption areas.
- .2 Coordinate repairs and touch-ups with the responsible trade.
- .3 Re-prime repairs.

.12 Coordinate with other trades to prevent:
- .1 Damage, and inadvertent activation of fire and smoke detectors.
- .2 Odour and dust distribution by permanent HVAC systems including fouling of ducts and filters.

.13 Field-mix Products in accordance with manufacturer's written instructions.

3.3 APPLICATION

.1 Apply painting systems in accordance with the MPI Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.

.2 Painting systems listed are required minima, apply additional coats if necessary to obtain substrate hiding acceptable to the Consultant.

.3 Tint intermediate coats lighter than final top coats for identification of each succeeding coat and to facilitate inspections. Include only manufacturer's recommended reducing and tinting accessories. Do not add adulterants.

.4 Primer to be specialized primer coating system as required by manufacturer for selected colour. Standard primer being tinted shall be tinted to a maximum of 1.5% by volume.

.5 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.

.6 Apply paint uniformly in thickness, colour, texture, and gloss, as determined by the Consultant under adequate illumination and viewed at a distance of 1500 mm. Apply finishes free of defects in materials and application which, in the opinion of the Consultant, affect appearance and performance. Defects include, but are not limited to:

- .1 Improper cleaning and preparation of surfaces.
- .2 Entrapped dust, dirt, rust.
- .3 Alligatoring, blisters, peeling.
- .4 Scratches, blemishes.
- .5 Uneven coverage, misses, drips, runs, and poor cutting in.

.7 Do not apply coatings on substrates which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.

.8 Repaint entire areas of damaged or incompletely covered surfaces, to the nearest inside or outside corner; patching will not be permitted.

.9 Miscellaneous painting requirements:

- .1 Paint projecting ledges, and tops, bottoms and sides of doors both above and below sight lines to match adjacent surfaces.
- .2 Paint door frames, access doors and frames, door grilles, prime coated butts, and prime coated door closers to match surface in which they occur.
- .3 Finish closets and alcoves as specified for adjoining rooms.
- .4 Paint light coves white whether a light lense is installed or not, unless otherwise indicated.
- .5 Paint interior columns to match walls of room.
- .6 Allow for:
  - .1 2 wall colours per room, one ceiling colour per room.
  - .2 Different door colours in each functionally different area.
  - .3 Different colours on both sides of same door.

.10 Mechanical, electrical and other painting coordination:

- .1 Paint mechanical services in accordance with Mechanical Identification Division 21, 22 and 23.
- .2 Coordinate painting of pipes, ducts, and coverings with the work of Division 21, 22 and 23 to precede pipe colour banding, flow arrows, and other pipe identification labeling installation.

.3 Paint exposed conduit, pipes, hangers, ductwork, grilles, gratings, louvres, access panels, fire hose cabinets, registers, convector and radiator covers, enclosures, and other mechanical and electrical equipment including services concealed inside cupboard and cabinet work; apply colour and sheen to match adjacent surfaces, except as noted otherwise.

.4 Paint portions of surfaces such as duct interiors, piping, ductwork, hangers, insulation, walls, and similar items, visible through grilles, louvres, convector covers etc., matte black in colour.

.5 Remove the following to accommodate painting, carefully store, clean, then re-install on completion of each area and when dry:

.1 Switch and receptacle plates, fittings and fastenings, grilles, gratings, louvres, access panels, convector covers, and enclosures .

3.4 FIELD QUALITY CONTROL

.1 Dry film thickness tests:

.1 Test for film thickness over entire surface to be painted, minimum one test/2 m^2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.

.2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.

.3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.

.4 Re-test employing same criteria after repair.

3.5 CLEANING

.1 Remove spilled, splashed, and spattered paint promptly as work proceeds and on completion of work. Clean surfaces soiled by paint spillage and paint spatters. Repair or replace damaged work, as directed by Consultant.

3.6 PROTECTION

.1 Post Wet Paint signs during drying and restrict or prevent traffic where necessary.

.2 Post sign, after Consultant's inspection and acceptance of each room, reading: PAINTING COMPLETE - NO ADMITTANCE WITHOUT CONTRACTOR'S PERMISSION.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services for washroom accessories work

1.2 REFERENCES

.1 ASTM A167, Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A312, Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

.3 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.4 ASTM F2285, Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.

.5 CAN/CSA B651-M, Accessible Design for the Built Environment.

