

PROJECT SPECIFICATIONS

St. Gregory Catholic Elementary School Additions and Renovations

For the
Waterloo Catholic District School Board
Project #25-106

WCDSB Tender # RFT 2026-01

Issued For Tender
April 9, 2026



**Waterloo Catholic
District School Board**
Quality, Inclusive, Faith Based Education



jp thomson architects ltd
2001 Provincial Rd, Unit 6A
Windsor, Ontario,
N8W 5V7



Project: 25-106
St. Gregory Catholic ES Additions & Renovations for the
Waterloo Catholic District School Board
WCDSB Tender # RFT 2026-01

Dated : March 2, 2026
Issue Date : April 9, 2026-Issued for Tender

SPECIFICATION

OF LABOUR AND MATERIALS REQUIRED FOR THE CONSTRUCTION AND COMPLETION OF THE ST. GREGORY CATHOLIC ELEMENTARY ADDITION AND RENOVATIONS, CAMBRIDGE, ONTARIO

For

Waterloo Catholic District School Board
35 Weber St. W., - Unit A
PO Box 91116
Kitchener, ON
N2G 4G2

In conformity with the accompanying drawings prepared for this purpose by:

J.P. Thomson Architects Ltd.
Windsor - Ontario



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1.1 INVITATION

.1 Bid Call

.1 REGISTERED SUPPLIERS/BIDDERS

- All Bidders shall have a Bidding System Vendor account and be registered as a Plan Taker for this Bid opportunity, which will enable the Bidder to download the Bid Call Document, to receive Addenda email notifications and download all documents without the watermark “preview” on them.
- To ensure receipt of the latest information and updates via email regarding this bid, or if a Bidder has obtained this Bid Document from a third party, the onus is on the Bidder to create a Bidding System Vendor account and be register as a Plan Taker for the bid opportunity.

.2

ELECTRONIC BID SUBMISSIONS ONLY, shall be received by the Bidding System. Hardcopy submissions are not permitted.

Bidders are cautioned that the timing of their Bid Submission is based on when the Bid is RECEIVED by the Bidding System, not when a Bid is submitted, as Bid transmission can be delayed due to file transfer size, transmission speed, etc.

For the above reasons, it is recommended that sufficient time to complete your Bid Submission and to resolve any issues that may arise. The closing time and date shall be determined by the Bidding System’s web clock.

Bidders should contact bids&tenders support listed below, at least twenty-four (24) hours prior to the closing time and date, if they encounter any problems. The Bidding System will send a confirmation email to the Bidder advising that their bid was submitted successfully. If you do not receive a confirmation email, contact bids&tenders support at support@bidsandtenders.ca.

Late Bids are not permitted by the Bidding System.

To ensure receipt of the latest information and updates via email regarding this bid, or if a Bidder has obtained this Bid Document from a third party, the onus is on the Bidder to create a Bidding System Vendor account and register as a Plan Taker for the bid opportunity.

Supplementary Form of Tender to be emailed to:
Stephen.butterworth@wcdsb.ca

Submission of the Form of Tender to the bidding system will be completed on or before **May 19, 2026 at 2:00:00 pm, local time**. This submission is to be followed by the Supplementary Form of Tender emailed to Stephen.butterworth@wcdsb.ca on or before **May 19, 2026 at 4:00:00 pm, local time**

.3 Instructions for tendering must be followed implicitly. Any Tender which does not comply with the *CCDC 2-2020 Stipulated Price Contract, Supplementary*

Conditions, as attached, and the Instructions to Bidders may be declared informal and may not be considered.

- .4 Stipulated sum tenders, submitted on the Form of Tender supplied, on the Work described in the following specifications and/or shown on the accompanying drawings, including all Addenda issued prior to the closing of Tender.
- .5 ALL BLANKS IN THE FORM OF TENDER, INCLUDING SUPPLEMENTAL FORM OF TENDER, SHALL BE FULLY COMPLETED OR THE TENDER MAY BE INVALIDATED. TENDERS NOT COMPLETED IN FULL, MAY, AT THE DISCRETION OF THE BOARD, BE REJECTED. IF A BLANK IS DEEMED TO BE NOT REQUIRED BY THE BIDDER, COMPLETE WITH A “NOT APPLICABLE (N/A)”, “OWN FORCES”, ETC.
- .6 Tenders shall be valid for sixty (60) Calendar Days from the date of closing above.
- .7 Tenders must note, and include, on a separate form, any “Separate Prices” requested by the Consultant; any “Alternate Prices to the Base Bid” requested by the Consultant; any “Supplementary Alternate Prices” proposed by the Bidder; as well as all Unit Prices indicated on the *Supplementary Form of Tender*. Tender award to be based on low bid as specified.
- .8 Tender award will be determined based on low Bid as specified.

1.2 INTENT

- .1 Intent of this Bid call is to obtain an offer to perform work to complete the construction of **St. Gregory Catholic Elementary School Additions & Renovations** located at **34 Osborne St, Cambridge, ON N1S 3H1**, for a Stipulated Price contract, in accordance with Contract Documents.

1.3 CONTRACT/BID DOCUMENTS

- .1 Agreement Form
- .2 Definitions
 - .1 Contract Documents: Defined in the *CCDC 2-2020* Stipulated Price Contract, Definitions.
 - .2 Bid Documents: Contract Documents supplemented with Instructions to Bidders, Project Information, Soils Investigation Data, Form of Tender, and Supplementary Form of Tender identified herein.
 - .3 Bid, Offer, or Bidding: Act of submitting an offer under seal or signed under witness.
 - .4 Bid Price: Monetary sum identified in Bid Form as an offer to perform work.
- .3 Availability

To obtain documents online please visit <https://wcdsb.bidsandtenders.ca/>. You can preview the bid documents with a Preview Watermark prior to registering for the opportunity.

 - .1 Documents are not provided in any other manner.
 - .2 Documents are made available only for purpose of obtaining offers for this project. Their use does not confer license or grant for other purposes.

- .3 A copy of soils investigation report may be found in Bid Documents
- .4 Examination
- .1 Upon receipt of Bid Documents verify that documents are complete.
- .2 Immediately notify, through the bidding system “Submit a Question”, upon finding discrepancies or omissions in Bid Documents.
- .5 Queries/Questions
- .1 Questions related to this bid are to be submitted to the Purchasing representative through the Bidding System only by clicking on the “Submit a Question” button for this specific bid opportunity.

Purchasing Representative

Stephen Butterworth
Purchasing Officer
Waterloo Catholic District School Board

Email: Stephen.Butterworth@wcdsb.ca

Neither the Board nor the Board contact will be responsible for any verbal instructions or clarifications given during the Bidding process. As a result, verbal recollections of discussions, meetings, or telephone conversations will not be considered valid.

- .6 Addendums
- .1 Bidders shall acknowledge receipt of any addenda through the Bidding System by checking the box for each addenda and any applicable attachment.

It is the responsibility of the Bidder to have received all Addenda that are issued. Bidders should check online at <https://wcdsb.bidsandtenders.ca/> prior to submitting their Bid and up until Bid closing time and date in the event additional addenda are issued.

If a Bidder submits their bid prior to the Bid closing time and date and addenda have been issued, the Bidding System shall WITHDRAW the Bid submission and the bid status will change to an INCOMPLETE STATUS and Withdraw the Bid. The Bidder can view this status change in the “MY BIDS” section of the Bidding System.

The Bidder is solely responsible to:

- make any required adjustments to their Bid; and
 - acknowledge the addenda; and
 - Ensure the re-submitted Bid is RECEIVED by the Bidding System no later than the stated bid closing time and date.
- .2 Clarifications requested by bidders must be received by the bidding system, not less than nine (9) days before date set for receipt of Bids. Reply will be in form of an addendum, a copy of which will be forwarded to known bidders no later than seven (7) working days before receipt of Bids

.7 Product/System Options

- .1 There are two opportunities for a Bidder to identify Alternates in the Bidder's Tender. The first method is to identify Alternates at the time of the Tender submission on the *Supplementary Form of Tender* to be attached to the Form of Tender. This document is to be entitled ALTERNATE PRICES TO BASE BID:
 - .1 Wherever possible or practical, the specifications are written on a "Base Bid" principle. When "Base Bid" product or service is identified, a number of "alternates" have been listed. The Bidder must tender on the "Base Bid" and indicate, on a separate sheet, Alternates and a credit to the Contract if one of the specified alternate supplier/manufacturer/installer or material/method of construction is being proposed by the Bidder. Only those identified Alternates in the Specification may be listed on the *Supplementary Form of Tender*. If the Specification identifies a "Base Bid" with a number of Alternates and the Bidder does not identify on the *Supplementary Form of Tender* any of the indicated Alternates with a credit, then the Contractor shall provide, in all instances, the "Base Bid" supplier/manufacturer/installer or material/method of construction.
 - .2 The Contractor shall accept full responsibility that a proposed Alternate will not exceed space requirements as indicated on the drawings and that coordination of the Contractor's own and related work and cost of installation is included in the Contractor's work. Approved alternate products or assemblies shall comply with all technical and design requirements specified in the "Base Bid". (E.g. materials, gauge, finish, colour, size, fit, mounting, strength, durability, operation and warranty.) If any additional design fee, either Architectural or Engineering, is required due to a change or substitution requested by the Contractor, the cost of such fee must be paid by the Contractor.
- .2 The second method is to identify alternates on the *Supplementary Form of Tender* and submitted, as requested by the Consultant, at the time of Tender. This document is to be entitled. SUPPLEMENTARY ALTERNATE PRICES:
 - .1 Mechanical and Electrical Alternates may be submitted on the Supplementary Form of Tender.
 - .2 If proposals for alternates (not already identified as alternates in the specification) are submitted by the Contractor to the Consultant during the tender period in sufficient time to allow for analysis and the issuance of an Addendum to include the proposals, then such proposal may be included in the Form of Tender under *Separate Prices*.
 - .3 Proposed alternates which are not covered by an Addendum and listed in the Form of Tender under *Separate Prices*, may be considered if the proposed entitled *Supplementary Alternate Prices* accompanies the Supplementary Form of Tender as a separate document on which the Alternate is completely specified and described, and on which is given the reason for substitution.
 - .4 Any proposed alternates or in lieu of prices will not necessarily be accepted.
 - .5 The Contractor shall accept full responsibility that a proposed Alternate will not exceed space requirements as indicated on the drawings and that

coordination of his own and related work and cost of installation is included in his work. Approved alternate products or assemblies shall comply with all technical and design requirements specified in the "Base Bid". (E.g. materials, gauge, finish, colour, size, fit, mounting, strength, durability, operation and warranty.) If any additional design fee, either Architectural or Engineering, is required due to a change or substitution requested by the Contractor, the cost of such fee must be paid by the Contractor.

- .6 Unless substitutions are submitted in this manner and subsequently accepted, provide products as specified.

1.4 OWNER

- .1 The Owner of the Project is:

WATERLOO CATHOLIC DISTRICT SCHOOL BOARD
35 Weber Street West, Unit A
Kitchener, Ontario N2H 3Z1
Phone: (519) 578-3660

1.5 CONSULTANT

- .1 The Architect on this Project is:

Company	J.P. Thomson Architects Ltd.
Address	2001 Provincial Rd., Suite 6A
City	Windsor, Ontario N8W 5V7
Phone	519-256-3131

E-mail
(Direct questions to the bidding portal)

1.6 SUB CONSULTANTS

- .1 The Civil Engineer for this Project is:

Company	Aleo Associates Inc.
Address	325 Devonshire Rd., Suite 500
City	Windsor, Ontario N8X 1N5
Phone	519-254-7926

- .2 The Structural Engineer for this Project is:

Company	Aleo Associates Inc.
Address	325 Devonshire Rd., Suite 500
City	Windsor, Ontario N8X 1N5
Phone	519-254-7926

- .3 The Mechanical Consultant on this Project is:

Company	RM Engineering
Address	162 Guelph Street, Unit 216
City	Georgetown, ON, L7G 4A6

Phone 416-726-1648

.4 The Electrical Consultant on this Project is:

Company RM Engineering
 Address 162 Guelph Street, Unit 216
 City Georgetown, ON, L7G 4A6
 Phone 905-617-4804

.5 The Spinkler System Consultant on this Project is:

Company Northern Sprinkler Design Inc.
 Address 445 Colborne Street
 City London, ON N6B 2T2
 Phone 866-798-1154

.6 The Landscape Architect Consultant on this Project is:

Company Bezair Partners
 Address 2255 Pelissier St.
 City Windsor, ON N8X 1N5
 Phone 519-966-6844

1.7 PREQUALIFIED GENERAL CONTRACTORS AND SPECIFIC TRADES

.1 The following General Contractors and Specific Trades have been prequalified by the Board to bid on the work included in this Tender.

NOTE: This Tender can be tendered by **prequalified General Contractors and Specific Trades ONLY**. Tenders received from non-prequalified General Contractors and Specific Trades will not be considered.

GENERAL CONTRACTORS

CRD Construction Reid and Deleye Pre Eng Contractors STM Construction Melloul Blamey Dakon Construction Elgin Contracting TRP Construction PM Contracting Devlan Construction Tambro Construction Percon Construction Everstrong Construction	Nith Valley Construction Norlon Builders Golden Gate Contracting Brook Restoration Genpro Contracting J.R. Certus Harbridge and Cross M J Dixon Construction AEC Developments S.G. Cunningham

MECHANICAL TRADES

Aim Industrial Inc. Dependable Mechanical Sys. Arcadian Projects Jay Stewart Mechanical Conestoga Mechanical JTS Mechanical Roberts Onsite Dean Lane CEC Mechanical	L.J. Barton Mechanical Soan Mechanical Linde Mechanical JMR Electric Velocity Mechanical Brenner Mechanical Kittel Mechanical Superior Boiler Works

ELECTRICAL TRADES

Kraun Electric Inc. Aim Industrial Inc. Powerserve Inc. PHE Contractor Roberts Onsite T. Lloyd Electric Juno Electric Comtrade Ltd MJM Electric Trade Services Group	Energy Network Services Superior Boiler Works Chamberlain Building Serv. RBT Electrical CEC Services Ltd. JMR Electric B Safe Electric Ltd Arcadian Projects Millers Electric L.J. Barton Mechanical

KINETIC NETWORK CONTRACTORS KINETIC SOLICIATION AND PROPOSAL NUMBER

- .1 The Waterloo Catholic District School Board has issued a proposal as listed below to be procured through the Kinetic GPO, Tremco Roofing and Building Maintenance and Weatherproofing Technologies Canada Contract # RFSO 24-06 a pre-competed National Purchasing Agreement (GPO). The formal tender process has been satisfied as outlined in section .5.
 1. Customer Proposal Number RFSO 24-06 - (6-digit number)
- .2 The Waterloo Catholic District School Board invites Pre-qualified In Network Contractors for Roofing Services to bid for the supply of all labour, materials, equipment, and services required for this tender in accordance with the drawings and specifications prepared by Svedas Architects Inc.
- .3 Tremco Roofing and Building Maintenance and Weatherproofing Technologies Canada serves as Program Administrator for the Canadian Cooperative Contractor Network and the Kinetic Roofing Program.
- .4 In Network Contractors, having been pre-qualified and authorized by successfully submitting their company's credentials for inclusion in the Canadian Cooperative Contractor Network, may submit competitive proposals for the unique needs of the referenced building(s) outlined within the project documents.
- .5 The formal process of the Kinetic GPO Contract # RFSO 24-06 was publicly advertised on Merx, Biddingo, and Bonfire. Responses were evaluated and

awarded using a competitive solicitation process consistent with Chapter 5 of the Canadian Free Trade Agreement (CFTA) and other international trade agreements, including the Canada-EU Comprehensive Economic and Trade Agreement (CETA), as well as the Broader Public Sector (BPS) Procurement Directive.

- .6 Competitive Proposals may be called, received, evaluated, accepted, and processed in accordance with the Board's Procurement and Purchasing By-Laws. By submitting a Proposal for this project, the Proposer agrees to be bound by the terms and conditions of such By-Laws and any amendments thereto, as fully as if it were incorporated herein. Any Contract resulting from this Kinetic GPO Competitive Proposal shall be governed by and interpreted in accordance with the laws of the Province of Ontario.
- .7 Order of Precedence. The terms and conditions of the Board will take precedent over provisions stated in the Provisions of Kinetic GPO. Conflicts, if any, between Kinetic GPO Provisions and others stipulated within the project documents, require the proposer to adhere to the most stringent requirement published, as determined by the procurement official. The Provisions of Kinetic GPO will govern in absence of any terms and condition in the Specification. In addition, it is incumbent on the Contractor to make any subcontractor(s) performing under the Kinetic GPO contract aware of, and to provide subcontractor(s) with the terms and conditions of the Board as well as the Provisions of Kinetic GPO. The additional Provisions for Kinetic GPO are found attached to the Price Bid Form.
- .8 All project documents shall include the Kinetic GPO Contract Number RFSO 24-06 - (6-digit number).

PRE-QUALIFIED KINETIC NETWORK CONTRACTORS

Atlas Apex Roofing	D. Thackeray Roofing Company Ltd.
Eillen Roofing Inc.	Flynn Canada Ltd. (Cambridge)
Horizon Roofing Ltd.	Lafleche Roofing Ltd.
Provincial Roofing	Semple Gooder Roofing Corporation
Spinton Roofing Ltd.	Trio Roofing Systems Inc.
Triumph Roofing and Sheet Metal Inc.	Wm. Green Roofing Ltd.
Conestoga Roofing and Sheet Metal Ltd.	GRRC Roofing
Goodmen Roofing and Sheet Metal	Pollard Enterprises Ltd.
Tectra Group Inc.	Nortex Roofing Ltd.
Roque Roofing Inc.	Nedlaw Roofing

1.8 SITE ASSESSMENT and MANDATORY SITE VISIT

- .1 Site Examination
 - .1 Visit project site and surrounding area before submitting Bid.

- .2 Notwithstanding the responsibility, a Site Visit to school / project site has been arranged for General Contractors and their sub-trades.
- .3 The location is at the front entrance of the school and the date and time is **May 1, 2026 at 8:30am**
- .4 Before tendering, the Bidder shall examine the site, and the Reports prepared by separately engaged Consultants, bound into the Specifications for reference only, and shall ascertain the extent and nature of the materials it may be necessary, and shall be sure that the Bidder's determinations are made in accordance with the drawings and specifications and the Reports.
- .5 Proposals shall include the cost imposed by existing conditions and limitations of site and the accepted proposal shall be held to have included such costs. NO ALLOWANCE WILL BE MADE FOR FAILURE TO EXAMINE THE EXISTING SITE.
- .6 The information shown on the drawings are furnished in good faith for the guidance of the Contractor, but shall in no way relieve the Contractor of the responsibility of ascertaining to the Contractor's own satisfaction the nature of all conditions at the site.

1.9 BID ENCLOSURES/REQUIREMENTS

- .1 Security Deposit
 - .1 Each tender shall be accompanied by a Bid Bond and Agreement to Bond in the most recent form approved by the Canadian Construction Association from a Surety Company, acceptable to the Board. The Bid Bond shall be in the amount of [...10% of Base Bid...], together with an Agreement to Bond. The Bid Bond must be valid for a minimum of sixty (60) Calendar Days from the closing date. Tenders not accompanied by a Bid Bond and Agreement to Bond will be declared informal.
 - .2 This Bid Bond shall be forfeited if the bidder declines to enter into a formal contract in the amount tendered, or as adjusted according to the separate prices included in the tender, and/or to furnish, when called upon to do so, a Performance Bond. This Bid Bond shall be accompanied by an Agreement from the Surety Company that a 50 % Performance Bond and a 50 % Labour and Material Payment Bond will be issued to the Bidder if the Bidder is awarded the contract. The cost of the Bonds shall be included in the amount of the Tender. Refer to the *CCDC 2-2020 Stipulated Price Contract and the Supplementary Conditions, as attached*, for further information.
 - .3 Retention and use of the Bid Bond, as outlined above, shall not be deemed a penalty, but a consideration to the Board for inviting and considering the Tender and as part payment for sustained damages and costs incurred by the Board, which shall be deemed to be the difference between the bid price of this Bidder and the bid price of the next lowest Bidder acceptable to the Board.
 - .4 A Performance Bond, equal to 50 % of the contract price, shall be furnished through a Surety Company or Insurance Company approved by the Consultant and the Board according to terms and conditions acceptable to the Board and the Consultant.
 - .5 On completion of the work, the Performance Bond shall remain in force as a MAINTENANCE BOND for a period of one (1) year from the date of acceptance

of the building by the Board. It shall form a guarantee of workmanship and materials for the one (1) year period.

.6 Use latest edition CCDC approved bond forms.

.2 Performance Assurance

.1 The Bidder to whom the contract is awarded must properly sign the contract and furnish a satisfactory Performance Bond, Labour and Material Payment Bond, Insurance Certificate and Workers' Compensation Board Certificate within ten (10) Working Days of acceptance of the tender by the Board, or forfeit the Bid Bond.

.2 Labour and Material Payment Bond, equal to 50 % of contract, to be provided within ten (10) Working Days, stating that the Board will not be held responsible if payment to subcontractors, as certified due by the Consultant, is not made by the General Contractor when due.

.3 Tenders must include all costs involved in having the contract "Fit for Legal Occupancy and Substantial Performance" by **August 2, 2027** and having the entire building Totally Completed by **August 23, 2027**

.4 Persons or firms submitting tender proposals shall be actually engaged as their recognized business in the lines of work required by the specifications, and shall be able to refer to work of a similar character which has been satisfactorily performed by them.

.3 Fees for Changes in Work

.1 It must be clearly understood that the Board cannot accept any price variation in the supply or installation of products or labour or materials from those submitted and carried by the Contractor at the time of tender. During the contract period, the Board will not be responsible for, or entertain any price increase in the cost of materials or labour carried in the tender amount.

.2 The tender amount shall not include Harmonized Sales Taxes but shall include all other applicable excise taxes, custom duties, freight, exchange and all other charges in effect and known to come into effect during the construction work described in this Contract.

.3 Unit Prices are exclusive of Harmonized Sales Taxes.

.4 The successful Bidder must provide the Bidder's H.S.T. (Tax) Registration Number and each request for payment must show this number and the amount of H.S.T.(Tax) payable.

.5 At the time of tender submission, include *Separate Prices* listed in the Supplemental Form of Tender for the identified items. Express each In Lieu of Price as a Credit or an Extra to the amount tendered. Contract Amount will be adjusted consistent with their acceptance or rejection by the Board. *Separate Prices* DO NOT include H.S.T.

.4 Unit Prices

.1 UNIT PRICES FOR ADDITIONAL WORK SHALL NOT EXCEED UNIT PRICES FOR DEDUCTED WORK BY MORE THAN 20%.

.2 Unit prices must be submitted at time of Tender.