1.3 SUBMITTALS

.1 Product data: Submit Product data to requirements of Section 01 00 00 indicating each washroom accessory describing size, finish, details of function, attachment methods, hardware and locks, description of rough-in frame, and building-in details of anchors for grab bars.

.2 Closeout submittals:

.1 Submit for each Product operation and maintenance instructions for incorporating into the Operations and Maintenance Manuals in accordance with Section 01 00 00.

.1 Supply 2 keys for each lockable washroom accessory to Consultant.

.2 Master key washroom accessories which are keyed.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in sealed cartons and containers with manufacturer’s name and product description clearly marked.

1.5 EXTENDED WARRANTY

.1 Submit an extended warranty for washroom accessories work in accordance with the General Conditions, except that the warranty period is extended to 10 years.

.1 Against cracked or scratched mirrors, spoiling or deterioration of silvering or backing, loosening of fastenings or adhesive

.2 Coverage: complete replacement including effected adjacent work.

1.6 MAINTENANCE

1. Maintenance Tools: Provide special tools necessary for accessing, assembly/disassembly or removal of toilet, bath and cleaning accessories in accordance with Section 01 00 00.

Part 2 Products

2.1 MATERIALS

.1 Stainless steel:
- .1 Sheet metal: ASTM A167, Type 304.
- .2 Tubing: ASTM A312, Type 304.

.2 Sheet steel: ASTM A653M, Z275; Cold rolled, commercial quality, surface preparation and pretreatment as required for applied finish.

.3 Fasteners, screws and bolts: ASTM A167, Type 304 stainless steel, tamper-proof.

2.2 ACCESSORIES

.1 Refer to drawings for quantity and location of washroom accessories.

.2 Toilet tissue dispenser:
- .1 K-73147 by Kohler or approved alternative; single roll surface mounted pivoting toilet tissue dispenser.
- .2 Finish: Zinc with brass finish.

.3 Towel bar:
- .1 #B-6737 by Bobrick or #7360 by ASI Group Canada; 460 mm long, complete with concealed mounting bracket.
- .2 Provide 2 units in each bedroom unit washroom.
- .3 Finish: Type 304 stainless steel with satin finish.

.4 Grab bar:
- .1 Series B-6806-99 by Bobrick or #3800-P Series by ASI Group Canada; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons. Lengths and configurations as indicated on drawings.
- .2 Finish: Type 304 stainless steel with a satin finish and peened grip.

.5 Grab bar (L-shaped):
- .1 'Series 6898-99 - L30x30' by Bobrick Washroom Equipment or approved alternative; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons.
- .2 Length and configuration: 762 x 762 mm, in L-shaped configuration as shown on Contract Drawings.
- .3 Finish: Type 304 stainless steel with a satin finish and peened grip.

.6 Mirror: 6 mm thick, mirror quality float glass
- .1 #B-290 Series by Bobrick Washroom Equipment; mitred corners welded, and polished smooth.
- .2 Dimensions: Sizes and locations as indicated on the Contract Drawings.
- .3 Frame finish: Type 304 stainless steel satin finish.

.7 Coat hook:
- .1 #B-7671 by Bobrick or approved alternative by ASI Group Canada; single robe hook, hook with flange, support arm and concealed mounting bracket.
- .2 Finish: Type 304 stainless steel, bright polished finish.

.8 Barrier free shower:
- .1 High quality, non-porous acrylic surface with centre drain including vertical and horizontal knurled stainless steel safety grab bars.
- .2 Surface wall mounted seat, stainless steel frame with 406 mm x 610 mm woodgrain phenolic seat slats.
- .3 Acceptable product: ‘Model SC2366 OBC 2Bar Phenolic Seat' by Longevity or approved alternative

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Verify and coordinate templates, inserts, and rough-in frames and verify exact location of washroom accessories for installation.

.2 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of washroom accessories.

.3 Provide fastening and mounting kits for washroom accessories.

.4 Locate washroom accessories where indicated on Drawings and where directed by Consultant.

.5 Install washroom accessory fixtures, accessories, and items in accordance with manufacturer's instructions and CAN/CSA B651-M. Provide exposed tamper-proof screws of stainless steel to match units.

.6 Install washroom accessories plumb, level, and securely and rigidly anchored to substrate surfaces and framing. Adjust accessories for proper operation and verify mechanisms function smoothly.

.7 Install grab bars to withstand minimum load of 1.3 kN applied vertically or horizontally. Provide necessary reinforcements as required.

.8 Clean and polish exposed surfaces and fill accessories with necessary supplies prior to acceptance by Consultant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for earthwork Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

.2 ASTM D4253, Test Method for Maximum Index Density and Unit Weight of Soil Using a Vibratory Table.

.3 OPSS, Ontario Provincial Standard Specification.

1.3 SUBMITTALS

.1 Reports:
- .1 Submit written laboratory test reports.
- .2 Submit written field inspection and test report results after each inspection.

.2 Submit dewatering methods 30 days in advance for review by Consultant. If well point system is required, Engineer shall design system and supervise installation.

.3 Submit to Consultant details of locations where surplus soils and other materials are to be disposed of or reused. Include each disposal/reuse Site and type of surplus soil or other material, location of the disposal/reuse Site, operator's name and business address, type of license under which Site operates, and criteria used by Site to access suitability of surplus material for disposal.

.4 Submit to Consultant, within 48 hours of a load of surplus soil or other material leaving the Site, a daily register recording the time and place of disposal/reuse of each load signed by a representative of the disposal site. Such documentation must be submitted before payment for excavation will be made.

1.4 QUALITY ASSURANCE

.1 Have shop drawings signed and sealed by a Professional Engineer licensed in Province of Ontario and having experience in design and inspection of shoring, bracing, underpinning and dewatering (if required) required to complete Work.

1.4 SITE CONDITIONS

.1 Geotechnical conditions: For information on subsurface conditions refer to document appended to Section 02 32 00.

.2 Cultural heritage resources: If Cultural Heritage Resources (such as archaeological sites, artifacts, building and structural remains, and/or human burials) are encountered during performance of Work, contact Consultant immediately and suspend Work in immediate area until assessment has been completed by Ministry of Culture, Tourism and Recreation. Perform required measures to mitigate negative impacts on found resources to acceptance of Consultant.

1.5 PROTECTION

.1 Existing buried utilities and structures:
- .1 Size, depth and location of known existing utilities and structures are indicated for guidance only. Completeness and accuracy is not guaranteed.
- .2 Prior to commencing any excavation Work, have authorities stake out utility locations to prevent disturbance during Work.
- .3 Confirm locations of buried utilities by careful test excavations. Hand dig test excavations as necessary.
- .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered. Obtain permission of Consultant before moving or otherwise disturbing utilities or structures.

.2 Existing buildings and surface features:
- .1 Conduct with Consultant, a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by Work.
- .2 Protect existing buildings and surface features which may be affected by Work from damage while Work is in progress and repair damage resulting from Work.
- .3 Where excavation necessitates root or branch cutting, perform Work in accordance with Authorities having Jurisdiction.
- .4 Confirm with Consultant, condition Survey of buildings and structures undertaken by Consultant.

.3 Temporarily cover local existing catch basins and maintenance holes to prevent entry of earth or debris. Ensure adequate surface drainage in affected area is maintained.

.4 Protect Work or work of other Contracts in progress or completed and protect existing properties, stored Products, services, utilities, trees, landscaping and natural features from damage.

.5 Protect excavations against flooding and damage and install and maintain appropriate warning devices during construction and during time when Work is closed down for any cause.

.6 Protect bottom of excavations that will support foundations, slabs, pavements etc. from frost or freezing.

.7 Keep access roads clear of debris and dirt resulting from Work of this Section to acceptance of Authorities having jurisdiction.

.8 Shoring, bracing and underpinning: Comply with local regulations, authorities having jurisdictions and requirements specified.

Part 2 Products

2.1 MATERIALS

.1 Select fill: Subject to approval of Consultant consisting of reusable fill excavated from Site or imported fill that is free of organic matter, rubble and material other than soil. Maximum particle size of half thickness of lift specified, moisture content at time of placing 2% maximum over its optimum moisture content and is either non plastic or has a plasticity index of 25% maximum.

.2 Granular A fill: Imported Granular A fill, free of organic matter and, in accordance with OPSS 1010.

.3 Granular B Fill: Imported Granular B fill free of organic matter and in accordance with OPSS 1010.

.4 Clear Stone fill: 19 mm clear stone in accordance with OPSS 1004, free of organic material.