-
- .3 The Board reserves the right to accept or reject any or all of the unit prices prior to entering into a contract.
 - .4 The Board reserves the right to negotiate any or all of the unit prices with the low Bid Contractor prior to signing a contract
 - .5 Refer to *CCDC 2-2020 Part 6 CHANGES IN THE WORK* regarding valuation of changes not covered by Unit Prices.
 - .5 Subcontractors
 - .1 Bidders are required to submit the list of subcontractors. The list is to be submitted with tender, on the *Supplemental Form of Tender* included in the Contract Documents. The Bidder shall name in these lists the subcontractors proposed to perform the work under the contract. No substitutions to these lists shall be made without the written approval of the Consultants.
 - .2 The selection of Subcontractors must be acceptable to the Board and to the Consultants. If the required substitution of a Subcontractor affects the sub-tender price, an adjustment will be made in the amount of the General Contract by the amount only of the difference in sub-tenders, without additional overhead or profit to the Contractor.
 - .3 If the Bidder proposes to do work with persons directly employed by the Bidder and not subcontract, then the Bidder shall insert the words “*Own Forces*” provided the Bidder can submit proof that the Bidder’s forces have had previous experience in this field.
 - .4 Subcontractors shall be actually engaged as their own recognized business, in the line of work required by the specifications and shall carry out themselves the work which they are awarded by subcontract. They shall not be permitted to re-subcontract their work or portions thereof, to other contractors.
 - .6 Fair Wage and Labour
 - .1 Rate of wages, hours and conditions of work shall be in accordance with Provincial Codes and as generally recognized and accepted in the locality. Building mechanics and labourers resident in the district are to be employed where suitable.
 - .7 Discrepancies and Omissions
 - .1 Bidders, including subcontractors, finding specified items unavailable, finding discrepancies in, or omissions from, the drawings or specifications or other contract documents, or having any doubt as to the intent or meaning of any part thereof, shall at once notify the Consultant in writing, who will issue an Addendum to all bidders in explanation of the inquiry if necessary.
 - .2 All definitions, explanations, corrections or additional information will be issued by the Consultant during the time of bidding in the form of typewritten addenda and such addenda will be available to all Bidders. These shall become part of the contract documents and **must** be shown on the Form of Tender as having been received.
 - .3 NO ORAL INSTRUCTIONS WILL BE VALID.
 - .8 Bidding Assumptions
 - .1 All bids submitted, are assumed to be based upon the complete set of Bid Documents.

- .9 Errors in Tender
 - .1 The Board shall not entertain requests for gratuitous payments arising from errors alleged to have been made in a tender which the Board has accepted
- .10 Building Permit
 - .1 Building Permit has been applied for by the Consultant and shall be paid for by the Board.
 - .2 The Contractor must, however, pay all other necessary fees, deposits and charges related to Municipal, Provincial and Federal Requirements. The General Contractor is responsible for determining the amounts of these permits, fees, etc.
- .11 Contract Documents
 - .1 The Contract shall be subject to the Requirements of the *CCDC 2-2020* Stipulated Price Contract and the Supplementary Conditions, as attached. The successful Bidder must sign the *CCDC 2-2020* Stipulated Price Contract as amended by the Supplementary Conditions using this document and these specifications and drawings, within ten (10) Working Days of notification of award. Failure to do so may result in termination of the award. The Contractor shall not be entitled to any payment until this document is signed.
 - .2 All Contractors will be held to have examined and made themselves familiar with the various articles of these Standard Documents and shall be as binding for all sections of the following specifications as though written in full therein.

1.10 OFFER ACCEPTANCE/ REJECTION

- .1 Privilege and Waiver of Non-Compliance
 - .1 Notwithstanding anything elsewhere herein set out, the lowest or any proposal will not necessarily be accepted by the Board, and the Board reserves the right in its sole discretion to reject any and all proposals at any time or to accept any proposal which is considered advantageous by the Board. Proposals which are non-compliant with the requirements of this Tender, or which contain qualifying conditions, may be disqualified or the Board may waive any non-compliance with the Tender documents, and in its sole discretion, retain for consideration proposals which are non-conforming or non-compliant.
- .2 Acceptance of Offer
 - .1 It must be clearly understood that the final acceptance of this contract is subject to approvals of the Board and other bodies and these may delay final approval. There will be no adjustments in the tendered price for a period of sixty (60) Calendar Days from receipt of Tenders due to delays resulting from obtaining necessary approvals.
- .3 No Change in Pricing
 - .1 It must be clearly understood that the Board cannot accept any price variation in the supply or installation of products or labour or materials from those submitted and carried by the Contractor at the time of tender. During the contract period, the Board will not be responsible for, or entertain any price increase, in the cost of materials or labour carried in the tender amount for any reason, including acts of war or world events.

.4 Withdrawal of Bids.

- .1 Bidders may edit or withdraw their Bid Submission prior to the closing time and date. However, the Bidder is solely responsible to ensure the re-submitted bid is received by the Bidding System no later than the stated closing time and date.

Bids by hardcopy, telephone, email, or fax will not be accepted.

1.11 SPECIFICATION MANUAL AND INSPECTIONS

- .1 The Bidder must be aware that the Board has instructed the Consultant to prepare a painting specification based upon the *Painting Architectural Specification Manual* prepared by the Ontario Painting Contractors' Association, 211 Consumers Road, Suite 305, Willowdale, ON, M2J 4G8
- .2 The Specification consists of three main components
- .1 Evaluation and Choice of Systems – Surface Preparation
- .2 Approved Product/Manufacture Listing – Specification Guide
- .3 Inspection and Guarantee Program
- .4 Refer to the specifications for the first two components listed above. The Inspection Procedure will be complied with in every respect by the successful General Contractor and the Painting Contractor as follows:
- .1 Upon issuance of a subcontract to the Painting Contractor, the General Contractor shall fill out our “*Request for Assignment of an Inspector*” Form. The Inspection fee, which is a percentage charge of the painting subcontract price, will be paid from the *Allowances* identified in the General Instructions. Provide a copy of the properly executed Inspector Form to the Consultant and confirm the accuracy of the subcontractor's painting bid.
- .5 The Form will contain the following information:
- .1 Name of Contractor
- .2 Name and Description of Project
- .3 Name and Address of the Architect
- .4 Job Location
- .5 Project starting date
- .6 Contract Price
- .7 Commencement Date of painting.
- .6 The Association will assign an Inspector to the project.
- .3 The Painting Contractor must advise the Association office of the actual starting date of painting. Painting shall not commence until the Association has been notified and the Inspector makes the initial site visit.
- .4 The Painting Contractor must supply the Inspector with a schedule of materials intended for use on the job at the commencement of the painting.
- .5 During the painting application the frequency of inspections will be sufficient to ensure adequate Quality Control procedures in accordance with the *Painting Architectural Specification Manual* and the Specifications.

- .6 The Inspector will use Interim Inspection Reports during the Project. One copy of each of these reports will be given to the Painting Contractor, one copy to the General Contractor, and two copies to the Association office, one of which will be forwarded to the Consultant. On completion of the job, the final Inspection Report will be made and routed as noted.
- .7 The Inspector will be required to check for proper preparation of surfaces, specified number of coats, as specified in the Specifications and drawings.
- .8 Any deficiencies must be corrected before the Guarantee is issued and final payment for painting made by the Board.
- .9 The Guarantee must cover making good any defects in painting and decorating due to faulty workmanship or defective materials supplied by the Painting and Decorating Subcontractor which appear during a two year period, following “substantial” completion of the Contract or the date of “Fit for Occupancy”, whichever occurs first.

1.12 RESERVED

1.13 COMPLIANCE WITH LAWS, REGULATION

- .1 In the performance of its obligations under the contract awarded (if any), the successful Respondent shall, at its own cost comply with, and ensure all persons for whom it is directly or indirectly responsible under this contract comply with all Federal, Provincial, County, City and Municipal laws, Acts, Codes and Regulations pertaining to the performance of the contract.
- .2 The successful Respondent shall obtain all necessary permits, licenses and fees required for the execution of the work and pay all fees required, including legal fees if any.

1.14 WCDSB POLICIES AND GUIDELINES

- .1 No work is to commence until an official purchase order, or award letter is received.
- .2 At all times while on the Board property, the successful Respondent, and all people for whom they are directly or indirectly responsible in law or under the contract, shall comply with all policies, rules and requirements of the Board.

END OF SECTION

1.1 TENDER INFORMATION

NAME OF BIDDER: _____

TENDER CLOSE:

May 19, 2026 at 02:00:00 pm

SUPPLEMENTAL TENDER FORM CLOSE:

May 19, 2026 at 04:00:00 pm

NAME OF PROJECT: **St. Gregory Catholic Elementary School Additions & Renovations**

PROJECT NUMBER: **Tender # RFT 2026-01**

ELECTRONIC BID SUBMISSIONS ONLY, shall be received by the Bidding System.

1.2 ACKNOWLEDGEMENT RE EXAMINATION OF TENDER DOCUMENTS

- .1 Having carefully examined all of the drawings (Architectural, Structural, Mechanical, Electrical, Site Servicing and Landscape) and having carefully examined the Instructions to Bidders, the requirements of the *CCDC 2-2020 Stipulated Price Contract, as amended by the Supplementary Conditions, as attached*, and all of the attached Specifications; (Architectural, Structural, Mechanical, Electrical, Site Servicing and Landscape) including Addenda numbered as follows:

Addenda #.....to/and including Addenda #.....

and, having visited the sites, investigated and examined all conditions affecting the Work, including soil reports and surveys, and other reports as included in the Tender Documents, the undersigned Bidder makes the offers set out below.

1.3 CASH ALLOWANCES

- .1 All allowances specified under Section 01 21 10 only amended as provided hereunder.

The Tender Amount includes the total Cash Allowance of **\$550,000.00** not including Harmonized Sales Tax (HST). (HST on *Cash Allowance is not to be included in the Tender Amount*)

1.4 TENDER AMOUNT

- .1 The undersigned Bidder hereby offers to furnish all materials, labour, plant and equipment and to perform all duties and services called for by the ENTIRE WORK INCLUDING ALL TRADES for the Project named above for the stipulated sum of:

.....
(Written Value)

\$.....
(Numeric Value)

in lawful money of Canada, excluding Harmonized Sales Tax, but including all other applicable Excise Taxes, Custom Duties, Insurance's, Freight, Exchange and all other charges.

1.5 TENDER VALIDITY

- .1 The undersigned Bidder is hereby submitting a valid Tender and will enter into the *CCDC 2-2020 Stipulated Price Contract, as amended by the Supplementary Conditions, as attached*, if we are notified in writing of our Tender acceptance by THE BOARD within sixty (60) calendar days from the closing of the Tender.

1.6 BONDING

- .1 The undersigned Bidder encloses a Bid Bond in the amount of [10]% made out in the name of WATERLOO CATHOLIC DISTRICT SCHOOL BOARD.
- .2 It is a condition of this Agreement that if the above mentioned Tender is accepted, application for a 50% Performance Bond and a 50% Labour and Material Payment Bond must be completed with undersigned within ten (10) days of acceptance of the tender related thereto, otherwise this Agreement shall be null and void.

1.7 CONSTRUCTION SCHEDULE

- .1 The undersigned Bidder solemnly undertakes, as an integral part of our proposal and tender to:
 - (a) Have the buildings "Fit for Occupancy" by August 2, 2027;
 - (b) Have all buildings and site work completed by August 23, 2027; and
 - (c) Have the Contract completed in its entirety by September 7, 2027.
- .2 The undersigned Bidder confirms that all appropriate costs, such as but not limited to winter heat, inclement weather protection and all overtime costs for all

trades to meet the aforementioned schedule, have been included in our tender price to achieve this date.

- .3 The Bidder acknowledges and agrees that so long as a building permit is obtained and the Bidder is directed to commence Work within the sixty (60) calendar days following the Closing Date, even if such direction does not occur until the fifty-ninth (59th) day following the Closing Date, the Bidder shall not be entitled to a delay claim.
- .4 The undersigned Bidder acknowledges and agrees to comply with the terms and conditions of the Project Occupancy Requirements as outlined in the Supplementary Conditions, attached hereto

1.8 REQUIRED DOCUMENTS

- .1 If notified of the acceptance of this Tender via a Letter of Intent issued by the Board, the undersigned Bidder agrees to provide the prerequisite documentation within ten (10) days.

1.9 FEES FOR CHANGES IN THE WORK

- .1 The undersigned Bidder acknowledges and agrees that the fees referred to in *CCDC 2-2020 Stipulated Price Contract, as amended by the Supplementary Conditions, as attached*, will apply to changes in the Contract not covered by Unit Prices.

1.10 SUPPLEMENTARY FORM OF TENDER

- .1 The undersigned Bidder agrees to submit the *SUPPLEMENTARY FORM OF TENDER*, as attached, at Tender close, which shall include the following:
 - BID AND COST BREAKDOWN
 - LIST OF SUBCONTRACTORS / SUPPLIERS / INSTALLERS
 - SEPARATE PRICES - REQUESTED BY CONSULTANTS
 - UNIT PRICES
 - ITEMIZED PRICES - REQUESTED BY CONSULTANTS
 - ALTERNATE PRICES TO BASE BID
 - LIST OF ALTERNATIVE BIDS SUBMITTED FOR CONSIDERATION

1.11 DECLARATION OF NO CONFLICT

- .1 The undersigned Bidder hereby declares that this Tender submission is made in good faith and without any connection, knowledge, comparison of figures, or arrangements with any other company, firm, or person making a Tender for the same work and is, in all respects, fair and without collusion with any other bidder for this Contract, and without fraud. The undersigned also represents and warrants that, to the best of the undersigned's knowledge and belief, no actual or potential conflict of interest exists with respect to the submission of the Tender or performance of the Contract other than those disclosed hereunder. The undersigned confirms that, where the Board discovers that the undersigned has

failed to disclose all actual or potential conflicts of interest, the Board may disqualify the undersigned or terminate any Contract awarded to the undersigned pursuant to this Tender process. The undersigned understands that, for the purposes hereof, “conflict of interest” also includes:

- (a) in relation to the Tender process, the undersigned has an unfair advantage or engages in conduct, directly or indirectly, that may give the undersigned an unfair advantage, including:
 - (i) having or having access to information in the preparation of the undersigned’s proposal that is confidential to the Board and not available to other bidders;
communicating with any person with a view to influencing preferred treatment in the Tender process; or,
engaging in conduct that compromises or could be seen to compromise the integrity of the open and competitive process and render that process non-competitive and unfair; or,
- (b) in relation to the performance of its contractual obligations in a Board contract, the undersigned’s other commitments, relationships or financial interests:
 - (i) could or could not be perceived to exercise an improper influence over the objective, unbiased and impartial exercise of the Board’s independent judgment; or,
 - (ii) could or could not be perceived to compromise, impair or be incompatible with the effective performance of the undersigned’s contractual obligations.

1.12 MUNICIPAL FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

- .1 This Tender and supporting documentation shall become the property of the Board. Information in a Tender is subject to potential disclosure to third parties after the award, in accordance with the provisions of the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990 (“MFOIPOP”). The Bidder acknowledges that any personal or confidential information which Bidders provide is being collected and will be used exclusively for the purposes of analyzing, evaluating and assessing Tenders submitted. Any information a Bidder wishes to identify as proprietary and have maintained as confidential, excluding unit pricing information as well as the total dollar value of the Tender, must be clearly identified as such, and any proposed restrictions on disclosure specified. For the purposes of a report to the Trustees of the Board, pricing information as well as the total dollar value of the Tender may be reported in a public report and will not be considered confidential. In addition, the Board may be ordered by the Information & Privacy Commissioner under the provisions of MFOIPOP to disclose additional information identified by a Bidder as proprietary and confidential.

1.13 LIMITATION OF LIABILITY

- .1 By submitting a Tender, the undersigned Bidder acknowledges and agrees that the Board will have no liability or obligation to any Tender except only that of the successful Bidder, if any, awarded the Contract by the Board, in its sole discretion. The Bidder also agrees that if the undersigned is not awarded the Contract, the Board shall be fully and forever released and discharged of all liability and obligations relating to this Request for Tender and all its submission procedures. All Bidders responding to this Request for Tender shall accept the decision of the Board as final and binding.

1.14 SIGNING OF TENDER

The undersigned Bidder is hereby submitting this Stipulated Sum Tender under a Corporate Seal or witnessed by an Individual.

PRINT COMPANY NAME: _____

PRINT ADDRESS OF COMPANY: _____

PRINT NAME OF CONTACT PERSON
REGARDING THIS TENDER: _____

CONTACT PERSON'S EMAIL: _____

PHONE NUMBER OF COMPANY: _____

SIGNATURE OF SIGNING OFFICER: _____

DATE: _____

PRINT NAME OF SIGNING OFFICER: _____

PRINT TITLE OF SIGNING OFFICER: _____

SIGNATURE OF WITNESS: _____

PRINT NAME OF WITNESS: _____

AFFIX CORPORATE SEAL (If no individual Witness):

END OF SECTION

Submit this Supplementary Form of Tender at the close of General Tenders.

1.1 TENDER INFORMATION

TENDER CLOSE:

May 19, 2026 at 2:00:00 pm, local time

SUPPLEMENTAL TENDER FORM CLOSE:

May 19, 2026 at 4:00:00 pm, local time

NAME OF PROJECT: **St. Gregory Catholic Elementary School Additions & Renovations**

PROJECT NUMBER: **Tender # RFT 2026-01**

Submission Email Address: stephen.butterworth@wcdsb.ca

1.2 SUPPLEMENTARY LIST OF SUBCONTRACTORS

- .1 I/We, the undersigned, propose to use the following Subcontractors and/or suppliers to perform work of this Contract, and I/we confirm that all have been investigated to confirm their reliability and competence to carry out the Work in accordance with the Contract Documents; and I/we agree that no changes from this may be made without the express written approval of the Board.

Extra costs to the Contract will not be considered for a Subcontractor/supplier substitution, regardless of the reason, except where a substitution is requested by the Owner.

Site Services _____

Asphalt Paving _____

Footings and Foundations _____

Hollowcore _____

Masonry _____

Structural Steel _____

Metal Fabrications _____

Millwork _____

Roofing _____

HM Frames _____

Wood Doors _____

Aluminum Framing and Glazing _____

Gypsum Board Assemblies _____

Acoustical Ceilings _____
Flooring _____
Terrazzo _____
Painting _____
Whiteboards and Tackboards _____
Fencing _____
Mechanical _____
Electrical _____
Sprinklers _____

1.3 SEPARATE PRICES

- .1 Separate Price items do NOT replace or substitute items already in the Bid Documents. Accepted Separate Prices are to be in accordance with Section 002100 (Instructions to Bidders) excluding HST:

- .1 Separate Price #1 – Provide for the supply and installation of re-roofing of Existing Roof Area C. Provide complete re-roof including all flashing and parapet work for this area. (Note: that new roof access ladders are part of the Base Bid and are not part of this separate price.)

\$ _____

1.4 ELECTRICAL UNIT PRICES:

- .1 I/We enclose herewith Unit Prices, exclusive of applicable taxes, which are an integral part of the Bid. Unit prices are, in effect, for the duration of this Project's construction period, unit prices are exclusive of applicable taxes.
- .2 The following unit costs will apply to all additional or deleted work from the Contract and should include their proportionate share of all labour equipment, materials, accessories, profits, overhead and taxes for a job completely installed. Applications of unit prices will be to the net difference of quantities of individual products and materials in each Proposed Change or Change Order.
- .3 The unit prices will be used for additions and deletions. Credit rate for deletions shall be at 80% of original rates listed under sections 1.4, 1.5, 1.6, 1.7, 1.8, 1.9.
- .4 Conduit and Cable:
- Supply and install the following conduit and cables including fastenings, clips, connectors, coupling boxes, etc. as required based on length as shown.

MORE WORK

.1	25MM EC/3500mm Length	\$_____
.2	2 #12-12mm C/3500mm Length	\$_____
.3	3 #12-12mm C/3500mm Length	\$_____
.4	2 #10-19mm C/3500mm Length	\$_____
.5	3 #10-19mm C/3500mm Length	\$_____
.6	3 #8- 19mm C/3500mm Length	\$_____

.5 Receptacles:

Supply and installation of one duplex receptacle, shall include the receptacle box, cover plate, 5000mm of conduit and wiring, including connection to adjacent receptacle and/or outlet box.

MORE WORK

.1	Supply and installation of one duplex receptacle	\$_____

.6 Light Switches

Supply and installation of light switch shall include the switch box, cover plate, conduit, wiring and connection to box containing the lighting circuit.

MORE WORK

.1	Supply and installation of one 347 volt light switch.	\$_____

.7 Fire Alarm System:

MORE WORK

.1	Supply and installation of one fire alarm pull station, including conduits, wiring and connections to the nearest fire alarm pull station. (Base conduit and wiring on 1500mm length).	\$_____
.2	Supply and installation of one fire alarm cone speaker including conduit, wiring and connections to nearest fire alarm cone speaker. (Base conduit and wiring on 1500mm length).	\$_____

.8 Lighting Fixtures:

Supply and installation of the following lighting fixtures. The supply and installation of lighting fixtures shall include the fixtures, flexible conduit, wiring and connection to nearest outlet box containing 347 and/or 120 volt circuits and the supply and installation of the lamps. (Base conduit and wiring on 4500mm length).

MORE WORK

.1	Supply and installation of one type 'A' fixture	\$ _____
.2	Supply and installation of one type 'ASM' fixture	\$ _____
.3	Supply and installation of one type 'A1' fixture	\$ _____
.4	Supply and installation of one type 'B' fixture	\$ _____
.5	Supply and installation of one type 'BSM' fixture	\$ _____
.6	Supply and installation of one type 'C' fixture	\$ _____
.7	Supply and installation of one type 'D' fixture	\$ _____
.8	Supply and installation of one type 'D1' fixture	\$ _____
.9	Supply and installation of one type 'DSM' fixture	\$ _____

1.5 LABOUR RATES

I/We enclose herewith Labour Rates which are an integral part of the Tender. Labour rates are in effect for the duration of this Project's construction period. The Owner is not obligated to accept Labour rates indicated.

.1 Mechanical Labour Rates

Labour at the following rates should be applied for additions or deletions to the work not covered by unit prices. The prices consist of salary, all agreed local union benefits. The rate quoted represents the net cost to the Contractor, exclusive of overhead and profit and applicable taxes.

.1	Plumbing & Drainage Tradesmen	\$ _____ Per Hour
.2	HVAC Piping Tradesman	\$ _____ Per Hour

.3	Insulation Tradesmen	\$_____ Per Hour
.4	Sheet Metal Tradesmen	
.1	Shop	\$_____ Per Hour
.2	Field	\$_____ Per Hour
.5	(Other)	\$_____ Per Hour
.6	Sprinkler Pipefitter & Installer	\$_____ Per Hour
.7	Sprinkler Work Office/Engineer	\$_____ Per Hour

1.6 SPRINKLER SUB-CONTRACTOR CASA MEMBERSHIP

Sprinkler Contractor shall be a paid member, and in good standing at time of Tender, of the Canadian Automatic Sprinkler Association. Attach membership certificate to this Supplementary Form of Tender.