.5 Unshrinkable fill: 0.7 MPa cement stabilized backfill conforming to requirements of CAN/CSA A23.1/A23.2-M.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 LINES AND ELEVATIONS

.1 Establish lines and elevations from Control Points shown on Contract Drawings.

.2 Have lines and elevations established by Registered Ontario Land Surveyor or qualified Civil Engineer registered in Province of Ontario.

.3 Protect and maintain Control Points and Bench Marks as long as they are required.

3.3 STRIPPING

.1 Do not handle topsoil while in wet or frozen condition or in manner in which soil composition is adversely affected.

.2 Strip topsoil from working area in locations shown.

.3 Strip topsoil to depths indicated. Avoid mixing topsoil with subsoil.

.4 Stockpile topsoil in locations directed by Consultant. Stockpile to height not exceeding 2 m. Remove excess topsoil from Site.

3.4 REMOVAL OF WATER

.1 Obtain letter of conditional approval from Authorities having jurisdiction to dispose of ground water into sewer drainage system. Apply for and pay for water disposal permit.

.2 Keep excavations and trenches free of water throughout construction period.

.3 Groundwater removal:

- .1 Lower groundwater level and maintain at depth below lowest point of excavation to ensure a dry stable surface.
- .2 Dewater to prevent loss of soil and maintain stability of sides and bottom of excavation and of adjacent structures.
- .3 Dispose of water in conformance with applicable by-laws and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
- .4 Supply and install flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to sewers, water courses or drainage areas in accordance with authorities having jurisdiction. Perform testing on settlement tank discharge to confirm that effluent meets sewer bylaw requirements. Locate tanks to acceptable area determined by Consultant.
- .5 Should method of dewatering fail to achieve conditions specified above, Consultant reserves right to revise methods and procedures at no cost to Owner.

.4 Surface water removal:

- .1 Remove surface run-off in a manner that will prevent loss of soil and maintain stability of sides and bottom of excavation. Obtain Consultant's approval of dewatering method to be used.
- .2 Discharge surface water into existing storm drainage system to acceptance of Consultant and local authorities.

.5 Do not obstruct flow of surface drainage or natural water courses.

3.5 EXCAVATION

.1 Remove concrete, masonry, paving, demolished foundations and rubble and other obstructions encountered during excavation Work.

.2 Do not disturb soil within drip line of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw in a manner acceptable to authorities having jurisdiction.

.3 Excavate to required lines and grades shown on Contract Drawings with allowance for subsequent Work including shoring, bracing and formwork. Make excavation clean and clear of loose material and true to size.

.4 Protect stockpiles of fill against contamination and moisture absorption.

.5 Do not undermine adjacent structures. Where it is necessary to have footings at different levels, found upper footing below imaginary 10-horizontal-to-7 vertical line, or as otherwise indicated, drawn up from base of lower footing. Protect adjacent foundations from frost.

.6 Have excavations in excess of 1200 mm in depth conform to requirements of Occupational Health and Safety Act, and Regulations for Construction Projects.

.7 Do not expose shale at subgrade elevation to drying cycles and in any case, following inspection, cover with minimum 50 mm of lean concrete within 4 hours after exposure.

.8 Fill excavations for foundations which are, through error, carried below elevation shown or approved depth, with 15 MPa concrete, or as directed by Consultant.

.9 Trim, and remove loose material, debris and organic material from excavations. Where material at bottom of excavation is disturbed, remove disturbed material and re-compact to density equal to or better than undisturbed soil or backfill with lean concrete as directed by Consultant.

.10 When excavations are complete, prior to commencement of subsequent Work, request Consultant for inspection of excavation Work.

3.6 TRENCHING

.1 Excavate trenches to lines and grades indicated and to a depth of 75 mm minimum below invert elevation and slope established for pipe, and backfill to invert elevation of pipe with specified granular material.

.2 Unless otherwise authorized by Consultant, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation. Remove unsuitable material from trench bottom to extent and depth as directed by Consultant.

.3 Backfill Over-excavation with granular material and compact.

.4 If unstable soil conditions are encountered, excavate trenches to depth directed by Consultant and backfill to correct elevation with backfill material.

.5 Remove loose material from bottom of trenches to ensure granular material is placed against undisturbed soil.

.6 Compact bedding and grade as required for even and uniform support on each length of pipe.

.7 Where excavating is required adjacent to and parallel with and below any footing, submit excavation and backfill procedures to Consultant for review prior to start of excavating.