- .1 Labour at the following rates shall be applied for additions or deletions to the work not covered by unit prices. The prices consist of salary, all agreed local union benefits. The rate quoted represents the net cost to the Contractor, exclusive of overhead and profit and applicable taxes.
- | | | |
|----|------------|------------------|
| .1 | Journeyman | \$_____ Per Hour |
| .2 | Foreman | \$_____ Per Hour |

1.7 MECHANICAL MANUFACTURERS AND SUPPLIERS:

I/We enclose herewith a list of Manufacturers and Suppliers to the Mechanical Building Services which is an integral part of the Tender. We hereby agree that the Owner may select from any substitutes that we have offered in our Tender. Our Tender Price is based on the equipment/manufacturers indicated hereunder and we hereby agree that we will not alter the indicated equipment/manufacturers unless specifically authorized by the Owner.

I/We, the undersigned, have inserted below proposed substitutions and prices for the Owner's consideration.

I/We agree that:

- .1 all prices submitted take into consideration and allow for changes and adjustments in other work as may be necessary to provide a finished and functional result, unless specifically indicated otherwise;

- .2 alternative prices are for work which is not included in the Tender price listed on Form of Tender but which may be substituted by the Owner for work which is included (no price listed shall mean no change in cost);
- .3 and that the Board reserves the right to accept or reject any of the prices proposed hereunder;
- .4 prices listed hereunder do not include HST

	<u>Product/Equipment Specified</u>	<u>Proposed Substitution</u>	<u>Reduction in Contract Price</u>
.1	_____		\$ _____
.2	_____		\$ _____
.3	_____		\$ _____
.4	_____		\$ _____
.5	_____		\$ _____
.6	_____		\$ _____
.7	_____		\$ _____
.8	_____		\$ _____
.9	_____		\$ _____
.10	_____		\$ _____

Attach additional sheets and supporting documentation, if necessary.

1.8 ITEMIZED PRICES

These Itemized Prices will be used to identify the cost of components within the total Bid Sum required for the Owner's own internal auditing, exclusive of HST.

- .1 Supply and installation of Fire Alarm System complete with associated components, conduit and wiring as shown on drawings and described in specifications.

_____ Dollars (\$_____)

- .2 Supply and installation of Lighting Control System complete with associated components, conduit and wiring as shown on drawings and described in specifications.

_____ Dollars (\$_____)

1.9 SIGNING OF SUPPLEMENTARY FORM OF TENDER

PRINT COMPANY NAME: _____

PRINT NAME OF CONTACT PERSON
REGARDING THIS TENDER: _____

PRINT ADDRESS OF COMPANY: _____

PHONE NUMBER OF COMPANY: _____

PRINT NAME OF CONTACT PERSON
REGARDING THIS TENDER: _____

CONTACT PERSON'S EMAIL: _____

EMAIL ADDRESS SIGNING OFFICER: _____

SIGNATURE OF SIGNING OFFICER: _____

DATE: _____

PRINT NAME OF SIGNING OFFICER: _____

PRINT TITLE OF SIGNING OFFICER: _____

SIGNATURE OF WITNESS: _____

PRINT NAME OF WITNESS: _____

AFFIX CORPORATE SEAL (If no individual Witness):

END OF SECTION



Waterloo Catholic
District School Board

**SUPPLEMENTARY CONDITIONS
AMENDMENTS TO CCDC 2 – 2020
STIPULATED PRICE CONTRACT (Version May 2022)**

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**Waterloo Catholic
District School Board**

**SUPPLEMENTARY CONDITIONS &
AMENDMENTS TO STANDARD CONSTRUCTION
DOCUMENT CCDC2 -2020 STIPULATED PRICE
CONTRACT**

(the “Supplementary Conditions”)

**AGREEMENT, DEFINITIONS, AND
GENERAL CONDITIONS**



SUPPLEMENTARY CONDITIONS

AMENDMENTS TO CCDC 2 – 2020

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The Standard Construction Document CCDC 2 2020 for a Stipulated Price Contract, English version, consisting of the Agreement Between *Owner* and Contractor, Definitions and General Conditions of the Stipulated Price Contract, Parts 1 to 13 inclusive, governing same, together with the changes with the new *Construction Act* is hereby made part of these *Contract Documents*, with the following amendments, additions and modifications:

AGREEMENT BETWEEN OWNER AND CONTRACTOR

SC1 ARTICLE A-1 – THE WORK

SC1.1	A-1.3	<u>Amend</u> Article A-1.3 by <u>deleting</u> all of the words after “<i>Contract Documents</i>” and <u>replace</u> them with the following” “attain .1 <i>Substantial Performance of the Work</i> by the [] day of [] in the year 20[]. .2 (if applicable) <i>Occupancy</i> by the [] day of [] in the year 20[], and .3 <i>Ready-for-Takeover</i> by the [] day of [] in the year 20[].”

SC2 ARTICLE A-3 – CONTRACT DOCUMENTS

SC2.1	A-3.1	<u>Add</u> the following documents to the list of <i>Contract Documents</i> in Article A-3.1: • Waterloo Catholic District School Board's Supplementary Conditions & Amendments to Standard Construction Document CCDC2-2020 Stipulated Price Subcontract, May 2022 Version, including any Special Supplementary Conditions listed in Appendix 2 thereto • <i>Drawings</i> • <i>Specifications</i> • Performance Bond (Form 32 -Performance Bond under Section 85.1 of the Act) • Labour and Material Payment Bond (Form 31 – Labour and Material Payment Bond under Section 85.1 of the Act)

SC3 ARTICLE A-4 – CONTRACT PRICE

SC3.1	A-4.4	<u>Delete</u> Article A-4.4 and <u>replace</u> it with the following: “4.4 The <i>Contract Price</i> shall remain fixed for the duration of the <i>Contract Time</i>, subject only to adjustments as provided for in the <i>Contract Documents</i>. For certainty, and without limiting the general application of the preceding sentence, the <i>Contractor</i> assumes all risks in connection with cost increases for overhead, <i>Products</i>, <i>Labour</i>, and <i>Construction Equipment</i> prescribed by the <i>Contract Documents</i> for the performance of the <i>Work</i>, and the <i>Contractor</i> assumes all responsibility for liabilities and additional costs that may arise as a result of the <i>Contractor's</i> inclusion of any <i>Product</i>, <i>Construction Equipment</i>, <i>Supplier</i>, or <i>Subcontractor</i> in its calculation of the <i>Contract Price</i>.”

SC4 ARTICLE A-5 – PAYMENT

SC4.1	A-5.1	<u>Delete</u> Article A- 5.1 in its entirety including all subparagraphs and <u>replace</u> it with the following:



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		"5.1 Subject to the provisions of the <i>Contract Documents</i> and the <i>Construction Act</i>, the <i>Owner</i> shall: .1 make progress payments to the <i>Contractor</i> on account of the <i>Contract Price</i> when due together with such <i>Value Added Taxes</i> as may be applicable to such payments, .2 upon <i>Substantial Performance of the Work</i> as certified by the <i>Consultant</i>, and on the 61st day after the publication of the certificate of <i>Substantial Performance of the Work</i>, in accordance with the <i>Construction Act</i>, there being no claims for lien registered against the title to the <i>Place of the Work</i> and no written notices of lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> the unpaid balance of the holdback, together with such <i>Value Added Taxes</i> as may be applicable to such payment, less any amount stated in the <i>Owner's Notice of Non-Payment</i>. .3 after <i>Ready-for-Takeover</i> has been achieved in accordance with the <i>Contract Documents</i> and the <i>Work</i> is complete, there being no claims for lien registered against the title to the <i>Place of the Work</i> and no written notices of lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> any unpaid balance of the <i>Contract Price</i> in accordance with GC 5.5 – FINAL PAYMENT, together with such <i>Value Added Taxes</i> as may be applicable to such payment."
SC 4.2	A-5.2.1	<u>Delete</u> subparagraph 5.2.1 in its entirety and <u>replace</u> it with the following: "1 Should either party fail to make payments as they become due under the terms of the <i>Contract</i> or in an award by arbitration or court, interest shall also become due and payable on such unpaid amounts at the prejudgment interest rate prescribed by the <i>Courts of Justice Act</i> (Ontario), as it may change from time to time."

SC5 *NEW* ARTICLE A-9 – CONFLICT OF INTEREST

SC5.1	A-9	<u>Add</u> new ARTICLE A-9 CONFLICT OF INTEREST as follows: "ARTICLE A-9 CONFLICT OF INTEREST 9.1 The <i>Contractor</i>, <i>Subcontractors</i> and <i>Suppliers</i> and any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall not engage in any activity or provide any services where such activity or the provision of such services creates a conflict of interest (actually or potentially, in the sole opinion of the <i>Owner</i>) with the provision of the <i>Work</i> pursuant to the <i>Contract</i>. The <i>Contractor</i> acknowledges and agrees that a conflict of interest, as described in this Article A-9, includes, but is not limited to, the use of <i>Confidential Information</i> where the <i>Owner</i> has not specifically authorized such use. 9.2 The <i>Contractor</i> shall disclose to the <i>Owner</i>, in writing, without delay, any actual or potential situation that may be reasonably interpreted as either a conflict of interest or a potential conflict of interest, including the retention of any <i>Subcontractor</i> or <i>Supplier</i> that is directly or indirectly affiliated with or related to the <i>Contractor</i>. 9.3 The <i>Contractor</i> covenants and agrees that it will not hire or retain the services of any employee or previous employee of the <i>Owner</i> where to do so constitutes a breach by such employee or previous employee of the <i>Owner's</i> conflict of interest policy, as it may be amended from time to time, until after completion of the <i>Work</i> under the <i>Contract</i>. 9.4 It is of the essence of the <i>Contract</i> that the <i>Owner</i> shall not have direct or indirect liability to any <i>Subcontractor</i> or <i>Supplier</i>, and that the <i>Owner</i> relies on the maintenance of an arm's-length relationship between the <i>Contractor</i> and its



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		<i>Subcontractors and Suppliers</i>. Consistent with this fundamental term of the <i>Contract</i>, the <i>Contractor</i> will not enter into any agreement or understanding with any <i>Subcontractor or Supplier</i>, whether as part of any contract or any written or oral collateral agreement, pursuant to which the parties thereto agree to cooperate in the presentation of a claim for payment against the <i>Owner</i>, directly or through the <i>Contractor</i>, where such claim is, in whole or in part, in respect of a disputed claim by the <i>Subcontractor or Supplier</i> against the <i>Contractor</i>, where the payment to the <i>Subcontractor or Supplier</i> by the <i>Contractor</i> is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the <i>Owner</i>, failing which the <i>Contractor</i> shall be saved harmless from all or a portion of those claims. The <i>Contractor</i> acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the <i>Contractor</i> shall only be entitled to advance claims against the <i>Owner</i> for amounts pertaining to <i>Subcontractor or Supplier</i> claims where the <i>Contractor</i> has actually paid or unconditionally acknowledged liability for those claims or where those claims are the subject of litigation or binding arbitration between the <i>Subcontractor or Supplier</i> and the <i>Contractor</i> has been found liable for those claims.
	9.5	Notwithstanding paragraph 7.1.2 of GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT, a breach of this Article A-9 by the <i>Contractor</i>, any of the <i>Subcontractors</i>, or any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall entitle the <i>Owner</i> to terminate the <i>Contract</i>, in addition to any other rights and remedies that the <i>Owner</i> has in the <i>Contract</i>, in law, or in equity."

SC6 *NEW* ARTICLE A-10 TIME OF THE ESSENCE

SC6.1	Article A-10	<u>Add</u> the following new Article A-10 as follows: "ARTICLE A-10 TIME OF THE ESSENCE 10.1 It is agreed that one of the reasons the <i>Contractor</i> was selected by the <i>Owner</i> for this <i>Contract</i> is the <i>Contractor's</i> representation and covenant that it will attain <i>Substantial Performance, Occupancy</i> (if applicable), and <i>Ready-for-Takeover</i> within the <i>Contract Time</i> stated in Article A-1 of this <i>Contract</i>. 10.2 The <i>Contractor</i> acknowledges and agrees that it is responsible to marshal its resources and those of its <i>Subcontractors and Suppliers</i> in a manner which will permit timely attainment of <i>Substantial Performance, Occupancy</i> (if applicable), and <i>Ready-for-Takeover</i>. The <i>Contractor</i> agrees that time is of the essence of this <i>Contract</i>."

SC7 DEFINITIONS

Revisions to Existing Definitions		
SC7.1	Consultant	<u>Amend</u> the definition of "Consultant" by <u>adding</u> the following to the end of the definition: "For the purposes of the <i>Contract</i>, the terms "<i>Consultant</i>", "<i>Architect</i>" and "<i>Engineer</i>" shall be considered synonymous."



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SC7.2	Payment Legislation/Construction Act	<u>Delete</u> the Definition of <i>Payment Legislation</i> and replace it with “Construction Act” as follows: “Construction Act <i>Construction Act</i> means the <i>Construction Act</i>, R.S.O. 1990, c. C.30, as amended, including all regulations passed under it that are enforceable as of the date of execution of this <i>Contract</i>. For certainty, the first procurement process for the <i>Project</i> (i.e., the “improvement” as that term is defined in the <i>Construction Act</i>) was commenced on or after October 1, 2019.”
SC7.3	Ready-for-Takeover	<u>Amend</u> the Definition of <i>Ready-for-Takeover</i> by deleting all the words after “as verified” and replacing them with “and approved by the <i>Owner</i>.”
New Definitions		
SC7.4	Adjudication	<u>Add</u> the following definition: “Adjudication <i>Adjudication</i> means construction dispute interim adjudication as defined under the <i>Construction Act</i>.”
SC7.5	Close-Out Documentation	<u>Add</u> the following new definition: “Close-Out Documentation <i>Close-Out Documentation</i> has the meaning given to it under GC 5.4.2.”
SC7.6	Confidential Information	<u>Add</u> the following definition: “Confidential Information <i>Confidential Information</i> means all the information or material of the <i>Owner</i> that is of a proprietary or confidential nature, whether it is identified as proprietary or confidential or not, including but not limited to information and material of every kind and description (such as drawings and move-lists) which is communicated to or comes into the possession or control of the <i>Contractor</i> at any time, but <i>Confidential Information</i> shall not include information that: .1 is or becomes generally available to the public without fault or breach on the part of the <i>Contractor</i>, including without limitation breach of any duty of confidentiality owed by the <i>Contractor</i> to the <i>Owner</i> or to any third party, but only after that information becomes generally available to the public; .2 the <i>Contractor</i> can demonstrate to have been rightfully obtained by the <i>Contractor</i> from a third party who had the right to transfer or disclose it to the <i>Contractor</i> free of any obligation of confidence; .3 the <i>Contractor</i> can demonstrate to have been rightfully known to or in the possession of the <i>Contractor</i> at the time of disclosure, free of any obligation of confidence; or .4 is independently developed by the <i>Contractor</i> without use of any <i>Confidential Information</i>.”
SC7.7	Construction Schedule	<u>Add</u> the following definition: “Construction Schedule <i>Construction Schedule</i> means the schedule for the performance of the <i>Work</i> provided by the <i>Contractor</i>, and approved by the <i>Owner</i>, pursuant to GC 3.4.1, including any amendments to the <i>Construction Schedule</i> made pursuant to the <i>Contract Documents</i>.”



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SC7.8	Construction Schedule Update	<u>Add</u> the following definition: “Construction Schedule Update <i>Construction Schedule Update</i> means an update to the <i>Construction Schedule</i> by the <i>Contractor</i> using Microsoft Project (or other approved scheduling software) that accurately depicts the progress of the <i>Work</i> relative to the critical path established in the <i>Construction Schedule</i> approved in GC 3.5.1 (or any approved successor <i>Construction Schedule</i>), aligns with the currently approved date for <i>Substantial Performance of the Work</i>, shows up-to-date projected major activity sequences and durations, and shows any changes or delays in anticipated completion dates of major activities in the <i>Work</i> relative to the last <i>Construction Schedule Update</i>, and includes the following minimum deliverables: (a) a record version of the updated <i>Construction Schedule</i> in .pdf format; (b) an editable copy of the updated original digital file of the <i>Construction Schedule</i> (e.g., .mpp format files for Microsoft Project)."
SC7.9	Direct Costs	<u>Add</u> the following definition: “Direct Costs <i>Direct Costs</i> are the reasonable costs of performing the contract or subcontract including costs related to the additional supply of services or materials (including equipment rentals), insurance and surety bond premiums, and costs resulting from seasonal conditions, that would not have been incurred, but do not include indirect damages suffered, such as loss of profit, productivity or opportunity, or any head office overhead costs."
SC7.10	EFT	<u>Add</u> the following definition: “EFT <i>EFT</i> has the definition given to it under GC 5.3.2."
SC7.11	Excess Soil	<u>Add</u> the following definition: “Excess Soil <i>Excess Soil</i> means “excess soil” as that term is defined under section 3 of the <i>Excess Soil Regulation</i>."
SC7.12	Excess Soil Regulation	<u>Add</u> the following Definition: “Excess Soil Regulation <i>Excess Soil Regulation</i> means O. Reg. 406/19: On-Site and Excess Soil Management to the <i>Environmental Protection Act</i>, R.S.O. 1990, c. E.19."
SC7.13	Final Pre-Invoice Submission Meeting	<u>Add</u> the following ne definition: “Final Pre-Invoice Submission Meeting <i>Final Pre-Invoice Submission Meeting</i> has the meaning given to it in GC 5.5.1."



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SC7.14	Force Majeure	<u>Add</u> the following definition: “Force Majeure <i>Force Majeure</i> means any cause, unknown at the effective date of the <i>Contract</i> and beyond either party's control, other than financial difficulties, bankruptcy or insolvency, which prevents the performance by a party, or both, of any of their respective obligations under the <i>Contract</i> and the event of <i>Force Majeure</i> did not arise from a party's default and could not be avoided or mitigated by the exercise of reasonable effort or foresight. <i>Force Majeure</i> includes <i>Labour Disputes</i>; fire; unusual delay by common carriers or unavoidable casualties; delays in obtaining third-party licences, permits, agreements, or approvals (excluding approvals of any <i>Subcontractors</i> or <i>Suppliers</i> of any tier); civil disturbance; emergency acts, orders, legislation, regulations or directives of any government or other public authority; acts of a public enemy; war; riot; sabotage; blockage; embargo; lightning; earthquake; adverse weather conditions but only if substantially beyond the weather norms of the <i>Place of the Work</i>; acts of God; or declared epidemic or pandemic outbreak or other public health emergency (e.g. SARS, COVID-19).”
SC7.15	Install	<u>Add</u> the following definition: “Install <i>Install</i> means install and connect. <i>Install</i> has this meaning whether or not the first letter is capitalized.”
SC7.16	Labour Dispute	<u>Add</u> the following definition: “Labour Dispute <i>Labour Dispute</i> means any lawful or unlawful labour problems, work stoppage, labour disruption, strike, job action, slow down, lock-outs, picketing, refusal to work or continue to work, refusal to supply materials, cessation or work or other labour controversy which does, or might, affect the <i>Work</i>.”
SC7.17	Notice of Non-Payment	<u>Add</u> the following definition: “Notice of Non-Payment <i>Notice of Non-Payment</i> means a notice of non-payment of holdback (Form 6) or a notice of non-payment (Form 1.1) under the <i>Act</i>, as applicable to the circumstances.”
SC7.18	OHSa	<u>Add</u> the following definition: “OHSa <i>OHSa</i> means the <i>Occupational Health and Safety Act</i>, R.S.O. 1990, c. O.1, as amended, including all regulations thereto.”
SC7.19	Overhead	<u>Add</u> the following definition: “Overhead <i>Overhead</i> means all site and head office operations and facilities, all site and head office administration and supervision; all duties and taxes for permits and licenses required by the authorities having jurisdiction at the <i>Place of the Work</i>; all requirements of Division 1, including but not limited to submittals, warranty, quality control, calculations, testing and inspections; meals and accommodations; and, tools, expendables and clean-up costs.”



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SC7.20	Payment Period	<u>Add</u> the following definition: “Payment Period <i>Payment Period</i> has the definition given to it under GC 5.2.1.”
SC7.21	Pre-Invoice Submission Meeting	<u>Add</u> the following definition: “Pre-Invoice Submission Meeting <i>Pre-Invoice Submission Meeting</i> has the definition given to it under GC 5.2.1.”
SC7.22	Proper Invoice	<u>Add</u> the following definition: “Proper Invoice <i>Proper Invoice</i> means a “proper invoice” as that term is defined in Section 6.1 of the Act, including the minimum requirements set out in Appendix “1” of the Supplementary Conditions.”
SC7.23	Proper Invoice Submission Date	<u>Add</u> the following definition: “Proper Invoice Submission Date <i>Proper Invoice Submission Date</i> has the definition given to it under GC 5.2.2.1.”
SC7.24	Request for Information (RFI)	<u>Add</u> the following definition: “Request for Information (RFI) <i>Request for Information</i> or <i>RFI</i> means written documentation sent by the Contractor to the Owner or to the Owner’s representative or the Consultant requesting written clarification(s) and/or interpretation(s) of the Drawings and/or Specifications, Contract requirements and/or other pertinent information required to complete the Work of the Contract without applying for a change or changes to the Work.”
SC7.25	Restricted Period	<u>Add</u> the following definition: “Restricted Period <i>Restricted Period</i> means the (inclusive) period of time between December 1 to January 8 and August 15 to September 15 of any given year throughout the duration of the Contract.”

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

Where a General Condition or paragraph of the General Conditions of the Contract is deleted by these amendments, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, unless stated otherwise herein, and the numbering of the deleted item will be retained, unused.

PART 1 GENERAL PROVISIONS

SC8 GC 1.1 CONTRACT DOCUMENTS

SC8.1	1.1.3	<u>Delete</u> GC 1.1.3 in its entirety and <u>replace</u> it with the following: “1.1.3 The Contractor shall review the Contract Documents and shall report promptly to the Consultant any error, inconsistency, or omission the Contractor may discover. Such review by the Contractor shall be undertaken with the standard of care described in GC 3.13.1. Except for its obligation to make such review and report the result, the



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		<i>Contractor</i> does not assume any responsibility to the <i>Owner</i> or to the <i>Consultant</i> for the accuracy of the <i>Contract Documents</i>. Provided it has exercised the degree of care and skill described in this GC 1.1.3, the <i>Contractor</i> shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the <i>Contract Documents</i>, which the <i>Contractor</i> could not reasonably have discovered through the exercise of the required standard of care.”
SC8.2	1.1.4	<u>Delete</u> GC 1.1.4 in its entirety and <u>replace</u> it with the following: “1.1.4 Except for the obligation to complete the review prescribed in GC 1.1.3, and report the results as set out in this GC 1.1.4, the <i>Contractor</i> is not responsible for errors, omissions or inconsistencies in the <i>Contract Documents</i>. If there are errors, omissions or inconsistencies discovered by or made known to the <i>Contractor</i> as part of its review under GC 1.1.3 or at any time during the performance of the <i>Work</i>, the <i>Contractor</i> shall immediately notify the <i>Consultant</i>, and request instructions, a <i>Supplemental Instruction</i>, <i>Change Order</i>, or <i>Change Directive</i>, as the case may require, and shall not proceed with the <i>Work</i> affected until the <i>Contractor</i> has received corrected or additional information from the <i>Consultant</i>. The <i>Contractor</i> shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the <i>Contract Documents</i>, which the <i>Contractor</i> could not reasonably have discovered through the exercise of care and skill described in GC 3.13.”
SC8.3	1.1.5.1	<u>Delete</u> GC 1.1.5.1 and <u>replace</u> with the following: “.1 the order of priority of documents, from highest to lowest, shall be: .1 Supplementary Conditions; .2 the Agreement between the Owner and the Contractor; .3 the Definitions; .4 the General Conditions; .5 Division 01 of the <i>Specifications</i> .6 technical <i>Specifications</i>; .7 material and finishing schedules; and .8 the <i>Drawings</i>.
SC8.4	1.1.5.5	<u>Delete</u> GC 1.1.5.5 and <u>replace</u> with the following: “.5 Noted materials and annotations on the <i>Drawings</i> shall govern over the graphic representation of the <i>Drawings</i>.”
SC8.5	1.1.5.6 to 1.1.5.8	<u>Add</u> the following new GC 1.1.5.6 to 1.1.5.8 as follows: “.6 Finishes in the room finish schedules shall govern over those shown on the <i>Drawings</i>. .7 Architectural drawings shall have precedence over structural, plumbing, mechanical, electrical and landscape drawings insofar as outlining, determining and interpreting conflicts over the required design intent of all architectural layouts and architectural elements of construction, it being understood that the integrity and installation of the systems designed by the <i>Consultant</i>, or its sub-<i>Consultants</i> are to remain with each of the applicable drawing disciplines. .8 Should reference standards contained in the <i>Specifications</i> conflict with the <i>Specifications</i>, the <i>Specifications</i> shall govern. Should reference standards and <i>Specifications</i> conflict with each other or if certain requirements of the <i>Specifications</i> conflict with other requirements of the <i>Specifications</i>, the more stringent requirements shall govern.”



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SC8.6	1.1.9	<u>Add</u> the following to the end of GC 1.1.9: “The <i>Specifications</i> are divided into divisions and sections for convenience but shall be read as a whole and neither such division nor anything else contained in the <i>Contract Documents</i> will be construed to place responsibility on the <i>Owner</i> or the <i>Consultant</i> to settle disputes among the <i>Subcontractors</i> and <i>Suppliers</i> with respect to such divisions. The <i>Drawings</i> are, in part, diagrammatic and are intended to convey the scope of the <i>Work</i> and indicate general and appropriate locations, arrangements and sizes of fixtures, equipment, outlets and other elements. The <i>Contractor</i> shall obtain more accurate information about the locations, arrangements and sizes from study and coordination of the <i>Drawings</i>, including <i>Shop Drawings</i> and shall become familiar with conditions and spaces affecting those matters before proceeding with the <i>Work</i>. Where site conditions require reasonable minor changes where the change requires only the additional labour two hours or less, the <i>Contractor</i> shall make such changes at no additional cost to the <i>Owner</i>. Similarly, where known conditions or existing conditions interfere with new installation and require relocation, the <i>Contractor</i> shall include such relocation in the <i>Work</i>. The <i>Contractor</i> shall arrange and install fixtures and equipment in such a way as to conserve as much headroom and space as possible. The schedules are those portions of the <i>Contract Documents</i>, wherever located and whenever issued, which compile information of similar content and may consist of drawings, tables and/or lists.”
SC8.7	1.1.13	<u>Add</u> new paragraph 1.1.13 as follows: 1.1.13 The <i>Contractor</i> shall keep one copy of the current <i>Contract Documents</i>, <i>Supplemental Instructions</i>, contemplated <i>Change Orders</i>, <i>Change Orders</i>, <i>Change Directives</i>, cash allowance disbursement authorizations, reviewed <i>Shop Drawings</i>, submittals, reports and records of meeting at the <i>Place of the Work</i>, in good order and available to the <i>Owner</i> and <i>Consultant</i>.”

SC9 GC 1.3 RIGHTS AND REMEDIES

SC9.1	1.3.2	In paragraph 1.3.2 <u>delete</u> the word “No” from the beginning of the paragraph and <u>replace</u> it with the words: “Except with respect to the requirements set out in paragraphs 6.4.1, 6.5.4, 6.6.1 and 8.3.2, no...”

SC10 *NEW* GC 1.5 EXAMINATION OF DOCUMENTS AND SITE

SC10.1	1.5	<u>Add</u> new GC 1.5 – EXAMINATION OF DOCUMENTS AND SITE as follows: “GC 1.5 EXAMINATION OF DOCUMENTS AND SITE 1.5.1 The <i>Contractor</i> declares and represents that in tendering for the <i>Work</i>, and in entering into a Contract with the <i>Owner</i> for the performance of the <i>Work</i>, it has investigated for itself the character of the <i>Work</i> to be done, based on information generally available from a visit to the <i>Place of the Work</i> and to the standard set out under GC 3.14.1 and further represents and warrants and acknowledges that it considered and took into account in the <i>Contract Price</i> all reasonably known impacts and restrictions arising from the COVID-19 pandemic, including without limitation corresponding legislative changes that may impact performance of the <i>Project</i>, various weather conditions that may affect the <i>Work</i>, the availability of supplies and labour or other conditions or risks that the <i>Contractor</i> knew about or reasonably ought to have known about prior to the date of the <i>Contract</i>. The <i>Contractor</i> has assumed and does hereby assume all risk of known conditions now existing or arising in the course of the <i>Work</i> which might or could make the <i>Work</i>, or any items



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		thereof more expensive in character, or more onerous to fulfil, than was contemplated or known when the tender was made or the <i>Contract</i> signed.
	1.5.2	The <i>Contractor</i> also declares that prior to commencement of the <i>Work</i> , where in tendering for the <i>Work</i> and in entering into this <i>Contract</i> , the <i>Contractor</i> relied upon information furnished by the <i>Owner</i> or any of its agents or servants respecting the nature or confirmation of the ground at the site of the <i>Work</i> , the <i>Contractor</i> shall review to the standard specified in GC 3.14.1, the accuracy of the information furnished by the <i>Owner</i> . If a condition is materially different than what is stated in the information furnished by the <i>Owner</i> , the <i>Contractor</i> shall, no later than five (5) <i>Working Days</i> after the first observation of such condition(s), deliver to the <i>Owner</i> and to the <i>Consultant</i> a <i>Notice in Writing</i> specifying the materially different condition and the <i>Contractor</i> shall not proceed with the affected part of the <i>Work</i> until receiving written direction from the <i>Owner</i> or the <i>Consultant</i> . Where the <i>Contractor</i> fails to provide prompt <i>Notice in Writing</i> in accordance with this GC 1.5.2, the <i>Contractor</i> expressly waives and releases the <i>Owner</i> from all claims with respect to the said information with respect to the <i>Work</i> .

PART 2 ADMINISTRATION OF THE CONTRACT

SC11 GC 2.2 ROLE OF THE CONSULTANT

SC11.1	2.2.5	<u>Delete</u> paragraph 2.2.4 and <u>replace</u> it with the following: “2.2.4 Upon receipt of an application for payment that satisfies the requirement of a <i>Proper Invoice</i> , based on the <i>Consultant's</i> observations and evaluation of the <i>Contractor's</i> application for payment, the <i>Consultant</i> will determine the amounts owing to the <i>Contractor</i> under the <i>Contract</i> and will issue certificates for payment as provided in Article A-5 - PAYMENT, GC 5.3 - PAYMENT, GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK, and GC 5.5 - FINAL PAYMENT. If the <i>Consultant</i> determines that the amount payable to the <i>Contractor</i> differs from the amount stated in a <i>Proper Invoice</i> , the <i>Consultant</i> shall notify the <i>Owner</i> as provided in GC 5.3.1.2 and prepare a draft of the applicable <i>Notice of Non-Payment</i> for the amount in dispute.”
SC11.2	2.2.6	In the first sentence of paragraph 2.2.6, <u>delete</u> the words “Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER”.
SC11.3	2.2.12	At paragraph 2.2.12, <u>insert</u> the following at end of that paragraph: “If, in the opinion of the <i>Contractor</i> , the <i>Supplemental Instruction</i> involves an adjustment in the <i>Contract Price</i> or in the <i>Contract Time</i> , it shall, within ten (10) <i>Working Days</i> of receipt of a <i>Supplemental Instruction</i> , provide the <i>Consultant</i> with a notice in writing to that effect. Failure to provide written notification within the time stipulated in this paragraph 2.2.12 shall be deemed an acceptance of the <i>Supplemental Instruction</i> by the <i>Contractor</i> , without any adjustment in the <i>Contract Price</i> or <i>Contract Time</i> .”

SC12 GC 2.3 REVIEW AND INSPECTION OF THE WORK

SC12.1	2.3.2	Amend paragraph 2.3.2 by <u>adding</u> the words “and <i>Owner</i> ” after the words “ <i>Consultant</i> ” in the second and third lines.
SC12.2	2.3.3	<u>Delete</u> paragraph 2.3.3 in its entirety and <u>replace</u> it with the following: “2.3.3 The <i>Contractor</i> shall furnish promptly two copies to the <i>Consultant</i> and one copy to the <i>Owner</i> of all certificates and inspection reports relating to the <i>Work</i> .”



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SC12.3	2.3.4	In paragraph 2.3.4 <u>add</u> the word “review” after the word “inspections” in the first and second lines of paragraph 2.3.4.
SC12.4	2.3.5	In paragraph 2.3.5 in the first line after the word “Consultant”, <u>add</u> “or the Owner”.
SC12.5	2.3.8	<u>Add</u> a new paragraph 2.3.8 as follows: “2.3.8 The <i>Consultant</i> will conduct periodic reviews of the <i>Work</i> in progress, to determine general conformance with the requirements of the <i>Contract Documents</i> . Such reviews, or lack thereof, shall not give rise to any claims by the <i>Contractor</i> in connection with construction means, methods, techniques, sequences and procedures, nor in connection with construction safety at the <i>Place of Work</i> , responsibility for which belongs exclusively to the <i>Contractor</i> .”

SC13 GC 2.4 DEFECTIVE WORK

SC13.1	2.4.1	<u>Amend</u> GC 2.4.1 by inserting “, the <i>Owner</i> and/or its agent” in the first sentence following “rejected by the <i>Consultant</i> ”.
SC13.2	2.4.1.1 to 2.4.1.2	<u>Add</u> new paragraphs 2.4.1.1 and 2.4.1.2 as follows: “2.4.1.1 The <i>Contractor</i> shall rectify, in a manner acceptable to the <i>Consultant</i> and to the <i>Owner through the Consultant</i> all defective work and deficiencies throughout the <i>Work</i> , whether or not they are specifically identified by the <i>Consultant</i> . 2.4.1.2 The <i>Contractor</i> shall prioritize the correction of any defective work, which, in the sole discretion of the <i>Owner through the Consultant</i> , adversely affects the day to day operations of the <i>Owner</i> or which, in the sole discretion of the <i>Consultant</i> , adversely affects the progress of the <i>Work</i> .”
SC13.3	2.4.2	<u>Delete</u> paragraph 2.4.2 in its entirety and <u>replace</u> it with the following: “2.4.2 The <i>Contractor</i> shall promptly pay the <i>Owner</i> for costs incurred by the <i>Owner</i> , the <i>Owner’s</i> own forces or the <i>Owner’s</i> other contractors, for work destroyed or damaged or any alterations necessitated by the <i>Contractor’s</i> removal, replacement or re-execution of defective work.”
SC13.4	2.4.4	<u>Add</u> new paragraph 2.4.4 as follows: “2.4.4 Neither acceptance of the <i>Work</i> by the <i>Consultant</i> or the <i>Owner</i> , nor any failure by the <i>Consultant</i> or the <i>Owner</i> to identify, observe or warn of defective <i>Work</i> or any deficiency in the <i>Work</i> shall relieve the <i>Contractor</i> from the sole responsibility for rectifying such defect or deficiency at the <i>Contractor’s</i> sole cost, even where such failure to identify, observe or warn is negligent.”

PART 3 EXECUTION OF THE WORK

SC14 GC 3.1 CONTROL OF THE WORK

SC14.1	3.1.2	Amend paragraph 3.1.2 by <u>inserting</u> the words “Construction Schedule” after the word “sequences”.
SC14.2	3.1.3 & 3.1.4	<u>Add</u> new paragraphs 3.1.3 and 3.1.4 as follows: “3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the <i>Contractor</i> shall verify at the <i>Place of the Work</i> , all relevant measurements and



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		levels necessary for proper and complete fabrication, assembly and installation of the <i>Work</i> and shall further carefully compare such field measurements and conditions with the requirements of the <i>Contract Documents</i>. Where dimensions are not included or exact locations are not apparent, the <i>Contractor</i> shall immediately notify the <i>Consultant</i> in writing and obtain written instructions from the <i>Consultant</i> before proceedings with any part of the affected <i>Work</i>. 3.1.4 Notwithstanding the provisions of paragraphs 3.1.1 and 3.1.2, the <i>Owner</i> shall have access to the site at all times to monitor all aspects of construction. Such access shall in no circumstances affect the obligations of the <i>Contractor</i> to fulfill its contractual obligations.”

SC15 GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

SC15.1	3.2.2.1	<u>Delete</u> subparagraph 3.2.2.1 and <u>replace</u> it with “[Intentionally left blank]”.
SC15.2	3.2.3.2	<u>Delete</u> subparagraph 3.2.3.2 and <u>replace</u> it with the following: “.2 co-ordinate and schedule the activities and work of other contractors and the <i>Owner’s</i> own forces, including where other contractors or the <i>Owner’s</i> own forces are used after the <i>Owner</i> and the <i>Contractor</i> cannot reach agreement on the value of a change, with the <i>Work</i> of the <i>Contractor</i> and connect as specified or shown in the <i>Contract Documents</i>.”
SC15.3	3.2.3.4	<u>Delete</u> the period at the end of subparagraph 3.2.3.4 and <u>replace</u> it with a semi-colon.
SC15.4	3.2.3.5	<u>Add</u> new subparagraph 3.2.3.5 as follows: “.5 Subject to GC 9.4 CONSTRUCTION SAFETY, for the <i>Owner’s</i> own forces and for other contractors, assume overall responsibility for compliance with all aspects of the applicable health and safety legislation in force at the <i>Place of the Work</i>, including all of the responsibilities of the “constructor”, pursuant to the <i>OHSA</i>.”

SC16 GC 3.3 TEMPORARY WORK

SC16.1	3.3.2	In paragraph 3.3.2, in the second line after the words “where required by law”, insert “or by the <i>Consultant</i> ”.

SC17 GC 3.4 CONSTRUCTION SCHEDULE

SC17.1	3.4.1	<u>Delete</u> GC 3.4.1 in its entirety and <u>replace</u> it with the following: “3.4.1 The <i>Contractor</i> shall: 1 within five (5) calendar days of receiving written confirmation of the award of the <i>Contract</i>, prepare and submit to the <i>Owner</i> and the <i>Consultant</i> for their review and approval, a construction schedule in the format indicated below that indicates the timing of the activities of the <i>Work</i> and provides sufficient detail of the critical events and their inter-relationship to demonstrate the <i>Work</i> will be performed in conformity with the <i>Contract Time</i> and in accordance with the <i>Contract Documents</i>. Such schedule is to include a delivery schedule for <i>Products</i> whose delivery is critical to the schedule for the <i>Work</i> or are required by the <i>Contract</i> to be included in a <i>Products</i> delivery schedule. The <i>Contractor</i> shall employ construction scheduling software, being the latest version of “Microsoft Project”, that permits the progress of the <i>Work</i> to be monitored in relation to the critical path established in the schedule. The <i>Contractor</i> shall provide such schedule and any successor or revised schedules in



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		both original digital file format (e.g., .mpp format for Microsoft Project), portable data file (PDF) format, and hard copy. Once accepted by the <i>Owner</i> and the <i>Consultant</i>, the construction schedule submitted by the <i>Contractor</i> shall become the baseline “Construction Schedule”; .2 provide the expertise and resources, such resources including manpower and equipment, as are necessary on a best efforts basis to maintain progress under the accepted baseline <i>Construction Schedule</i> or revised construction schedule accepted by the <i>Owner</i> pursuant to GC 3.4 CONSTRUCTION SCHEDULE, which includes without limitation, the <i>Contractor</i>’s use of all possible and, if necessary, extraordinary measures, to bring the progress of the <i>Work</i> into compliance with the <i>Construction Schedule</i>, such as (i) increasing the presence of its own forces at the <i>Place of the Work</i>; (ii) directing any <i>Subcontractors</i> or <i>Suppliers</i> to increase their labour forces and equipment; (iii) working overtime and extra shifts; and (iv) providing any additional supervision and coordination of the <i>Project</i>, all at the <i>Contractor</i>’s own cost and expense save and except where GC 6.5.1, 6.5.2, or 6.5.3 apply; and, .3 monitor the progress of the <i>Work</i> on a weekly basis relative to the baseline <i>Construction Schedule</i>, or any revised <i>Construction Schedule</i> accepted by the <i>Owner</i> pursuant to GC 3.4 CONSTRUCTION SCHEDULE, deliver a <i>Construction Schedule Update</i> to the <i>Consultant</i> and <i>Owner</i> with each application for payment, at a minimum, or as may be reasonably required by the <i>Consultant</i> and advise the <i>Consultant</i> and the <i>Owner</i> weekly in writing of any variation from the baseline or slippage in the schedule; and, .4 if after applying the expertise and resources required under paragraph 3.4.1.2, the <i>Contractor</i> forms the opinion that the slippage in schedule reported in paragraph 3.4.1.3 cannot be recovered by the <i>Contractor</i>, it shall, in the same notice provided under paragraph 3.4.1.3, indicate to the <i>Consultant</i> if the <i>Contractor</i> intends to apply for an extension of <i>Contract Time</i> as provided in PART 6 —CHANGES IN THE WORK; and, .5 ensure that the <i>Contract Price</i> shall include all costs required to phase or stage the <i>Work</i>.”
SC17.2	3.4.2	<u>Add</u> new GC 3.4.2 and GC 3.4.3 as follows: “3.4.2 If, at any time, it should appear to the <i>Owner</i> or the <i>Consultant</i> that the actual progress of the <i>Work</i> is behind schedule or is likely to become behind schedule, or if the <i>Contractor</i> has given notice of such to the <i>Owner</i> or the <i>Consultant</i> pursuant to GC 3.4.1.3, the <i>Contractor</i> shall, either at the request of the <i>Owner</i> or the <i>Consultant</i>, or following giving notice pursuant to GC 3.4.1.3, take appropriate steps to cause the actual progress of the <i>Work</i> to conform to the schedule or minimize the resulting delay. Within 5 calendar days of the request by the <i>Owner</i> or the <i>Consultant</i> or the notice being given pursuant to GC 3.4.1.3, the <i>Contractor</i> shall produce and present to the <i>Owner</i> and the <i>Consultant</i> a plan demonstrating how the <i>Contractor</i> will recover the performance of the <i>Work</i> to align with the currently approved <i>Construction Schedule</i>. 3.4.3 The <i>Contractor</i> shall not amend the <i>Construction Schedule</i> without the prior written consent of the <i>Owner</i>.. Any revisions to the <i>Construction Schedule</i> approved by the <i>Owner</i> shall not be deemed to be an extension of the <i>Contract Time</i>. All requests by the <i>Contractor</i> for a revision to the <i>Construction Schedule</i> that include an extension to the <i>Contract Time</i> must be approved by the <i>Owner</i> through an executed <i>Change Order</i>.”

SC18 GC 3.5 SUPERVISION

SC18.1	3.5.1	<u>Delete</u> GC 3.5.1 and <u>replace</u> it with the following:



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		“3.5.1 The <i>Contractor</i> shall employ a competent full-time superintendent, acceptable to the <i>Owner</i> and <i>Consultant</i>, who shall be in full time attendance at the <i>Place of the Work</i> while the <i>Work</i> is being performed. The superintendent shall not be changed by the <i>Contractor</i> without valid reason which shall be provided in writing and shall not be changed without prior consultation with and agreement by the <i>Owner</i> and the <i>Consultant</i>. The <i>Contractor</i> shall replace the superintendent within 7 <i>Working Days</i> of the <i>Owner's</i> written notification, if the superintendent's performance is not acceptable to the <i>Owner</i>. The <i>Contractor</i> shall provide the <i>Owner</i> and the <i>Consultant</i> with the names, addresses and telephone numbers of the superintendent referred to in this GC 3.5.1 and other responsible persons who may be contacted for emergency and other reasons during non-working hours. .”
SC18.2	3.5.2	<u>Delete</u> GC 3.5.2 and <u>replace</u> it with the following: “3.5.2 The superintendent, and any project manager appointed by the <i>Contractor</i>, shall represent the <i>Contractor</i> at the <i>Place of the Work</i> and shall have full authority to act on written instructions given by the <i>Consultant</i> and/or the <i>Owner</i>. Instructions given to the superintendent or the project manager shall be deemed to have been given to the <i>Contractor</i> and both the superintendent and any project manager shall have full authority to act on behalf of the <i>Contractor</i> and bind the <i>Contractor</i> in matters related to the <i>Contract</i>.”
SC18.3	3.5.3 to 3.5.6	<u>Add</u> new GC 3.5.3, 3.5.4, 3.5.5 and 3.5.6 as follows: “3.5.3 The <i>Owner</i> may, at any time during the course of the <i>Work</i>, request the replacement of the appointed representative(s). Immediately upon receipt of the request, the <i>Contractor</i> shall make arrangements to appoint an acceptable replacement, which is approved by the <i>Owner</i>. 3.5.4 The supervisory staff assigned to the <i>Project</i> shall also be fully competent to implement efficiently all requirements for scheduling, coordination, field engineering, reviews, inspections and submittals defined in the <i>Specifications</i>, and have a minimum 5 years documented “Superintendent/Project Management” experience. 3.5.5 The <i>Consultant and Owner</i> shall reserve the right to review the record of experience and credentials of supervisory staff assigned to the <i>Project</i> prior to commencement of the <i>Work</i>. 3.5.6 A superintendent assigned to the <i>Work</i> shall be “Gold Seal Certified” as per the Canadian Construction Association; or a superintendent that can demonstrate the requisite experience and success related to the <i>Project</i> to the sole satisfaction of the <i>Owner</i>.”