.8 Keep width of trenches to a minimum to ensure minimum span for pipe to be supported.

.9 Make excavations for fire hydrants of sufficient size and depth to accommodate a minimum 0.75 m^3 of crushed stone. Hand place stone and tamp around and below hydrant elbow to ensure proper drainage of hydrant.

3.7 EXCAVATED MATERIAL DISPOSAL

.1 Except for material to be used as select fill, immediately remove and dispose of excavated material from Site.

.2 Remove and dispose of construction rubble, abandoned gas, water and sewer pipes, valves, valve boxes and fittings, maintenance holes, frames and covers and other material which may be encountered during excavation but not indicated on Contract Drawings.

3.8 BACKFILLING

.1 Do not proceed with backfilling operations until walls, slabs, waterproofing and below grade Work has been inspected and accepted by Consultant.

.2 Backfill areas which are free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Do not backfill on or against any membrane or protection board covered waterproofing with jagged rock or other sharp objects which might damage waterproofing.

.5 Limit vertical drop of backfill material to 2000 mm.

.6 Use only rubber-tired vehicles over roof of structure during backfilling, maximum tire pressure 70 kPa. Metal-tracked vehicles will not be allowed on roofs for compaction purposes.

.7 To avoid pockets and voids, remove sheathing and shoring materials that require removal, as backfilling progresses.

.8 Prior to backfilling or placing concrete on exposed soil subgrade, proof roll subgrade to identify soft or loose areas. Proceed with placing backfill or concrete only after inconsistencies identified by above procedure have been reworked and compacted or excavated, backfilled and compacted as required to eliminate such conditions to acceptance of Consultant.

.9 Place backfill material, grade and compact to levels shown on Contract Drawings.

.10 Place backfill materials in uniform layers 200 mm maximum loose thickness unless specified otherwise.

.11 Ensure each layer is compacted, and accepted by Consultant, before placing succeeding layers.

.12 Unless otherwise indicated, use specified granular material from bottom of trench to 300 mm above top of pipe or 150 mm above top of electrical conduits. Hand place in 150 mm layers and compact carefully to ensure proper backfilling and compaction around bottom quadrants and sides of pipe.

.13 For backfill from 300 mm above top of pipe or 150 mm above electrical conduits to sub-grade level, use select fill unless otherwise noted. Compact either by hand or by machine.

.14 Do not backfill trenches until piping, conduits and cables therein have been inspected, tested, and approved by inspection authorities having jurisdiction and Consultant.

.15 Prior to backfilling of trenches, remove wood block or wedges used to prevent movement of piping during tests.

.16 Where there is a common boundary between select fill and granular fill or unshrinkable fill, place select fill after granular fill has been compacted. Place and compact fill around free standing structures evenly on all sides of structure simultaneously in layers sloping away from structure.

.17 During backfilling, take care to avoid displacing or damaging Utilities Work and Services.

.18 Notify Consultant prior to commencement of backfilling and compacting operations.

3.9 COMPACTION

.1 Compaction densities for select fill, granular fill, and sand fill materials will be determined by ASTM D698. Compaction densities for clear stone and pea gravel will be determined by ASTM D4253.

.2 Add water if necessary to obtain required densities. Correct irregularities or depressions that may develop during compaction by removing or adding material to form a smooth and uniform surface.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.4 If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers acceptable to Consultant.

.6 Compact backfill materials in accordance with Geotechnical Report providing the following as a minimum:
- .1 Imported fill: 98% standard Proctor maximum dry density (SPMDD).
- .2 Under slabs, walks and pavements: 100% (SPMDD).
- .3 All other areas: 95% (SPMDD).

3.10 GRADING

.1 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.2 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice. Ensure no frozen material is used in placing.

.3 Grade as necessary to bring Work areas to required elevations. Supply additional material required to obtain new grade levels. Place and compact as specified.

.4 Grade drainage ditches to elevations indicated on Contract Drawings.

.5 Maintain positive drainage.

.6 Grade materials using methods which do not lead to segregation or degradation of aggregate.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace that portion of layer in which material becomes segregated during spreading.

.9 Slope grade away from buildings 1:50 minimum.

.10 Make graded areas smooth to profile, free of debris, with local excavations and depressions filled and compacted.

.11 Do not disturb soil within branch spread of trees and shrubs remaining.