SC19 GC 3.6 SUBCONTRACTORS AND SUPPLIERS

SC19.1	3.6.1.1	In paragraph 3.6.1.1 <u>add</u> to the end of the second line the words “including any warranties and service agreements which extend beyond the term of the <i>Contract</i> .”
SC19.2	3.6.1.2	In subparagraph 3.6.1.2 after the words “the <i>Contract Documents</i> ” <u>add</u> the words “including any required surety bonding”.
SC19.3	3.6.2	<u>Delete</u> paragraph 3.6.2. in its entirety and <u>replace</u> it with the following: “3.6.2 The substitution of any <i>Subcontractor</i> and/or <i>Suppliers</i> after submission of the <i>Contractor's</i> bid will not be accepted unless a valid reason is given in writing to and approved by the <i>Owner</i>, whose approval may be arbitrarily withheld. The reason for substitution must be provided to the <i>Owner</i> and to the original <i>Subcontractor</i> and/or <i>Supplier</i> and the <i>Subcontractor</i> and/or <i>Supplier</i> shall be given the opportunity to reply



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		to the <i>Contractor</i> and <i>Owner</i> . The <i>Contractor</i> shall be fully aware of the capability of each <i>Subcontractor</i> and/or <i>Supplier</i> included in its bid, including but not limited to technical ability, financial stability and ability to maintain the proposed construction schedule.”
SC19.4	3.6.7, 3.6.8, 3.6.9 & 3.6.10	<u>Add</u> new paragraphs 3.6.7, 3.6.8, 3.6.9, and 3.6.10 as follows: “3.6.7 The <i>Contractor</i> represents and warrants that it has confirmed the availability of its <i>Subcontractors</i> for the <i>Project</i> and, in particular, for the performance of their respective portions of the <i>Work</i> to ensure completion of the <i>Project</i> within the <i>Contract Price</i> and the <i>Contract Time</i>. 3.6.8 The <i>Consultant</i> or the <i>Owner</i>, acting reasonably, may from time to time require the <i>Contractor</i> to remove from the <i>Project</i> any personnel of the <i>Contractor</i>, including project managers, superintendents or <i>Subcontractors</i>. Such persons shall be replaced by the <i>Contractor</i> in a timely fashion to the satisfaction of the <i>Consultant</i> or the <i>Owner</i>, as the case may be, at no cost to the <i>Owner</i>. 3.6.9 Where provided in the <i>Contract</i>, the <i>Owner</i> may assign to the <i>Contractor</i>, and the <i>Contractor</i> agrees to accept, any contract procured by the <i>Owner</i> for <i>Work</i> or services required on the <i>Project</i> that has been pre-tendered or pre-negotiated by the <i>Owner</i>, and upon such assignment, the <i>Owner</i> shall have no further liability to any party for such contract. 3.6.10 The <i>Contractor</i> covenants that each subcontract or supply contract which the <i>Contractor</i> enters into for the purpose of performing the <i>Work</i> shall expressly provide for the assignment thereof to the <i>Owner</i> (at the option of the <i>Owner</i>) and the assumption by the <i>Owner</i> of the obligations of the <i>Contractor</i> thereunder, upon the termination of the <i>Contract</i> and upon written notice by the <i>Owner</i> to the other parties to such subcontracts or supply contracts, without the imposition of further terms or conditions; provided, however, that until the <i>Owner</i> has given such notice, nothing herein contained shall be deemed to create any contractual or other liability upon the <i>Owner</i> for the performance of obligations under such subcontracts or supply contracts and the <i>Contractor</i> shall be fully responsible for all of its obligations and liabilities (if any) under such subcontracts and supply contracts.”

SC20 GC 3.7 LABOUR AND PRODUCTS

SC20.1	3.7.1	<u>Amend</u> paragraph 3.7.1 by <u>adding</u> the words, “..., agents, <i>Subcontractors</i> and <i>Suppliers</i> ...” after the word “employees” in the first line.
SC20.2	3.7.2	<u>Delete</u> paragraph 3.7.2 and <u>substitute</u> with the following: “3.7.2 <i>Products</i> provided shall be new and shall conform to all current applicable specifications of the Canadian Standards Association, Canadian Standards Board or General Standards Board, ASTM, National Building Code, provincial and municipal building codes, fire safety standards, and all governmental authorities and regulatory agencies having jurisdiction at the <i>Place of the Work</i>, unless otherwise specified. <i>Products</i> which are not specified shall be of a quality consistent with those specified and their use acceptable to the <i>Consultant</i>. <i>Products</i> brought on to the <i>Place of the Work</i> by the <i>Contractor</i> shall be deemed to be the property of the <i>Owner</i>, but the <i>Owner</i> shall be under no liability for loss thereof or damage thereto arising from any cause whatsoever. The said <i>Products</i> shall be at the sole risk of the <i>Contractor</i>. Workmanship shall be, in every respect, first class and the <i>Work</i> shall be performed in accordance with the best modern industry practice.”
SC20.3	3.7.4 to 3.7.8	<u>Add</u> new paragraphs 3.7.4, 3.7.5, 3.7.6, 3.7.7, and 3.7.8 as follows:



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		“3.7.4 Upon receipt of a <i>Notice in Writing</i> from the <i>Owner</i>, the <i>Contractor</i> shall immediately remove from the <i>Place of the Work</i>, tradesmen and labourers or anyone whose conduct jeopardizes the safety of the <i>Owner's</i> operations or who are considered by the <i>Owner</i> or the <i>Consultant</i> to be unskilled or otherwise objectionable. Immediately upon receipt of the request, the <i>Contractor</i> shall make arrangements to appoint an acceptable replacement. 3.7.5 The <i>Contractor</i> shall cooperate with the <i>Owner</i> and its representatives and shall take all reasonable and necessary actions to maintain stable and harmonious labour relations with respect to the <i>Work</i> at the <i>Place of the Work</i>, including cooperation to attempt to avoid <i>Work</i> stoppages, trade union jurisdictional disputes and other <i>Labour Disputes</i>. Any costs arising from labour disputes shall be at the sole expense of the <i>Contractor</i>. 3.7.6 The cost for overtime required beyond the normal <i>Working Day</i> to complete individual construction operations of a continuous nature, such as pouring or finishing of concrete or similar work, or <i>Work</i> that the <i>Contractor</i> elects to perform at overtime rates without the <i>Owner</i> requesting it, shall not be chargeable to the <i>Owner</i>. 3.7.7 All manufactured <i>Products</i> which are identified by their proprietary names or by part or catalogue number in the <i>Specifications</i> shall be used by the <i>Contractor</i>. No substitutes for such specified <i>Products</i> shall be used without the written approval of the <i>Owner</i> and the <i>Consultant</i>. Substitutes will only be considered by the <i>Consultant</i> when submitted in sufficient time to permit proper review and investigation. When requesting approval for the use of substitutes, the <i>Contractor</i> shall include in its submission any proposed change in the <i>Contract Price</i>. The <i>Contractor</i> shall use all proprietary <i>Products</i> in strict accordance with the manufacturer's directions. Where there is a choice of proprietary <i>Products</i> specified for one use, the <i>Contractor</i> may select any one of the <i>Products</i> so specified for this use. 3.7.8 Materials, appliances, equipment and other <i>Products</i> are sometimes specified by reference to brand names, proprietary names, trademarks or symbols. In such cases, the name of a manufacturer, distributor, <i>Supplier</i> or dealer is sometimes given to assist the <i>Contractor</i> to find a source <i>Supplier</i>. This shall not relieve the <i>Contractor</i> from its responsibility from finding its own source of supply even if the source names no longer supplies the <i>Product</i> specified. If the <i>Contractor</i> is unable to obtain the specified <i>Product</i>, the <i>Contractor</i> shall supply a substitute product equal to or better than the specified <i>Product</i>, as approved by the <i>Consultant</i> with no extra compensation. Should the <i>Contractor</i> be unable to obtain a substitute <i>Product</i> equal to or superior to the specified <i>Product</i> and the <i>Owner</i> accepts a different <i>Product</i>, the <i>Contract Price</i> shall be adjusted accordingly, as approved by the <i>Consultant</i>.”

SC21 GC 3.8 SHOP DRAWINGS

SC21.1	3.8.1	<u>Delete</u> paragraph 3.8.1 in its entirety and <u>replace</u> with the following: “3.8.1 The <i>Contractor</i> shall provide shop drawings as described in the <i>Contract Documents</i> and as the <i>Consultant</i> may reasonably request.”
SC21.2	3.8.3	<u>Delete</u> paragraph 3.8.3 and <u>replace</u> it with the following: “3.8.3 The <i>Contractor</i> shall prepare a <i>Shop Drawings</i> schedule acceptable to the <i>Owner</i> and the <i>Consultant</i> prior to the first application for payment. A draft of the proposed <i>Shop Drawings</i> schedule shall be submitted by the <i>Contractor</i> to the <i>Consultant</i> and the <i>Owner</i> for approval. The draft <i>Shop Drawings</i> schedule shall clearly indicate the phasing of <i>Shop Drawings</i> submissions. The <i>Contractor</i> shall



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		periodically re-submit the <i>Shop Drawings</i> schedule to correspond to changes in the <i>Construction Schedule</i> ."
SC21.3	3.8.5	<u>Delete</u> paragraph 3.8.5 in its entirety and <u>substitute</u> the following: "3.8.5 At the time of providing <i>Shop Drawings</i> , the <i>Contractor</i> shall advise the <i>Consultant</i> in writing of any deviations in <i>Shop Drawings</i> from the requirements of the <i>Contract Documents</i> . The <i>Consultant</i> shall indicate the acceptance of such deviation expressly in writing. Where manufacturers' literature is submitted in lieu of scaled drawings, it shall be clearly marked in ink, to indicate the specific items for which review is requested."
SC21.4	3.8.8 to 3.8.12	<u>Add</u> new paragraphs 3.8.8, 3.8.9, 3.8.10, 3.8.11, and 3.8.12 as follows: "3.8.8 Reviewed <i>Shop Drawings</i> shall not authorize a change in the <i>Contract Price</i> and/or the <i>Contract Time</i> . 3.8.9 Except where the parties have agreed to a different <i>Shop Drawings</i> schedule pursuant to paragraph 3.10.3, the <i>Contractor</i> shall comply with the requirements for <i>Shop Drawings</i> submissions stated in the <i>Specifications</i> . 3.8.10 The <i>Contractor</i> shall not use the term "by others" on <i>Shop Drawings</i> or other submittals. The related trade, <i>Subcontractor</i> or <i>Supplier</i> shall be stated. 3.8.11 Certain <i>Specifications</i> sections require the <i>Shop Drawings</i> to bear the seal and signature of a professional engineer. Such professional engineer must be registered in the jurisdiction of the <i>Place of the Work</i> and shall have expertise in the area of practice reflected in the <i>Shop Drawings</i> . 3.8.12 The <i>Consultant</i> will review and return <i>Shop Drawings</i> and submittals in accordance with the schedule agreed upon in paragraph 3.10.3, The <i>Contractor</i> shall allow the <i>Consultant</i> a minimum of 10 <i>Working Days</i> to review <i>Shop Drawings</i> from the date of receipt. If resubmission of <i>Shop Drawings</i> is required, a further 10 <i>Working Day</i> period is required for the <i>Consultant's</i> review."

SC22 *NEW* GC 3.9 USE OF THE WORK

SC22.1	GC 3.9	<u>Add</u> new GC 3.9 – USE OF THE WORK as follows: "GC 3.9 USE OF THE WORK 3.9.1 The <i>Contractor</i> shall confine <i>Construction Equipment</i> , <i>Temporary Work</i> , storage of <i>Products</i> , waste products and debris, and operations of employees and <i>Subcontractors</i> to limits indicated by laws, ordinances, permits, by the direction of the <i>Owner</i> or the <i>Consultant</i> , or the <i>Contract Documents</i> and shall not unreasonably encumber the <i>Place of the Work</i> . 3.9.2 The <i>Contractor</i> shall not load or permit to be loaded any part of the <i>Work</i> with a weight or force that will endanger the safety of the <i>Work</i> . 3.9.3 The <i>Owner</i> shall have the right to enter or occupy the <i>Place of the Work</i> in whole or in part for the purpose of placing fittings and equipment, or for other use before <i>Substantial Performance of the Work</i> , if, in the opinion of the <i>Consultant</i> , such entry and occupation does not prevent or substantially interfere with the <i>Contractor</i> in the performance of the <i>Contract</i> within the <i>Contract Time</i> . Such entry or occupation shall neither be considered as acceptance of the <i>Work</i> or in any way relieves the <i>Contractor</i> from its responsibility to complete the <i>Contract</i> ."



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SC23 *NEW* GC 3.10 CUTTING AND REMEDIAL WORK

SC23.1	GC 3.10	<u>Add</u> new GC 3.10 – CUTTING AND REMEDIAL WORK as follows: “GC 3.10 CUTTING AND REMEDIAL WORK 3.10.1 The <i>Contractor</i> shall perform the cutting and remedial work required to make the affected parts of the <i>Work</i> come together properly. Such cutting and remedial work shall be performed by specialists familiar with the <i>Products</i> affected and shall be performed in a manner to neither damage nor endanger the <i>Work</i>. 3.10.2 The <i>Contractor</i> shall coordinate the <i>Work</i> to ensure all cutting and remedial work required is kept to a minimum. 3.10.3 Unless specifically stated otherwise in the <i>Specifications</i>, the <i>Contractor</i> shall do all cutting and making good necessary for the proper installation and performance of the <i>Work</i>. 3.10.4 To avoid unnecessary cutting, the <i>Contractor</i> shall lay out its work and advise the <i>Subcontractors</i>, when necessary, where to leave holes for installation of pipes and other work.”

SC24 *NEW* GC 3.11 CLEAN UP

SC24.1	3.11.1, 3.11.2, 3.11.3, 3.11.4, 3.11.5 & 3.11.6	Add new paragraphs 3.11.1, 3.11.2, 3.11.3, 3.11.4, 3.11.5, and 3.11.6 as follows: “3.11.1 The <i>Contractor</i> shall maintain the <i>Work</i> in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the <i>Owner</i>, other contractors or their employees. The <i>Contractor</i> shall remove accumulated waste and debris at least once a week as a minimum or as required by the nature of the <i>Work</i>. 3.11.2 Before applying for <i>Substantial Performance of the Work</i>, the <i>Contractor</i> shall remove waste products and debris, other than that resulting from the work of the <i>Owner</i>, other contractors or their employees, and shall leave the <i>Place of the Work</i> clean and suitable for use or occupancy by the <i>Owner</i>. The <i>Contractor</i> shall remove products, tools, materials, <i>Construction Equipment</i>, and <i>Temporary Work</i> not required for the performance of the remaining work. 3.11.3 As a condition precedent to submitting its application for final payment, the <i>Contractor</i> shall remove any remaining products, tools, materials, <i>Construction Equipment</i>, <i>Temporary Work</i>, and waste products and debris, other than those resulting from the work of the <i>Owner</i>, other contractors or their employees. 3.11.4 The <i>Contractor</i> shall clean up garbage during and after construction and maintain the <i>Place of the Work</i> in a neat and orderly condition on a daily basis. Prior to leaving the <i>Place of the Work</i> and following completion of the <i>Work</i>, the <i>Contractor</i> shall make good all damage to the building and its components caused by the performance of the <i>Work</i> or by any <i>Subcontractor</i> or <i>Supplier</i>. The <i>Contractor</i> shall leave the <i>Place of the Work</i> in a clean and finished state; remove all <i>Construction Equipment</i> and materials; remove all paint, stains, labels, dirt, etc. from the <i>Place of the Work</i>; and touch up all damaged painted areas (if applicable). The <i>Contractor</i> shall be responsible for restoring those areas of the <i>Place of the Work</i>, impacted by the <i>Work</i>, to their original condition.”



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		3.11.5 Without limitation to or waiver of the <i>Owner's</i> other rights and remedies, the <i>Owner</i> shall have the right to back charge to the <i>Contractor</i> the cost of damage to the site caused by transportation in and out of the <i>Place of the Work</i> by the <i>Contractor</i>, <i>Subcontractors</i> or <i>Suppliers</i>, if not repaired before final payment. 3.11.6 The <i>Contractor</i> shall dispose of debris at a location and in a manner acceptable to the <i>Owner</i> (and to the authorities having jurisdiction at the <i>Place of the Work</i> and at the disposal area) and the <i>Contractor</i> shall cover containers with tarpaulins."

SC25 *NEW* GC 3.12 EXCESS SOIL MANAGEMENT

SC25.1	GC 3.12	<u>Add</u> new GC 3.12 – EXCESS SOIL MANAGEMENT as follows: "GC 3.12 EXCESS SOIL MANAGEMENT 3.12.1 The <i>Contractor</i> shall be solely responsible for the proper management of all <i>Excess Soil</i> at the <i>Place of the Work</i> and for performance of the <i>Work</i> in compliance with the rules, regulations and practices required by the <i>Excess Soil Regulation</i> until such time as <i>Ready-for-Takeover</i> is achieved. Without restricting the generality of the previous sentence, the <i>Contractor's</i> responsibility under this GC 3.12 includes the designation, transportation, tracking, temporary and/or final placement, record keeping, and reporting of all <i>Excess Soil</i> in connection with the <i>Work</i> all in compliance with the <i>Excess Soil Regulation</i>. 3.12.3 The <i>Contractor</i> shall indemnify and save harmless the <i>Owner</i>, their agents, officers, directors, administrators, employees, consultants, successors and assigns from and against the consequences of any and all health and safety infractions committed directly by the <i>Contractor</i>, or those for whom it is responsible at law, under the <i>Excess Soil Regulation</i>, or any environmental protection legislation, including the payment of legal fees and disbursements on a substantial indemnity basis. Such indemnity shall apply to the extent to which the <i>Owner</i> is not covered by insurance."

SC26 *NEW* GC 3.13 CONTRACTOR STANDARD OF CARE

SC26.1	3.13	<u>Add</u> a new GC 3.13 – CONTRACTOR STANDARD OF CARE as follows: "GC 3.13 CONTRACTOR STANDARD OF CARE 3.13.1 In performing its services and obligations under the <i>Contract</i>, the <i>Contractor</i> shall exercise the standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The <i>Contractor</i> acknowledges and agrees that throughout the <i>Contract</i>, the performance of the <i>Contractor's</i> obligations, duties and responsibilities shall be interpreted in accordance with this standard. The <i>Contractor</i> shall exercise the same standard of care, skill and diligence in respect of any <i>Products</i>, personnel or procedures which it may recommend to the <i>Owner</i> or employ on the <i>Project</i>. 3.13.2 The <i>Contractor</i> further represents, covenants and warrants to the <i>Owner</i> that: .1 the personnel it assigns to the <i>Project</i> are appropriately experienced; .2 it has a sufficient staff of qualified and competent personnel to replace any of its appointed representatives, subject to the <i>Owner's</i> approval, in the event of death, incapacity, removal or resignation; and



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		.3 there are no pending, threatened or anticipated claims, liabilities or contingent liabilities that would have a material effect on the financial ability of the <i>Contractor</i> to perform its work under the <i>Contract</i> ."

PART 4 ALLOWANCES

SC27 GC 4.1 CASH ALLOWANCES

SC27.1	4.1.3	In GC 4.1.3 <u>delete</u> the words "through the <i>Consultant</i> " and <u>replace</u> them with "in writing."
SC27.2	4.1.4	<u>Delete</u> GC 4.1.4 in its entirety and <u>replace</u> it with the following: "4.1.4 Where the actual cost of the <i>Work</i> under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, by the <i>Consultant</i> at the <i>Owner's</i> direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the <i>Contract Price</i> for overhead and profit. Only where the actual cost of the <i>Work</i> under all cash allowances exceeds the total amount of all cash allowances shall the <i>Contractor</i> be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in the <i>Contract Documents</i> ."
SC27.3	4.1.7	<u>Delete</u> GC 4.1.7 in its entirety and <u>replace</u> it with the following: "4.1.7 The net amount of any unexpended cash allowances, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the <i>Contract Price</i> by <i>Change Order</i> without any adjustment for the <i>Contractor's</i> overhead and profit on such amount."
SC27.4	4.1.8 and 4.1.9	<u>Add</u> new GC 4.1.8 and 4.1.9 as follows: "4.1.8 The <i>Owner</i> reserves the right to call, or to have the <i>Contractor</i> call, for competitive bids for portions of the <i>Work</i> to be paid for from cash allowances. 4.1.9 Cash allowances cover the net cost to the <i>Contractor</i> of services, <i>Products</i> , <i>Construction Equipment</i> , freight, unloading, handling, storage, installation, provincial sales tax, and other authorized expenses incurred in performing any <i>Work</i> stipulated under the cash allowances but does not include any <i>Value Added Taxes</i> payable by the <i>Owner</i> and the <i>Contractor</i> ."

PART 5 PAYMENT

SC28 GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

SC28.1	5.1	<u>Delete</u> GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER and all paragraphs thereunder, including any reference to GC 5.1 throughout the <i>Contract</i> .

SC29 GC 5.2 APPLICATIONS FOR PAYMENT

SC29.1	5.2.1	<u>Delete</u> GC 5.2.1 and <u>replace</u> it with the following: "5.2.1 Upon execution of the <i>Contract</i> , and in any event prior to the <i>Contractor</i> submitting its first application for payment, the <i>Owner</i> shall issue a purchase order to the <i>Contractor</i> for the performance of the <i>Contract</i> . The number indicated on such purchase order must be clearly identifiable on all applications for payment."



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		Applications for payment shall be dated the last day of each month or an alternative day of each month agreed to in writing by the parties, with each month representing one payment period under the <i>Contract</i> (each a "Payment Period"). Within 3 calendar days of the end of each <i>Payment Period</i>, the <i>Contractor</i> will submit a draft application for payment to the <i>Owner</i> and the <i>Consultant</i>. Upon receipt of the draft application for payment, and within 7 calendar days, a representative of each of the <i>Contractor</i>, <i>Owner</i>, and the <i>Consultant</i> shall attend a meeting to discuss and review the work completed during the <i>Payment Period</i>, including quantities, if applicable (the "Pre-Invoice Submission Meeting"). In the event that the scheduled date for the <i>Pre-Invoice Submission Meeting</i> is not a <i>Working Day</i>, the <i>Pre-Invoice Submission Meeting</i> shall occur on the next <i>Working Day</i>. The <i>Contractor</i> shall bring with it to the <i>Pre-Invoice Submission Meeting</i> the following: .1 a copy of the draft application for payment; .2 any documents the <i>Contractor</i> is required to bring to the <i>Pre-Invoice Submission Meeting</i> as stipulated in the <i>Contract Documents</i> or as reasonably requested by the <i>Owner</i>; and .3 any other documents reasonably requested, in advance, by the <i>Owner</i> or the <i>Consultant</i>."
SC29.2	5.2.2	<u>Delete</u> GC 5.2.2 in its entirety and <u>replace</u> it with the following: "5.2.2 Applications for payment shall be given in accordance with the following requirements: .1 Within 5 calendar days following the <i>Pre-Invoice Submission Meeting</i>, the <i>Contractor</i> shall deliver its application for payment to the <i>Owner</i> and to the <i>Consultant</i> for <i>Work</i> performed during the <i>Payment Period</i> ("Proper Invoice Submission Date") subject to the following: .1 if the fifth calendar day following the <i>Pre-Invoice Submission Meeting</i>, to which an invoice relates falls on a day that is not a <i>Working Day</i>, the <i>Proper Invoice Submission Date</i> shall be deemed to fall on the next <i>Working Day</i>. .2 The application for payment must be delivered to the <i>Owner/WCDSB Lead</i> and to the <i>Consultant</i> in the same manner as a <i>Notice in Writing</i> during the hours of 9:00 am to 4:00pm (EST) on the <i>Proper Invoice Submission Date</i>. Delivery to the <i>Owner</i> shall be to the following email address: .3 If an application for payment is received after 4:00 p.m. (EST) on the applicable <i>Proper Invoice Submission Date</i>, the application for payment will not be considered or reviewed by the <i>Owner</i> and <i>Consultant</i> until the next <i>Proper Invoice Submission Date</i>. Notwithstanding the foregoing, the <i>Owner</i> in its sole and absolute discretion may elect to accept an application for payment submitted after 4:00 p.m. on the applicable <i>Proper Invoice Submission Date</i>; however, such acceptance shall not be construed as a waiver of any of its rights or waive or release the <i>Contractor's</i> obligations to strictly comply with the requirements prescribed in this subparagraph 5.2.2.3. .4 No applications for payment shall be accepted by the <i>Owner</i> prior to the <i>Proper Invoice Submission Date</i>. .5 All applications for payment shall include all of the requirements for a <i>Proper Invoice</i> prescribed by the <i>Construction Act</i> and this <i>Contract</i> and be dated the last day of the applicable <i>Payment Period</i>;"



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SC29.3	5.2.3	<u>Delete</u> GC 5.2.3 and <u>replace</u> it with the following: “5.2.3 The amount claimed shall be for the value, proportionate to the amount of the <i>Contract</i>, of <i>Work</i> performed and <i>Products</i> delivered and incorporated into the <i>Work</i> as of the last date of the applicable <i>Payment Period</i>. Materials may also be deemed to be supplied to an improvement, for payment purposes, when, in the <i>Owner’s</i> opinion, they are placed and properly secured on the land on which the improvement is made, or placed upon land designated by the <i>Owner</i> or agent of the <i>Owner</i>, but placing the materials on the land so designated does not, of itself, make that land subject to a lien. No amount claimed shall include products delivered and incorporated into the work, unless the products are free and clear of all security interests, liens and other claims of third parties. No amount claimed shall include <i>Products</i> delivered to the <i>Place of the Work</i> unless the <i>Products</i> are free and clear of all security interests, liens, and other claims of third parties.”
SC29.4	5.2.4	After the word “ <i>Consultant</i> ” in GC 5.2.4 <u>add</u> the words “and the <i>Owner</i> ”
SC29.5	5.2.5	After the word “ <i>Consultant</i> ” in GC 5.2.5 <u>add</u> the words “or the <i>Owner</i> ”.
SC29.6	5.2.6	In GC 5.2.6, <u>delete</u> the word “ <i>Consultant</i> ” and <u>replace</u> it with “ <i>Owner</i> ”.
SC29.7	5.2.9	<u>Add</u> new 5.2.9 as follows: “5.2.9 The <i>Contractor</i> shall prepare and maintain current as-built drawings which shall consist of the <i>Drawings</i> and <i>Specifications</i> revised by the <i>Contractor</i> during the <i>Work</i>, showing changes to the <i>Drawings</i> and <i>Specifications</i>, which current as-built drawings shall be maintained by the <i>Contractor</i> and made available to the <i>Consultant</i> for review with each application for progress payment. The <i>Consultant</i> shall recommend to the <i>Owner</i> that the <i>Owner</i> retain a reasonable amount for the value of the as-built drawings not presented for review.”

SC30 GC 5.3 PAYMENT

SC30.1	5.3.1	<u>Delete</u> GC 5.3.1 in its entirety, including all subparagraphs thereunder, and <u>replace</u> it with the following: “5.3.1 After receipt by the <i>Owner</i> and the <i>Consultant</i> of an application for payment submitted by the <i>Contractor</i> in accordance with GC 5.2 - APPLICATIONS FOR PAYMENT: .1 the <i>Consultant</i> will either: (a) issue to the <i>Owner</i> with a copy to the <i>Contractor</i>, a progress payment certificate in the amount applied for by the <i>Contractor</i> in the <i>Proper Invoice</i>, or (b) issue to the <i>Owner</i>, with a copy to the <i>Contractor</i>, a certificate for payment for an amount determined by the <i>Consultant</i> to be properly due to the <i>Contractor</i> after applying any credits, withheld amounts, or other set-offs which the <i>Consultant</i> has determined that the <i>Owner</i> is entitled to notwithstanding any notice of dispute or disagreement that the <i>Contractor</i> may have served, along with the <i>Consultant’s</i> reasons why an amount other than what is claimed in the <i>Proper Invoice</i> is properly due to the <i>Contractor</i>, which finding the <i>Owner</i> may accept or amend prior to the <i>Owner</i> issuing a <i>Notice of Non-Payment</i>, if any, in accordance with GC 5.3.2;



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		.2 the <i>Owner</i> shall make payment to the <i>Contractor</i> on account as provided in Article A-5 PAYMENT, (a) in the amount stated in the certificate for payment, or (b) in the amount stated in the certificate for payment less such amount stated in the <i>Owner's Notice of Non-Payment</i> issued pursuant to GC 5.3.3, on the 28th calendar day after receipt of a <i>Proper Invoice</i>, unless such 28th calendar day lands on a day that is other than a <i>Working Day</i>, in which case payment shall be made on the next <i>Working Day</i> after such 28th day.”
SC30.2	5.3.2 to 5.3.7	<u>Add</u> new paragraphs 5.3.2, 5.3.3, 5.3.4, 5.3.4, 5.3.5, 5.3.6, and 5.3.7 as follows: 5.3.2 All payments to the <i>Contractor</i> shall be processed using electronic funds transfer (“EFT”) and deposited directly to the <i>Contractor's</i> bank account unless agreed to otherwise by the <i>Contractor</i> and the <i>Owner</i> in writing. Prior to the <i>Contractor</i> submitting its first application for payment, the <i>Owner</i> and the <i>Contractor</i> shall exchange such information as is necessary to facilitate EFT payments. 5.3.3 In the event that the application for payment delivered by the <i>Contractor</i> pursuant to GC 5.2 - APPLICATIONS FOR PAYMENT does not include the requirements for a <i>Proper Invoice</i> or where the <i>Owner</i> disputes the amount claimed as payable in the <i>Proper Invoice</i>, then the <i>Owner</i> shall within 14 calendar days of receipt of the application for payment, issue a <i>Notice of Non-Payment</i> (Form 1.1). 5.3.4 Where the <i>Owner</i> has delivered a <i>Notice of Non-Payment</i>, the <i>Owner</i> and the <i>Contractor</i> shall first engage in good faith negotiations to resolve the dispute. If within 5 calendar days following the issuance of a <i>Notice of Non-Payment</i>, despite good faith efforts by both parties and the assistance of the <i>Consultant</i>, the <i>Owner</i> and the <i>Contractor</i> cannot resolve the dispute, either party may commence an <i>Adjudication</i> in accordance with the procedures set out in the <i>Construction Act</i>. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.3.1.2. 5.3.5 Provided that the <i>Owner</i> complies with its obligations under the <i>Construction Act</i>, and subject to any interim determination of an adjudicator in accordance with any <i>Adjudication</i>, and where applicable, a final determination made in accordance with the dispute resolution processes prescribed by this <i>Contract</i>, the <i>Owner</i> shall be entitled to claim in a <i>Notice of Non-Payment</i> a right to deduct from or, set off against, any payment of the <i>Contract Price</i>: .1 any amount expended by the <i>Owner</i> in exercising the <i>Owner's</i> rights under this <i>Contract</i> to perform any of the <i>Contractor's</i> obligations that the <i>Contractor</i> has failed to perform; .2 any damages, costs or expenses (including, without limitation, reasonable legal fees and expenses) incurred by the <i>Owner</i> as a result of the failure of the <i>Contractor</i> to perform any of its obligations under the <i>Contract</i>; .3 any other amount owing from the <i>Contractor</i> to the <i>Owner</i> under this <i>Contract</i>. 5.3.6 The amounts disputed and described under the <i>Notice of Non-Payment</i> shall be held by the <i>Owner</i> until all disputed amounts of the <i>Proper Invoice</i> have been resolved pursuant to PART 8 – DISPUTE RESOLUTION. 5.3.7 The <i>Contractor</i> represents, warrants, and covenants to the <i>Owner</i> that it is familiar with its prompt payment and trust obligations under the <i>Construction Act</i> and will



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		take all required steps and measures to ensure that it complies with the applicable prompt payment and trust provisions under the <i>Construction Act</i> including, without limitation, section 8.1 of the <i>Construction Act</i> . Evidence of the <i>Contractor's</i> compliance under this GC 5.3.7, including evidence demonstrating that all <i>EFTs</i> by the <i>Owner</i> to the <i>Contractor</i> are kept in a bank account in the <i>Contractor's</i> name will be made available to the <i>Owner</i> within 5 <i>Working Days</i> following receipt by the <i>Contractor</i> of a <i>Notice in Writing</i> making such request."

SC31 GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK- AND PAYMENT OF HOLDBACK

SC31.1	GC 5.4	~~Delete~~ GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK in its entirety and <u>replace</u> it with the following: "GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK 5.4.1 When the <i>Contractor</i> considers that <i>Substantial Performance of the Work</i> has been achieved, the <i>Contractor</i> shall prepare and submit to the <i>Consultant</i> and the <i>Owner</i> a comprehensive deficiency list of items to be completed or corrected, including any incomplete <i>Close-Out Documentation</i>, and apply for a review by the <i>Consultant</i> and the <i>Owner</i> to establish <i>Substantial Performance of the Work</i>. Failure to include an item on the list does not alter the responsibility of the <i>Contractor</i> to complete the <i>Contract</i>. 5.4.2 Prior to, or as part of its written application for <i>Substantial Performance of the Work</i> the <i>Contractor</i> shall submit to the <i>Consultant</i> submit to the <i>Consultant</i> all closeout documentation required by the <i>Contract Documents</i>, including but not limited to, warranties, manuals, guarantees, as-built drawings and all other relevant literature from suppliers and manufacturers including, but not limited to, where applicable (the "Close-Out Documentation"): .1 equipment, maintenance, and operations manuals; .2 equipment specifications, data sheets and brochures, parts lists and assembly drawings, performance curves and other related data; .3 line drawings, value charts and control sheets sequences with description of the sequence of operations; .4 warranty documents; .5 guarantees; .6 certificates; .7 service and maintenance reports; .8 <i>Specifications</i>; .9 <i>Shop Drawings</i>; .10 coordination drawings; .11 testing and balancing results and reports; .12 <i>Commissioning</i> and quality assurance documentation; .13 distribution system diagrams; .14 spare parts; .15 samples; .16 existing reports and correspondence from authorities having jurisdiction in the <i>Place of the Work</i>; .17 inspection certificates; .18 red-lined record drawings from the construction trailer in two copies and .19 other materials or documentation required to be submitted under the <i>Contract</i>. 5.4.3 The <i>Consultant</i> will review the <i>Work</i> to verify the validity of the application and shall promptly, and in any event, no later than 30 calendar days after receipt of the <i>Contractor's</i> complete deficiency list and application:



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		.1 prepare a final deficiency list incorporating all items to be completed or corrected, including any incomplete or unsubmitted <i>Close-Out Documentation</i>. Each item shall have an indicated value for correction or completion and the determination of the total value of such items shall be determined pursuant to GC 5.8 – DEFICIENCY HOLDBACK. The final deficiency list complete with values is to be included with the <i>Consultant's</i> draft verification and shall be reviewed with the <i>Owner</i> prior to the <i>Consultant</i> rendering a determination in accordance with GC 5.4.3.2 .2 having completed the requirements set out in GC 5.4.3.1, (a) the <i>Consultant</i> shall advise the <i>Contractor</i> in writing that the <i>Work</i> or the designated portion of the <i>Work</i> is not substantially performed and give reasons why, or (b) the <i>Consultant</i> shall state the date of <i>Substantial Performance of the Work</i> in a certificate and issue a copy of that certificate to each the <i>Owner</i> and the <i>Contractor</i>. 5.4.4 Following the issuance of the certificate of <i>Substantial Performance of the Work</i> referenced in subparagraph 5.4.3.2(b): .1 The <i>Contractor</i> shall publish, in a construction trade newspaper in the area of the location of the <i>Work</i>, a copy of the certificate of <i>Substantial Performance of the Work</i> referred to in GC 5.4.2.2(b) within seven (7) calendar days of receiving a copy of the certificate signed by the <i>Consultant</i>, and the <i>Contractor</i> shall provide suitable evidence of the publication to the <i>Consultant</i> and the <i>Owner</i>. If the <i>Contractor</i> fails to publish such notice, the <i>Owner</i> shall be at liberty to publish said certificate and back-charge the <i>Contractor</i> its reasonable costs for doing so; .2 The <i>Contractor</i> shall complete the <i>Work</i> within forty (40) calendar days of the date certified as the date of <i>Substantial Performance of the Work</i>; .3 Notwithstanding any other provisions of the <i>Contract</i>, no payments will be processed between <i>Substantial Performance of the Work</i> and <i>Ready-for-Takeover</i>; .4 The <i>Owner</i> reserves the right to contract out any or all unfinished <i>Work</i> if it has not been completed within forty (40) days of <i>Substantial Performance of the Work</i> using, without limitation, the funds retained in accordance with GC 5.8 - DEFICIENCY HOLDBACK, without prejudice to any other right or remedy and without affecting the warranty period. The cost to the <i>Owner</i> of completing the <i>Work</i> including <i>Owner</i> and <i>Consultant</i> wages and materials shall be deducted from the <i>Contract Price</i>. 5.4.5 After publication of the certificate of the <i>Substantial Performance of the Work</i>, and provided that the <i>Contractor</i> has completed performance of the <i>Work</i> within the 40 calendar days following certification of <i>Substantial Performance of the Work</i>, the <i>Contractor</i> may submit an application for payment of the outstanding <i>Construction Act</i> holdback amount, which application for payment shall: .1 include all of the requirements listed in EXHIBIT "1" - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE, as applicable to the application for payment of the holdback amount; and .2 include a statement that the <i>Contractor</i> has not received any written notices of lien or any claims for liens from any <i>Subcontractor</i> or <i>Supplier</i>.



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		5.4.6 The <i>Construction Act</i> holdback amount shall become due and payable the day immediately following the expiration of the holdback period prescribed by the <i>Construction Act</i> (in most cases being the 61st calendar day following the publication of the certificate of <i>Substantial Performance of the Work</i> referred to in GC 5.4.4.1), subject to the occurrence of any of the following: .1 the preservation of a lien in respect of the <i>Project</i> that has not been satisfied, discharged or otherwise provided for in accordance with the <i>Construction Act</i>; .2 receipt by the <i>Owner</i> of a written notice of lien that has not been satisfied, discharged or otherwise provided for in accordance with the <i>Construction Act</i>; or .3 prior to the expiry of 40 calendar days following the publication of the certificate of <i>Substantial Performance of the Work</i>, the <i>Owner</i> publishes a <i>Notice of Non-Payment</i> of holdback in accordance with the <i>Construction Act</i> (Form 6), setting out the amount of holdback that will not be paid, which may include non-payment to secure the correction of deficiencies and/or the completion of the <i>Work</i>. 5.4.7 Notwithstanding the <i>Owner's</i> obligation to make payment of the holdback amount in accordance with GC 5.4.6, the processing of such payment remains subject to the <i>Owner's</i> internal <i>EFT</i> timing limitations. The <i>Owner</i> covenants, and the <i>Contractor</i> agrees, that payment of the holdback shall be made by <i>EFT</i> at the first opportunity during the <i>Owner's</i> normal processing of <i>EFTs</i> upon the holdback becoming due in accordance with GC 5.4.6..

SC32 GC 5.5 FINAL PAYMENT

SC32.1	GC 5.5	<u>Delete</u> GC 5.5 in its entirety, including all subparagraphs thereunder and <u>replace</u> it with the following: "5.5.1 When <i>Ready-for-Takeover</i> has been achieved in accordance with GC 12.1 – READY-FOR-TAKEOVER and the <i>Contractor</i> considers the <i>Work</i> is complete, and after the <i>Contractor</i>, the <i>Owner</i>, and the <i>Consultant</i> have attended a <i>Pre-Invoice Submission Meeting</i> analogous to the requirement in GC 5.2.1 (the "<i>Final Pre-Invoice Submission Meeting</i>"), the <i>Contractor</i> may submit an application for final payment to the <i>Owner</i> and to the <i>Consultant</i>, which application for payment shall: .1 include all of the requirements set out in GC 5.2.2, including without limitation those requirements listed in APPENDIX "1" - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE that are specific to an application for final payment; and .2 if applicable, (a) a certificate from the <i>Consultant</i> or written confirmation from the <i>Owner</i> that the deficiencies or incomplete <i>Work</i> waived by the <i>Owner</i> pursuant to GC 12.1.2 have been fully rectified as of the date of the <i>Contractor's</i> application for final payment, and/or (b) written confirmation, signed by the <i>Owner</i> and the <i>Contractor</i>, that the <i>Contract Price</i> has been reduced by a specified amount in exchange for the <i>Owner</i> releasing the <i>Contractor</i> of its obligation to rectify the certain outstanding deficiencies and/or incomplete <i>Work</i> waived by the <i>Owner</i> pursuant to GC 12.1.2, as detailed in such written confirmation.



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		5.5.2 No later than 5 calendar days prior to the <i>Final Pre-Invoice Submission Meeting</i>, the <i>Contractor</i> will, if not already provided, submit to the <i>Consultant</i> all <i>Close-Out Documentation</i>. 5.5.3 Delivery of all <i>Close-Out Documentation</i> is a requirement for the <i>Proper Invoice</i> for final payment. 5.5.4 After receipt by the <i>Owner</i> and the <i>Consultant</i> of an application for payment submitted by the <i>Contractor</i> that is a <i>Proper Invoice</i> and by no later than 10 calendar days after the receipt of the <i>Proper Invoice</i>: .1 the <i>Consultant</i> will either: (a) issue to the <i>Owner</i> with a copy to the <i>Contractor</i>, a progress payment certificate in the amount applied for by the <i>Contractor</i> in the <i>Proper Invoice</i>, or (b) deliver a finding to the <i>Owner</i> with reasons why an amount other than what is claimed in the <i>Proper Invoice</i> is properly due to the <i>Contractor</i>, which finding the <i>Owner</i> may accept or amend prior to issuing a <i>Notice of Non-Payment</i> (Form 1.1), if any, in accordance with GC 5.5.2; .2 the <i>Owner</i> shall make payment to the <i>Contractor</i> on account as provided in Article A-5 PAYMENT, (a) in the amount stated in the certificate for payment, or (b) in the amount stated in the certificate for payment less such amount stated in the <i>Owner's Notice of Non-Payment</i> issued pursuant to GC 5.5.5, on the 28th calendar day after receipt of a <i>Proper Invoice</i>, unless such 28th calendar day lands on a day that is other than a <i>Working Day</i>, in which case payment shall be made on the next <i>Working Day</i> after such 28th day. 5.5.5 In the event that the application for final payment delivered by the <i>Contractor</i> does not include the requirements of GC 5.5.1 (including the requirements for a <i>Proper Invoice</i>) and GC 5.5.2 or where the <i>Owner</i> disputes the amount claimed as payable in the <i>Proper Invoice</i>, then the <i>Owner</i> shall within 14 calendar days of receipt of the application for payment, issue a <i>Notice of Non-Payment</i>. Where the <i>Owner</i> has delivered a <i>Notice of Non-Payment</i>, as specified under this GC 5.5.5, the <i>Owner</i> and the <i>Contractor</i> shall first engage in good faith negotiations to resolve the dispute. If within 5 calendar days following the issuance of a <i>Notice of Non-Payment</i>, despite good faith efforts by both parties with the assistance of the <i>Consultant</i>, the <i>Owner</i> and the <i>Contractor</i> cannot resolve the dispute, either party may commence an <i>Adjudication</i> in accordance with the procedures set out in the <i>Construction Act</i>. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.5.4.2. 5.5.6 Subject to the provisions of the <i>Construction Act</i> and any other rights conferred on the <i>Owner</i> at law or under this <i>Contract</i> to withhold payment or backcharge or set-off against payment, the <i>Owner</i> shall pay the amount payable under a <i>Proper Invoice</i> for final payment in accordance with the <i>Construction Act</i>. 5.5.7 When the <i>Consultant</i> issues certificate of completion in accordance with GC 5.5.4.1, the <i>Consultant</i> shall also issue a certificate for release of any holdback for finishing work amount. In accordance with the <i>Construction Act</i>, the <i>Owner</i> may retain any amounts which are required by law to satisfy any liens against the <i>Work</i>, in respect of any third party claims made to the <i>Owner</i> in respect of the <i>Contract</i> or the <i>Work</i>, and in respect of any claims the <i>Owner</i> may have against the <i>Contractor</i>. Subject to



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		the foregoing, the <i>Owner</i> shall release the holdback in accordance with the <i>Construction Act</i> ."

SC33 GC 5.6 DEFERRED WORK

SC33.1	5.6.1	<u>Delete</u> paragraph 5.6.1 and <u>replace</u> with the following: "5.6.1 If because of conditions reasonably beyond the control of the <i>Contractor</i>, there are items of work that cannot be performed, payment in full for that portion of the <i>Work</i> which has been performed as certified by the <i>Consultant</i> shall not be withheld or delayed by the <i>Owner</i> on account thereof, but the <i>Owner</i> may withhold, subject to its requirement to issue a <i>Notice of Non-Payment</i> under the <i>Construction Act</i>, until the remaining portion of the <i>Work</i> is finished, only such an amount that the <i>Consultant</i> determines is sufficient and reasonable to cover the cost of performing such remaining work. The remaining work shall be valued as deficient work as defined in GC 5.8.1."

SC34 *NEW* GC 5.8 DEFICIENCY HOLDBACK

SC34.1	5.8.1	<u>Add</u> new GC 5.8 – DEFICIENCY HOLDBACK as follows: "GC 5.8 DEFICIENCY HOLDBACK 5.8.1 Notwithstanding any provisions contained in the <i>Contract Documents</i> concerning certification and release of monies to the <i>Contractor</i>, the <i>Owner</i> reserves the right to establish a deficiency holdback, at the time of the review for <i>Substantial Performance of the Work</i>, based on a 200% dollar value of the deficiencies listed by the <i>Consultant</i>. 5.8.2 In performing the calculation under GC 5.8.1, .1 no individual deficiency will be valued at less than five hundred dollars (\$500.00); and .2 for any <i>Close-Out Documentation</i> not submitted in advance of or as part of the <i>Contractor's</i> application for <i>Substantial Performance of the Work</i>, an amount shall be retained by the <i>Owner</i> as part of the deficiency holdback that is equal to the estimated time and material costs to retain a third-party to re-create the applicable <i>Close-Out Documentation</i>, as determined by the <i>Consultant</i>, until such time as the applicable <i>Close-Out Documentation</i> is submitted and approved. 5.8.3 The deficiency holdback shall be due and payable to the <i>Contractor</i> on the 61st day following completion of all of the deficiencies listed by the <i>Consultant</i>, there being no claims for lien registered against the title to the <i>Place of the Work</i> issued in accordance with the <i>Construction Act</i>, and less any amounts disputed under an <i>Owner's Notice of Non-Payment</i> (Form 1.1)."