.12 Cultivate entire area which is to receive topsoil to a depth of 100 mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted soil.

.13 Remove surface debris, roots, vegetation, branches and stones in excess of 50 mm in diameter.

3.11 FINISH GRADING

.1 Fine grade and loosen topsoil. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Roll to consolidate topsoil for areas to be seeded or sodded leaving surface smooth, uniform, firm against deep foot printing, and with fine loose texture to approval of Consultant.

3.12 UNSHRINKABLE FILL

.1 Place unshrinkable fill in locations indicated on Contract Drawings or where Work area is too limited to permit proper placing and compaction. Obtain Consultants approval prior to placing unshrinkable fill. Place in accordance with supplier's written instructions.

.2 If embedded items occur in area being backfilled, coordinate with appropriate trades to ensure that disturbance of embedded items during backfilling is prevented.

3.13 RESTORATION

.1 Upon completion of Work, remove surplus materials and debris, trim slopes, and correct defects as directed by Consultant.

.2 Replace topsoil and reinstate existing pavement, sidewalk, lawns, walks to elevation and condition which existed before excavation.

.3 Clean and reinstate areas affected to acceptance of Consultant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for foundation drainage Work in accordance with the Contract Documents.

1.2 REFERENCES

.1 ASTM D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.2 ASTM F449, Standard Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control.

.3 ASTM F667, Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

1.3 SUBMITTALS

.1 Product data:
- .1 Submit manufacturer's Product data in accordance with Section 01 00 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Samples:
- .1 Submit following samples in accordance with Section 01 00 00:
  - .1 Two 300 x 300 mm samples of drainage board.
  - .2 Two 300 mm long samples of perimeter drainage and/or pipe.

Part 2 Products

2.1 MATERIALS

.1 Perimeter drainage:
- .1 ASTM D3350 and ASTM F667, 100 mm diameter HDPE, perforated with fittings prewrapped with filter cloth by Ideal Pipe or approved alternative or ‘TREMDrain Total Drain’ by Tremco Inc.
- .2 Perimeter drainage system to be complete with accessories as required for complete installation including but not limited to corner guard pieces and outlet pipe connections.

.2 Drainage board: Three-dimensional dimpled core and geotextile fabric complete with adhesive or fasteners as required for installation. ‘Miradrain 6000’ by Carlisle Coatings and Waterproofing, ‘Delta-Drain 6000’ by Cosella-Dorken, ‘TREMDrain’ by Tremco Inc. or ‘Mel-Drain 5035' by W. R. Meadows.

.3 Drainage pipe: ASTM D3350 and ASTM F667, 100 mm diameter HDPE by Ideal Pipe or approved alternative, unperforated with fittings, and perforated with fittings prewrapped with filter cloth in locations as indicated on drawings or as specified herein.

.4 Clean outs: 100 mm HDPE outlets , tees, extension pipes, reducers, flush plugs, etc. suitable for use with drainage pipe as manufactured by Canron Inc, Ideal Pipe, or approved alterative.

.5 Foundation drainage Pipe Fill: 19 mm clear stone in accordance with OPSS 1004.

.6 Granular fill: Free draining, sharp, hard, durable, granular material conforming to OPSS 1010, Type A.

.7 Filter cloth: Terrafix 270R as manufactured by Terrafix Geosynthetics Inc. or approved equivalent.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

.1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to installation.

3.3 INSTALLATION

.1 Install perimeter drainage where indicated on Drawings.

.2 Install drainage board in accordance with ASTM F449 and manufacturer's recommendations. Drainage board shall extend full height of foundation wall to top of footing where indicated on Drawings. Install drainage board after installation of waterproofing membrane is complete. Position panel with flat side against wall and filter fabric toward soil/drainage side and attach to foundation wall using manufacturer approved fastening system.

.3 Provide unperforated drainage pipe between perforated drainage pipe and drain connection installed by Division 22 and 23.

.4 Install drainage pipe on a bed of foundation drainage fill, minimum 100 mm deep where pipe is not placed over footing, and surround with same fill 150 mm thick at sides and over top of pipe and for under floor drainage extend fill to under side of slab.

.5 Provide cleanouts on non-perforated pipe at all changes of direction and in pipe runs greater than 15 metres. Provide flush cleanouts where indicated.

.6 Cover foundation drainage fill with filter cloth. Cover filter cloth with sand 300 mm thick at top and sides.

END OF SECTION