PART 6 CHANGES IN THE WORK

SC35 GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

SC35.1	6.1.2	<u>Add</u> the following to the end of GC 6.1.2:



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		"This requirement is of the essence and it is the express intention of the parties that any claims by the <i>Contractor</i> for a change in the <i>Contract Price</i> and/or <i>Contract Time</i> shall be barred unless there has been strict compliance with PART 6 - CHANGES IN THE WORK. No verbal dealings between the parties and no implied acceptance of alterations or additions to the <i>Work</i> and no claims that the <i>Owner</i> has been unjustly enriched by any alteration or addition to the <i>Work</i>, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for additional payment under this <i>Contract</i>, an increase to the <i>Contract Price</i>, or a claim for any extension of the <i>Contract Time</i>."
SC35.2	6.1.3 to 6.1.8	<u>Add</u> new paragraphs 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.7 and 6.1.8 as follows: "6.1.3 The <i>Contractor</i> agrees that changes resulting from construction coordination, including but not limited to, site surface conditions, site coordination, and <i>Subcontractor and Supplier</i> coordination are included in the <i>Contract Price</i> and the <i>Contractor</i> shall be precluded from making any claim for a change in the <i>Contract Price</i> as a result of such changes. 6.1.4 Labour costs shall be actual, prevailing rates at the <i>Place of the Work</i> paid to workers, plus statutory charges on labour including WSIB, unemployment insurance, Canada pension, vacation pay, hospitalization and medical insurance. The <i>Contractor</i> shall provide these rates, when requested by the <i>Consultant</i>, for review and/or agreement. 6.1.5 Quotations for changes to the <i>Work</i> shall only include <i>Direct Costs</i> and be accompanied by itemized breakdowns together with detailed, substantiating quotations or cost vouchers from <i>Subcontractors</i> and <i>Suppliers</i>, submitted in a format acceptable to the <i>Consultant</i> and shall include any <i>Direct Costs</i> associated with extensions in <i>Contract Time</i>. 6.1.6 When both additions and deletions covering related <i>Work</i> or substitutions are involved in a change to the <i>Work</i>, payment, including <i>Overhead</i> and profit, shall be calculated on the basis of the net difference, if any, with respect to that change in the <i>Work</i>. 6.1.7 No extension to the <i>Contract Time</i> shall be granted for changes in the <i>Work</i> unless the <i>Contractor</i> can clearly demonstrate that such changes significantly alter the overall construction schedule submitted at the commencement of the <i>Work</i>. Extensions of <i>Contract Time</i> and all associated costs, if approved, shall be included in the relevant <i>Change Order</i>. 6.1.8 When a change in the <i>Work</i> is proposed or required, the <i>Contractor</i> shall within 10 calendar days submit to the <i>Consultant</i> for review a claim for a change in <i>Contract Price</i> and/or <i>Contract Time</i>. Should 10 calendar days be insufficient to prepare the submission, the <i>Contractor</i> shall within 5 calendar days, advise the <i>Consultant</i> in writing of the proposed date of submission of the claim. Claims submitted after the dates prescribed herein will not be considered."

SC36 GC 6.2

CHANGE ORDER

SC36.1	6.2.1	In paragraph 6.2.1 after the last sentence in the paragraph <u>add</u> the following: "The adjustment in the <i>Contract Time</i> and the <i>Contract Price</i> shall include an adjustment, if any, for delay or for the impact that the change in the <i>Work</i> has on the <i>Work</i> of the <i>Contractor</i>, and once such adjustment is made, the <i>Contractor</i> shall be precluded from making any further claims for delay or impact with respect to the change in the <i>Work</i>."



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SC36.2	6.2.3 to 6.2.5	<u>Add</u> new paragraphs 6.2.3, 6.2.4, and 6.2.5 as follows: “6.2.3 The value of a change shall be determined in one or more of the following methods as directed by the <i>Consultant</i>: .1 by estimate and acceptance of a lump sum; .2 by negotiated unit prices which include the <i>Contractor's</i> overhead and profit, or; .3 by the actual <i>Direct Cost</i> to the <i>Owner</i>, such costs to be the actual cost after all credits included in the change have been deducted, plus the following ranges of mark-up on such costs: .1 for <i>Change Orders</i> with a value of \$0 to \$15,000 the total <i>Subcontractor/Supplier</i> mark-up including <i>Overhead</i> and profit shall be 10% and the total <i>Contractor</i> mark-up including overhead and profit shall be 5%. .2 for <i>Change Orders</i> in excess of \$15,000, the total <i>Subcontractor/Supplier</i> mark-up including <i>Overhead</i> and profit shall be 5% and the total <i>Contractor</i> mark-up including <i>Overhead</i> and profit shall be 3%. 6.2.4 All quotations shall include <i>Direct Costs</i> and be submitted in a complete manner listing: .1 quantity of each material, .2 unit cost of each material, .3 man hours involved, .4 cost per hour, .5 <i>Subcontractor</i> quotations submitted listing items 1 to 4 above and item 6 below. .6 mark-up. 6.2.5 The <i>Owner</i> and the <i>Consultant</i> will not be responsible for delays to the <i>Work</i> resulting from late, incomplete or inadequately broken-down valuations submitted by the <i>Contractor</i>.”

SC37 GC 6.3 CHANGE DIRECTIVE

SC37.1	6.3.6.1	<u>Amend</u> paragraph 6.3.6.1 by deleting the final period and adding the following: “.1 Ten percent (10%) for profit plus five percent (5%) for overhead on work by the <i>Contractor's</i> own forces up to the value of \$15,000 and five percent (5%) for profit plus three percent (3%) for <i>Overhead</i> on work by the <i>Contractor's</i> own forces in excess of \$15,000 and, .2 Ten percent (10%) fee on amounts paid to <i>Subcontractors</i> or <i>Suppliers</i> under subparagraph 6.3.7.9 for changes up to the value of \$15,000 and five percent (5%) on changes over \$15,000. Unless a <i>Subcontractor's</i> or <i>Supplier's</i> price has been approved by the <i>Owner</i>, the <i>Subcontractor</i> or <i>Supplier</i> shall be entitled to its actual net cost as determined in accordance with paragraph 6.3.7, plus ten percent (10%) for profit and five percent (5%) for <i>Overhead</i> on such actual net cost for changes in the <i>Work</i>, up to the value of \$15,000 and five percent



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		(5%) for profit and three percent (3%) for overhead on such actual net cost changes in the <i>Work</i> in excess of \$15,000.”
SC37.2	6.3.6.2	<u>Delete</u> paragraph 6.3.6.2 and <u>replace</u> it with the following: “.2 If a change in the <i>Work</i> results in a net decrease in the <i>Contract Price</i> , the amount of the credit shall be the net cost, without deduction for <i>Overhead</i> or profit.”
SC37.3	6.3.7.1(4)	<u>Delete</u> GC 6.3.7.1(4).
SC37.4	6.3.7.7	Amend GC 6.3.7.7 by <u>deleting</u> the words “described in paragraph 6.3.7.1” and <u>replacing</u> them with “approved by the <i>Owner</i> in writing and in advance of any such expenses being incurred;”
SC37.5	6.3.7.9	Amend GC 6.3.7.9 by <u>adding</u> the following to the end of the paragraph: “...when specifically requested by the <i>Owner</i> or as directed by the <i>Consultant</i> ;”.
SC37.6	6.3.7.10	Amend GC 6.3.7.10 by <u>adding</u> the following to the end of the paragraph: “, provided that such amounts are not caused by negligent acts, omissions, or default of the <i>Contractor</i> or <i>Subcontractor</i> ;”.
SC37.7	6.3.7.13	<u>Delete</u> GC 6.3.7.13.
SC37.8	6.3.7.15	<u>Delete</u> GC 6.3.7.15.
SC37.9	6.3.7.17	<u>Delete</u> GC 6.3.7.17 in its entirety including all subparagraphs.
SC37.10	6.3.11	<u>Delete</u> GC 6.3.11 and <u>replace</u> it with the following: “6.3.11 The value of the <i>Work</i> performed as a result of a <i>Change Directive</i> shall not be eligible to be included in progress payments until the amount, including the method for determining the amount, of such <i>Change Directive</i> has been determined.”

SC38 GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

SC38.1	6.4.1	<u>Delete</u> paragraph 6.4.1 in its entirety and <u>replace</u> with the following: “6.4.1.1 Prior to the submission of the bid on which the Contract was awarded, the Contractor confirms that it carefully investigated the Place of the Work insofar as the Place of Work was available for investigation and, in doing so, applied to that investigation the degree of care and skill required by paragraph 3.14.1 6.4.1.2 No claim by the <i>Contractor</i> will be considered by the <i>Owner</i> or the <i>Consultant</i> in connection with conditions which could reasonably have been ascertained by such investigation or other due diligence undertaken prior to the execution of the <i>Contract</i> .”
SC38.2	6.4.2	<u>Amend</u> paragraph 6.4.2 by <u>adding</u> a new first sentence as follows: “Having regard to paragraph 6.4.1, if the <i>Contractor</i> believes that the conditions of the <i>Place of the Work</i> differ materially from those reasonably anticipated, differ materially from those indicated in the <i>Contract Documents</i> or were concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.1, it shall provide the <i>Owner</i> and the <i>Consultant</i> with <i>Notice in Writing</i> no later than five (5) <i>Working Days</i> after the first observation of such conditions.” -and-



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		<u>amend</u> the existing second sentence of paragraph 6.4.2 in the second line, following the word “materially” by <u>adding</u> the words “or were concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.1.”.
SC38.3	6.4.3	<u>Delete</u> paragraph 6.4.3 in its entirety and <u>substitute</u> the following: “6.4.3 If the <i>Consultant</i> makes a finding pursuant to paragraph 6.4.2 that no change in the <i>Contract Price</i> or the <i>Contract Time</i> is justified, the <i>Consultant</i> shall report in writing the reasons for this finding to the <i>Owner</i> and the <i>Contractor</i> .”
SC38.4	6.4.5	<u>Add</u> new paragraph 6.4.5 as follows: “6.4.5 No claims for additional compensation or for an extension of <i>Contract Time</i> shall be allowed if the <i>Contractor</i> fails to give <i>Notice in Writing</i> to the <i>Owner</i> or <i>Consultant</i> , as required by paragraph 6.4.2.”

SC39 GC 6.5 DELAYS

SC39.1	6.5.1	In paragraph 6.5.1 <u>delete</u> the words after the word “for” in the fourth line and <u>replace</u> them with the words “...reasonable <i>Direct Costs</i> directly flowing from the delay, but excluding any consequential, indirect or special damages (including, without limitation, loss of profits, loss of opportunity or loss of productivity).”
SC39.2	6.5.2	<u>Delete</u> GC 6.5.2 in its entirety and <u>replace</u> it with the following: “6.5.2 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by a stop work order issued by a court or other public authority and providing that such order was issued on account of a direct breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes by the <i>Owner</i> , <i>Other Contractor(s)</i> , or the <i>Consultant</i> , and relating to the <i>Work</i> or the <i>Place of the Work</i> , then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Consultant</i> may determine. The <i>Contractor</i> shall be reimbursed by the <i>Owner</i> for reasonable <i>Direct Costs</i> directly flowing from the delay, but excluding any consequential, indirect or special damages (including, without limitation, loss of profits, loss of opportunity or loss of productivity).”
SC39.3	6.5.3	<u>Delete</u> paragraph 6.5.3 in its entirety and <u>replace</u> with the following: “6.5.3 If either party is delayed in the performance of their obligations under this <i>Contract</i> by <i>Force Majeure</i> , then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Owner</i> and the <i>Contractor</i> shall agree. The extension of time shall not be less than the time lost as a result of the event causing the delay, unless the parties agree to a shorter extension. Neither party shall be entitled to payment for costs incurred by such delays. Upon reaching agreement on the extension of the <i>Contract Time</i> attributable to the <i>Force Majeure</i> event, the <i>Owner</i> and the <i>Contractor</i> shall execute a <i>Change Order</i> indicating the length of the extension to the <i>Contract Time</i> and confirming that there are no costs payable by the either party for the extension of <i>Contract Time</i> . However, if at the time an event of <i>Force Majeure</i> arises a party is in default of its obligations under the <i>Contract</i> and has received a notice of default pursuant to PART 7 – DEFAULT NOTICE, this paragraph 6.5.3 shall not excuse a party from its obligation to cure the default(s). For greater certainty, the defaulting party, to the extent possible, must continue to address and cure the default notwithstanding an event of <i>Force Majeure</i> .”
SC39.4	6.5.4	<u>Delete</u> paragraph 6.5.4 in its entirety and <u>replace</u> it with the following:



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		“6.5.4 No extension or compensation shall be made for delay or impact on the <i>Work</i> unless notice in writing of a claim is given to the <i>Consultant</i> not later than ten (10) <i>Working Days</i> after the commencement of the delays or impact on the <i>Work</i>, provided however, that, in the case of a continuing cause of delay or impact on the <i>Work</i>, only one notice of claim shall be necessary.”
SC39.5	6.5.6 to 6.5.8	<u>Add</u> new paragraphs 6.5.6, 6.5.7 and 6.5.8 as follows: “6.5.6 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by an act or omission of the <i>Contractor</i> or anyone directly or indirectly employed or engaged by the <i>Contractor</i>, or by any cause within the <i>Contractor’s</i> control, then (i) firstly, at its expense, and to the extent possible, the <i>Contractor</i> shall accelerate the work and/or provide overtime work to recover time lost by a delay arising under this paragraph 6.5.6, and (ii) secondly, where it is not possible for the <i>Contractor</i> to recover the time lost by implementing acceleration measures and/or overtime work, the <i>Contract Time</i> may be extended for such reasonable time as the <i>Owner</i> may decide in consultation with the <i>Consultant</i> and the <i>Contractor</i>. The <i>Owner</i> shall be reimbursed by the <i>Contractor</i> for all reasonable costs incurred by the <i>Owner</i> as the result of such delay, including, but not limited to, <i>Owner’s</i> staff costs, the cost of all additional services required by the <i>Owner</i> from the <i>Consultant</i> or any sub-consultants, project managers, or others employed or engaged by the <i>Owner</i>, and in particular, the costs of the <i>Consultant’s</i> services during the period between the date of <i>Substantial Performance of the Work</i> stated in Article A-1 herein, as the same may be extended through the provision of these General Conditions, and any later or actual date of <i>Substantial Performance of the Work</i> achieved by the <i>Contractor</i>. 6.5.7 Without limiting the obligations of the <i>Contractor</i> described in GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS or GC 9.4 – CONSTRUCTION SAFETY, the <i>Owner</i> or <i>Consultant</i> may, by <i>Notice in Writing</i>, direct the <i>Contractor</i> to stop the <i>Work</i> where the <i>Owner</i> or <i>Consultant</i> determines that there is an imminent risk to the safety of persons or property at the <i>Place of the Work</i>. In the event that the <i>Contractor</i> receives such notice, it shall immediately stop the <i>Work</i> and secure the site. The <i>Contractor</i> shall not be entitled to an extension of the <i>Contract Time</i> or to an increase in the <i>Contract Price</i> unless the resulting delay, if any, would entitle the <i>Contractor</i> to an extension of the <i>Contract Time</i> or the reimbursement of the <i>Contractor’s</i> costs as provided in paragraphs 6.5.1, 6.5.2 or 6.5.3. 6.5.8 No claim for delay shall be made by the <i>Contractor</i> and the <i>Contract Time</i> shall not be extended due to climatic conditions or arising from the <i>Contractor’s</i> efforts to maintain the <i>Construction Schedule</i>.”

PART 7 DEFAULT NOTICE

SC40 GC 7.1

**OWNER’S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR’S
RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT**

SC40.1	7.1.2	In GC 7.1.2, <u>delete</u> the words “and if the <i>Consultant</i> has given a written statement to the <i>Owner</i> and <i>Contractor</i> which provides the detail of such neglect to perform the <i>Work</i> properly or such failure to comply with the requirements of the <i>Contract</i> to a substantial degree”.
SC40.2	7.1.3.4	<u>Add</u> a new subparagraph 7.1.3.4 as follows: “.4 an “acceptable schedule” as referred to in subparagraph 7.1.3.2. means a schedule approved by the <i>Consultant</i> and the <i>Owner</i> wherein the default can be corrected within the balance of the <i>Contract Time</i> and shall not cause delay to any other aspect of the



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		Work or the work of other contractors, and in no event shall it be deemed to give a right to extend the <i>Contract Time</i> ."
SC40.3	7.1.4.1	<u>Delete</u> subparagraph 7.1.4.1 and <u>replace</u> it with the following: ".1 correct such default and deduct the cost, including <i>Owner's</i> expenses, thereof from any payment then or thereafter due the <i>Contractor</i> ."
SC40.4	7.1.4.2	<u>Delete</u> subparagraph 7.1.4.2 and <u>replace</u> it with the following: ".2 by providing <i>Notice in Writing</i> to the <i>Contractor</i> , terminate the <i>Contractor's</i> right to continue with the <i>Work</i> in whole or in part or terminate the <i>Contract</i> , and publish a notice of termination (Form 8) in accordance with the <i>Act</i> ."
SC40.5	7.1.5.3	In subparagraph 7.1.5.3 <u>delete</u> the words: "however, if such cost of finishing the <i>Work</i> is less than the unpaid balance of the <i>Contract Price</i> , the <i>Owner</i> shall pay the <i>Contractor</i> the difference"
SC40.6	7.1.6 to 7.1.10	<u>Delete</u> GC 7.1.6 and <u>replace</u> it with new paragraphs 7.1.6, 7.1.7, 7.1.8, 7.1.9 and 7.1.10 as follows: "7.1.6 In addition to its right to terminate the <i>Contract</i> set out herein, the <i>Owner</i> may terminate this <i>Contract</i> at any time for any other reason and without cause upon giving the <i>Contractor</i> fifteen (15) <i>Working Days Notice in Writing</i> to that effect. In such event, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed including reasonable profit, for loss sustained upon <i>Products</i> and <i>Construction Equipment</i> , and such other damages as the <i>Contractor</i> may have sustained as a result of the termination of the <i>Contract</i> , but in no event shall the <i>Contractor</i> be entitled to be compensated for any loss of profit on unperformed portions of the <i>Work</i> , or indirect, special, or consequential damages incurred. 7.1.7 The <i>Owner</i> may suspend <i>Work</i> under this <i>Contract</i> at any time for any reason and without cause upon giving the <i>Contractor Notice in Writing</i> to that effect. In such event, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed to the date of suspension and be compensated for all actual costs incurred arising from the suspension, including reasonable profit, for loss sustained upon <i>Products</i> and <i>Construction Equipment</i> , and such other damages as the <i>Contractor</i> may have sustained as a result of the suspension of the <i>Work</i> , but in no event shall the <i>Contractor</i> be entitled to be compensated for any indirect, special, or consequential damages incurred. In the event that the suspension continues for more than thirty (30) calendar days, the <i>Contract</i> shall be deemed to be terminated and the provisions of paragraph 7.1.6 shall apply. 7.1.8 In the case of either a termination of the <i>Contract</i> or a suspension of the <i>Work</i> under GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT or GC 7.2 - CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> shall use its best commercial efforts to mitigate the financial consequences to the <i>Owner</i> arising out of the termination or suspension, as the case may be. 7.1.9 Upon the resumption of the <i>Work</i> following a suspension under GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT or GC 7.2 - CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> will endeavour to minimize the delay and financial consequences arising out of the suspension. 7.1.10 The <i>Contractor's</i> obligations under the <i>Contract</i> as to quality, correction, and warranty of the <i>Work</i> performed by the <i>Contractor</i> up to the time of termination or



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		suspension shall continue after such termination of the <i>Contract</i> or suspension of the <i>Work</i> ."

SC41 GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

SC41.1	7.2.2	<u>Delete</u> paragraph 7.2.2 and <u>replace</u> it with the following: "7.2.2 If the <i>Work</i> is suspended or otherwise delayed for a period of 40 consecutive <i>Working Days</i> or more under a stop work order issued by a court or other public authority on account of a breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes directly by the <i>Owner</i>, the <i>Owner's</i> other contractor(s), or the <i>Consultant</i>, and relating to the <i>Work</i> or the <i>Place of the Work</i>, the <i>Contractor</i> may, without prejudice to any other right or remedy the <i>Contractor</i> may have, terminate the <i>Contract</i> by giving the <i>Owner</i> Notice in <i>Writing</i> to that effect."
SC41.2	7.2.3.1	<u>Delete</u> subparagraph 7.2.3.1 in its entirety.
SC41.3	7.2.3.2	<u>Delete</u> subparagraph 7.2.3.2 in its entirety.
SC41.4	7.2.3.4	In subparagraph 7.2.3.4, <u>delete</u> the words "except for GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER".
SC41.5	7.2.5	<u>Delete</u> paragraph 7.2.5 and <u>replace</u> it with the following: "7.2.5 If the default cannot be corrected within the 5 <i>Working Days</i> specified in paragraph 7.2.4, the <i>Owner</i> shall be deemed to have cured the default if it: .1 commences correction of the default within the specified time; .2 provides the <i>Contractor</i> with an acceptable schedule for such correction; and, .3 completes the correction in accordance with such schedule."
SC41.6	7.2.6 to 7.2.9	<u>Add</u> new paragraphs 7.2.6, 7.2.7, 7.2.8 and 7.2.9 as follows: "7.2.6 If the <i>Contractor</i> terminates the <i>Contract</i> under the conditions described in GC 7.2 – CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed to the date of termination, as determined by the <i>Consultant</i>. The <i>Contractor</i> shall also be entitled to recover the direct costs associated with termination, including the costs of demobilization and losses sustained on <i>Products</i> and <i>Construction Equipment</i>. The <i>Contractor</i> shall not be entitled to any recovery for any special, indirect or consequential losses, including loss of profit. 7.2.7 The <i>Contractor</i> shall not be entitled to give notice of the <i>Owner's</i> default or terminate the <i>Contract</i> in the event the <i>Owner</i> withholds certificates or payment or both in accordance with the <i>Contract</i> because of: .1 the <i>Contractor's</i> failure to pay all legitimate claims promptly, or .2 the failure of the <i>Contractor</i> to discharge construction liens which are registered against the title to the <i>Place of the Work</i>. 7.2.8 The <i>Contractor's</i> obligations under the <i>Contract</i> as to quality, correction and warranty of the <i>Work</i> performed by the <i>Contractor</i> up to the effective date of



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		termination shall continue in force and shall survive termination of this <i>Contract</i> by the <i>Contractor</i>. 7.2.9 If the <i>Contractor</i> suspends the <i>Work</i> or terminates the <i>Contract</i> as provided for in GC 7.2 – CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> shall ensure the site and the <i>Work</i> are left in a safe, secure condition as required by authorities having jurisdiction at the <i>Place of the Work</i> and the <i>Contract Documents</i>."

PART 8 DISPUTE RESOLUTION

SC42 GC 8.1 AUTHORITY OF THE CONSULTANT

SC42.1	8.1.3	<u>Delete</u> paragraph 8.1.3 in its entirety and <u>substitute</u> as follows: "8.1.3 If a dispute is not resolved promptly, the <i>Consultant</i> will give such instruction as in the <i>Consultant's</i> opinion are necessary for the proper performance of the <i>Work</i> and to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by doing so neither party will jeopardize any claim the party may have."

SC43 GC 8.2 ADJUDICATION

SC43.13	8.2.2 to 8.2.7	<u>Add</u> new GC 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, and 8.2.7 as follows: "8.2.2 Save and except where the <i>Contractor</i> has given an undertaking, in accordance with the <i>Act</i>, to refer a dispute to <i>Adjudication</i>, prior to delivering a notice of <i>Adjudication</i> in a form prescribed by the <i>Act</i>, the parties agree to first address all disputes with at least one in-person meeting with the <i>Owner's</i> representative, the <i>Consultant's</i> representative, and the <i>Contractor's</i> representative. The parties agree that such steps will be taken to resolve any disputes in a timely and cost-effective manner. 8.2.3 Notwithstanding any other provisions in PART 8 DISPUTE RESOLUTION, the parties shall engage in <i>Adjudication</i> proceedings as required by, and in accordance with, the <i>Construction Act</i>. 8.2.4 The following procedures shall apply to any <i>Adjudication</i> the parties engage in under the <i>Construction Act</i>: .1 any hearings shall be held at a venue within the jurisdiction of the <i>Place of the Work</i> or such other venue as the parties may agree and which is acceptable to the adjudicator; .2 the <i>Adjudication</i> shall be conducted in English; .3 each party may be represented by counsel throughout an <i>Adjudication</i>; .4 there shall not be any oral communications with respect to issues in dispute that are the subject of an <i>Adjudication</i> between a party and the adjudicator unless it is made in the presence of both parties or their legal representatives; and .5 a copy of all written communications between the adjudicator and a party shall be given to the other party at the same time.



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		8.2.5 Any documents or information disclosed by the parties during an <i>Adjudication</i> are confidential and the parties shall not use such documents or information for any purpose other than the <i>Adjudication</i> in which they are disclosed and shall not disclose such documents and information to any third party, unless otherwise required by law, save and except the for the adjudicator. 8.2.6 If the <i>Contractor</i> fails to comply with any of the notice requirements set out in the <i>Contract</i>, including the time limits set out in any of the following: .1 GC 6.4 – CONCEALED OR UNKNOWN CONDITIONS; .2 GC 6.5 – DELAYS; .3 GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE; .4 PART 8 DISPUTE RESOLUTION .5 GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES .6 GC 9.3 – ARTIFACTS AND FOSSILS; or .7 GC 9.5 - MOULD in respect of any claim or dispute, the <i>Contractor</i> shall have no entitlement whatsoever (including to an increase in the <i>Contract Price</i>, or an extension of <i>Contract Time</i>) in the context of an <i>Adjudication</i> under the <i>Construction Act</i> and waives the right to make any such claims or disputes in an <i>Adjudication</i>. This GC 8.2.6 shall operate conclusively as an estoppel and bar in the event such claims or disputes are brought in an <i>Adjudication</i> and the <i>Owner</i> may rely on this GC 8.2.6 as a complete defence to any such claims or disputes. 8.2.7 The parties hereby acknowledge and agree, .1 that counterclaims, claims of set-off or the exercise or use of other contractual rights that permit the <i>Owner</i> to withhold, deduct or retain from monies otherwise owed to the <i>Contractor</i> under the <i>Contract</i> may be referred to, and included as part of, <i>Adjudications</i> under the <i>Construction Act</i>; .2 that disputes related to the termination or abandonment of the <i>Contract</i>, as well as any disputes that arise or are advanced following the termination or abandonment of the <i>Contract</i>, shall not be referred to <i>Adjudication</i> under the <i>Construction Act</i>; .3 that notice(s) of <i>Adjudication</i>, with respect to any dispute or claim relating to the <i>Project</i>, shall not be given, and no <i>Adjudication</i> shall be commenced following <i>Contract</i> completion, <i>Contract</i> abandonment, or termination of the <i>Contract</i>; .4 that any <i>Adjudication</i> between the <i>Contractor</i> and a <i>Subcontractor</i> or a supplier that relates to an <i>Adjudication</i> between the <i>Owner</i> and the <i>Contractor</i> shall be joined together to be adjudicated by a single adjudicator, provided that the adjudicator agrees to do so, and the <i>Contractor</i> shall include a provision in each of its contracts that contain an equivalent obligation to this GC 8.2.7.4; and .5 that, other than where the <i>Contractor</i> is obliged to commence an <i>Adjudication</i> pursuant to an undertaking under the <i>Construction Act</i>, neither the <i>Owner</i> nor the <i>Contractor</i> shall commence an <i>Adjudication</i> during the <i>Restricted Period</i>. 8.2.8 The parties acknowledge and agree that no <i>Adjudication</i>, arbitration, action, suit or other proceeding may be brought by the <i>Contractor</i> against the <i>Owner</i> in respect of a claim for an increase to the <i>Contract Price</i> as set out in GC 6.6, before the <i>Consultant</i> has issued its findings in respect of same, pursuant to GC 6.6.5. For greater clarity and without limiting the foregoing, the amount applied for in each <i>Proper Invoice</i> shall not include any amounts pertaining to the <i>Contractor's</i> claim for an increase in <i>Contract Price</i> unless and until the <i>Consultant</i> has issued a written notice to the <i>Contractor</i> regarding the validity of such claim, as provided for in GC 6.6.5. However, nothing in this GC 8.2.8 shall prevent a <i>Contractor</i> from commencing an <i>Adjudication</i> where, pursuant to the <i>Construction Act</i>, the <i>Contractor</i> is required



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		to give an undertaking to a <i>Subcontractor</i> to commence an <i>Adjudication</i> following delivery of a <i>Notice of Non-Payment</i> .”

SC44 GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

SC44.1	8.3.1	Amend paragraph 8.3.1 by changing part of the second line from “shall appoint a <i>Project Mediator</i> ” to “may appoint a <i>Project Mediator</i> , except that such an appointment shall only be made if both the <i>Owner</i> and the <i>Contractor</i> agree.”
SC44.2	8.3.4	Amend paragraph 8.3.4 by changing part of the second line from “the parties shall request the <i>Project Mediator</i> ” to “and subject to paragraph 8.3.1 the parties may request the <i>Project Mediator</i> ”.
SC44.3	8.3.6 to 8.3.9	Delete paragraphs 8.3.6, 8.3.7 and 8.3.8 in their entirety and <u>replace</u> them with the following new GCs 8.3.6, 8.3.7, 8.3.8, and 8.3.9: “8.3.6 The dispute may be finally resolved by arbitration under the Rules for Arbitration of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing, provided that both the <i>Contractor</i> and the <i>Owner</i> agree. If the <i>Contractor</i> and the <i>Owner</i> agree to resolve the dispute by arbitration, the arbitration shall be conducted in the jurisdiction of the <i>Place of the Work</i>. 8.3.7 Prior to delivering a notice of <i>Adjudication</i> in a form prescribed by the <i>Act</i>, the parties agree to first address all disputes by attending at least one meeting with the <i>Owner</i>’s representative, the <i>Consultant</i>’s representative, and the <i>Contractor</i>’s representative, prior to commencing an <i>Adjudication</i>. The parties agree that such steps will be taken to resolve any disputes in a timely and cost effective manner. If a resolution to the dispute(s) is not made at such a meeting, any party who plans to commence an <i>Adjudication</i> shall provide the other party with 5 <i>Working Days</i>’ <i>Notice in Writing</i> of its intention to issue a notice of <i>Adjudication</i>. 8.3.8 Other than where the <i>Contractor</i> is obliged to commence an <i>Adjudication</i> pursuant to an undertaking under the <i>Construction Act</i>, neither the <i>Owner</i> nor the <i>Contractor</i> shall commence an <i>Adjudication</i> during the <i>Restricted Period</i>. 8.3.9 Where either party has delivered a notice of <i>Adjudication</i> in a form prescribed by the <i>Act</i>, the procedures and rules set out under the <i>Construction Act</i> and the regulations thereto shall govern the <i>Adjudication</i>.”

PART 9 PROTECTION OF PERSONS AND PROPERTY

SC45 GC 9.1 PROTECTION OF WORK AND PROPERTY

SC45.1	9.1.1.1	Delete subparagraph 9.1.1.1 in its entirety and <u>substitute</u> the following: “.1 errors in the <i>Contract Documents</i> which the <i>Contractor</i> could not have discovered applying the standard of care described in paragraph 3.14.1;”
SC45.2	9.1.2	Delete paragraph 9.1.2 in its entirety and <u>substitute</u> as follows: “9.1.2 Before commencing any <i>Work</i>, the <i>Contractor</i> shall determine the locations of all underground or hidden utilities and structures indicated in or inferable from the <i>Contract Documents</i>, or that are inferable from an inspection of the <i>Place of the Work</i> exercising the degree of care and skill described in paragraph 3.14.1.”
SC45.3	9.1.5	Add new paragraph 9.1.5 as follows:



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		"9.1.5 With respect to any damage to which paragraphs 9.1.3 or 9.1.4 apply, the <i>Contractor</i> shall neither undertake to repair or replace any damage whatsoever to the work of other contractors, or to adjoining property, nor acknowledge that the same was caused or occasioned by the <i>Contractor</i>, without first consulting the <i>Owner</i> and receiving written instructions as to the course of action to be followed from either the <i>Owner</i> or the <i>Consultant</i>. Where, however, there is danger to life, the environment, or public safety, the <i>Contractor</i> shall take such emergency action as it deems necessary to remove the danger."

SC46 GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

SC46.1	9.2.1	Amend GC 9.2.1 by <u>inserting</u> the following to the end of the paragraph: "For the purposes of GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES, <i>Excess Soil</i> shall not be considered a 'toxic and hazardous substance'."
SC46.2	9.2.5.5	Add a new subparagraph 9.2.5.5 as follows: ".5 in addition to the steps described in subparagraph 9.2.5.3, take any further steps it deems necessary to mitigate or stabilize any conditions resulting from encountering toxic or hazardous substances or materials."
SC46.3	9.2.6	<u>Amend</u> GC 9.2.6 by <u>adding</u> the following words after the word "responsible" in the second line: "or whether any toxic or hazardous substances or materials already at the <i>Place of the Work</i> (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the <i>Contractor</i> or anyone for whom the <i>Contractor</i> is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damages to the property of the <i>Owner</i> or others,".
SC46.4	9.2.8	<u>Amend</u> GC 9.2.8 by <u>adding</u> the following words after the word "responsible" in the second line: "or whether any toxic or hazardous substances or materials already at the <i>Place of the Work</i> (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the <i>Contractor</i> or anyone for whom the <i>Contractor</i> is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damages to the property of the <i>Owner</i> or others,".
SC46.5	9.2.10	<u>Add</u> new paragraph 9.2.10 as follows: "9.2.10 The <i>Contractor</i>, <i>Subcontractors</i> and <i>Suppliers</i> shall not bring on to the <i>Place of the Work</i> any toxic or hazardous substances and materials except as required in order to perform the <i>Work</i>. If such toxic or hazardous substances or materials are required, storage in quantities sufficient to allow work to proceed to the end of any current work week only shall be permitted. All such toxic and hazardous materials and substances shall be handled and disposed of only in accordance with all laws and regulations that are applicable at the <i>Place of the Work</i>."

SC47 GC 9.4 CONSTRUCTION SAFETY

SC47.1	9.4.1	<u>Delete</u> GC 9.4.1 in its entirety and <u>replace</u> it with the following:



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		"9.4.1 The <i>Contractor</i> shall be solely responsible for construction safety at the <i>Place of the Work</i> and for compliance with the rules, regulations, and practices required by the <i>OHSA</i>, including, but not limited to those of the "constructor", and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the <i>Work</i>. The <i>Contractor's</i> health and safety program documentation shall be made available for review by the <i>Owner</i> or <i>Consultant</i> immediately upon request. Without limiting the foregoing, the <i>Contractor</i> shall be solely responsible for construction safety in respect of the <i>Consultant, Subcontractors</i> and <i>Suppliers</i>, the <i>Owner's</i> own forces, <i>Other Contractors</i>, and all persons attending the <i>Place of the Work</i> during the course of the <i>Project</i>."
SC47.2	9.4.2	Amend GC 9.4.2 by <u>adding</u> the following words after "and the <i>Contractor</i> ": ", <i>Subcontractors</i> and <i>Suppliers</i> ".
SC47.3	9.4.3	Amend GC 9.4.3 by <u>adding</u> the following words after "and the <i>Contractor</i> ": ", <i>Subcontractors</i> and <i>Suppliers</i> ".
SC47.4	9.4.4	<u>Delete</u> GC 9.4.4 and replace it with the following: "9.4.4 The <i>Owner</i> undertakes to include in its contracts with other contractors and in its instructions to its own forces the requirement that the other contractor or its own forces, as the case may be, comply with the policies and procedures of and the directions and instructions from the <i>Contractor</i> with respect to occupational health and safety and related matters."
SC47.5	9.4.5	<u>Delete</u> GC 9.4.5 in its entirety and <u>replace</u> it with the following: "9.4.5 Prior to the commencement of the <i>Work</i>, the <i>Contractor</i> shall submit to the <i>Owner</i>: .1 a current WSIB clearance certificate; .2 copies of the <i>Contractor's</i> insurance policies having application to the <i>Project</i> or certificates of insurance, at the option of the <i>Owner</i>; .3 documentation setting out the <i>Contractor's</i> in-house safety programs; .4 a copy of the Notice of Project filed with the Ministry of Labour naming itself as "constructor" under the <i>OHSA</i>; and .5 copies of any documentation or notices to be filed or delivered to the authorities having jurisdiction for the regulation of occupational health and safety at the <i>Place of the Work</i>;"
SC47.6	9.4.6 to 9.4.12	<u>Add</u> new GC 9.4.6, 9.4.7, 9.4.8, 9.4.9, 9.4.10, 9.4.11, and 9.4.12 as follows: "9.4.6 The <i>Contractor</i> shall indemnify and save harmless the <i>Owner</i>, its agents, trustees, officers, directors, employees, consultants, successors, appointees, and assigns from and against the consequences of any and all safety infractions committed by the <i>Contractor</i> under <i>OHSA</i> and any other occupational health and safety legislation in force at the <i>Place of the Work</i> including the payment of legal fees and disbursements on a solicitor and client basis. Such indemnity shall apply to the extent to which the <i>Owner</i> is not covered by insurance. 9.4.7 If the <i>Owner</i> is of the reasonable opinion that the <i>Contractor</i> has not taken such precautions as are necessary to ensure compliance with the requirements of paragraph 9.4.1, the <i>Owner</i> may take any remedial measures which it deems necessary, including stopping the performance of all or any portion of the <i>Work</i>, and



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		the <i>Owner</i> may use its employees, the <i>Contractor</i>, any <i>Subcontractor</i> or any other contractors to perform such remedial measures. 9.4.8 The <i>Contractor</i> shall file any notices or any similar document required pursuant to the <i>Contract</i> or the safety regulations in force at the <i>Place of the Work</i>. This duty of the <i>Contractor</i> will be considered to be included in the <i>Work</i> and no separate payment therefore will be made to the <i>Contractor</i>. 9.4.9 Unless otherwise provided in the <i>Contract Documents</i>, the <i>Contractor</i> shall develop, maintain and supervise for the duration of the <i>Work</i> a comprehensive safety program that will effectively incorporate and implement all required safety precautions. The program shall, at a minimum, respond fully to the applicable safety regulations and general construction practices for the safety of persons or property, including, without limitation, any general safety rules and regulations of the <i>Owner</i> and any workers' compensation or occupational health and safety statutes or regulations in force at the <i>Place of the Work</i>. 9.4.10 The <i>Contractor</i> shall provide a copy of the safety program described in GC 9.4.9 hereof to the <i>Consultant</i> for delivery to the <i>Owner</i> prior to the commencement of the <i>Work</i>, and shall, ensure, as far as it is reasonably practical to do so, that every employer and worker performing work in respect of the <i>Project</i> complies with such program. 9.4.11 The <i>Contractor</i> shall arrange regular safety meetings, and shall supply and maintain, at its own expense, at its office or other well-known place at the job site, safety equipment necessary to protect the workers and general public against accident or injury as prescribed by the authorities having jurisdiction at the <i>Place of the Work</i>, including, without limitation, articles necessary for administering first-aid to any person and an emergency procedure for the immediate removal of any injured person to a hospital or a doctor's care. 9.4.12 The <i>Contractor</i> shall promptly report in writing to the <i>Owner</i> and the <i>Consultant</i> all accidents of any sort arising out of or in connection with the performance of the <i>Work</i>, whether on or adjacent to the job site, giving full details and statement of witnesses. If death or serious injuries or damages are caused, the accident shall be promptly reported by the <i>Contractor</i> to the <i>Owner</i> and the <i>Consultant</i> by telephone or messenger in addition to any reporting required under the applicable safety regulations.”.

PART 10 GOVERNING REGULATIONS

SC48 GC 10.1 TAXES AND DUTIES

SC48.1	10.1.2	<u>Amend</u> paragraph 10.1.2 by <u>adding</u> the following sentence to the end of the paragraph: “For greater certainty, the <i>Contractor</i> shall not be entitled to any mark-up for overhead or profit on any increase in such taxes and duties and the <i>Owner</i> shall not be entitled to any credit relating to mark-up for overhead or profit on any decrease in such taxes. The <i>Contractor</i> shall provide a detailed breakdown of <u>Additional</u> taxes if requested by the <i>Owner</i> in a form satisfactory to the <i>Owner</i>.”
SC48.2	10.1.3	<u>Add</u> new paragraph 10.1.3 as follows: “10.1.3 Where the <i>Owner</i> is entitled to an exemption or a recovery of sales taxes, customs duties, excise taxes or <i>Value Added Taxes</i> applicable to the <i>Contract</i>, the <i>Contractor</i> shall, at the request of the <i>Owner</i>, assist with the application for any exemption, recovery or refund of all such taxes and duties and all amounts recovered or exemptions obtained shall be for the sole benefit of the <i>Owner</i>. The



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		<i>Contractor</i> agrees to endorse over to the <i>Owner</i> any cheques received from the federal or provincial governments, or any other taxing authority, as may be required to give effect to this paragraph."

SC49 GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

SC49.1	10.2.5	<u>Amend</u> paragraph 10.2.5 by <u>adding</u> the words "Subject to paragraph 3.4" at the beginning of the paragraph. -and- <u>Add</u> the following to the end of the second sentence: "...and no further <i>Work</i> on the affected components of the <i>Contract</i> shall proceed until these directives have been obtained by the <i>Contractor</i> from the <i>Consultant</i>."
SC49.2	10.2.6	<u>Amend</u> paragraph 10.2.6 by <u>adding</u> the following sentence to the end of the paragraph: "In the event the <i>Owner</i> suffers loss or damage as a result of the <i>Contractor's</i> failure to comply with paragraph 10.2.5 and notwithstanding any limitations described in paragraph 12.1.1, the <i>Contractor</i> agrees to indemnify and to hold harmless the <i>Owner</i> and the <i>Consultant</i> from and against any claims, demands, losses, costs, damages, actions suits or proceedings resulting from such failure by the <i>Contractor</i>."
SC49.3	10.2.7	<u>Amend</u> paragraph 10.2.7 by inserting the words "which changes were not, or could not have reasonably been known to the <i>Owner</i> or to the <i>Contractor</i>, as applicable, at the time of bid closing and which changes did not arise as a result of a public emergency or other <i>Force Majeure</i> event" to the second line, after the words "authorities having jurisdiction".
SC49.4	10.2.8	<u>Add</u> new paragraph 10.2.8 as follows: "10.2.8 The <i>Contractor</i> shall furnish all certificates that are required or given by the appropriate governmental authorities as evidence that the <i>Work</i> as installed conforms with the laws and regulations of authorities having jurisdiction, including certificates of compliance for the <i>Owner's</i> occupancy or partial occupancy. The certificates are to be final certificates giving complete clearance of the <i>Work</i>, in the event that such governmental authorities furnish such certificates."

SC50 GC 10.4 WORKERS' COMPENSATION

SC50.1	10.4.1	<u>Delete</u> paragraph 10.4.1 and <u>replace</u> with the following: "10.4.1 Prior to commencing the <i>Work</i>, and with each and every application for payment thereafter, including the <i>Contractor's</i> application for payment of the holdback amount following <i>Substantial Performance of the Work</i> and again with the <i>Contractor's</i> application for final payment, the <i>Contractor</i> shall provide evidence of compliance with workers' compensation legislation in force at the <i>Place of the Work</i>, including payments due thereunder."

SC51 GC 11.1 INSURANCE

SC51.1	11.1	<u>Delete</u> entirety of GC 11.1 and <u>replace</u> with the following: "GC 11.1 INSURANCE



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		11.1.1 Without restricting the generality of GC 12 – INDEMNIFICATION, the <i>Contractor</i> shall provide, maintain, and pay for the insurance coverages specified in GC 11.1 – INSURANCE. Unless otherwise stipulated, the duration of each insurance policy shall be from the date of commencement of the <i>Work</i> until the expiration of the warranty periods set out in the <i>Contract Documents</i>. Prior to commencement of the <i>Work</i> and upon the placement, renewal, <u>amendment</u>, or extension of all or any part of the insurance, the <i>Contractor</i> shall promptly provide the <i>Owner</i> with confirmation of coverage and, if required, a certified true copy of the policies certified by an authorized representative of the insurer together with copies of any <u>amending</u> endorsements. .1 General Liability Insurance General liability insurance shall be in the name of the <i>Contractor</i>, with the <i>Owner</i> and the <i>Consultant</i> named as <u>Additional</u> insureds, with limits of not less than \$10,000,000.00 inclusive per occurrence for bodily injury, death, and damage to property, including loss of use thereof, for itself and each of its employees, <i>Subcontractors</i> and/or agents. The insurance coverage shall not be less than the insurance required by IBC Form 2100, or its equivalent <u>replacement</u>, provided that IBC Form 2100 shall contain the latest edition of the relevant CCDC endorsement form. To achieve the desired limit, umbrella, or excess liability insurance may be used. All liability coverage shall be maintained for completed operations hazards from the date of <i>Ready-for-Takeover</i>, as set out in the certificate of <i>Ready-for-Takeover</i>, on an ongoing basis for a period of 6 years following <i>Ready-for-Takeover</i>. Where the <i>Contractor</i> maintains a single, blanket policy, the <u>Addition</u> of the <i>Owner</i> and the <i>Consultant</i> is limited to liability arising out of the <i>Project</i> and all operations necessary or incidental thereto. The policy shall be endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in advance of any cancellation and of change or <u>amendment</u> restricting coverage. .2 Automobile Liability Insurance Automobile liability insurance in respect of licensed vehicles shall limits of not less than \$5,000,000.00 inclusive per occurrence for bodily injury, death and damage to property, covering all licensed vehicles <i>owned</i> or leased by the <i>Contractor</i>, and endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in advance of any cancellation, change or <u>amendment</u> restricting coverage. Where the policy has been issued pursuant to a government-operated automobile insurance system, the <i>Contractor</i> shall provide the <i>Owner</i> with confirmation of automobile insurance coverage for all automobiles registered in the name of the <i>Contractor</i>. .3 Aircraft and Watercraft Liability Insurance Where determined necessary by the <i>Contractor</i>, acting reasonably, aircraft and watercraft liability insurance will be obtained in accordance with the provisions of paragraph 11.1.3. Aircraft and watercraft liability insurance with respect to owned or non-owned aircraft and watercraft if used directly or indirectly in the performance of the <i>Work</i>, including use of <u>Additional</u> premises, shall be subject to limits of not less than \$2,000,000.00 inclusive per occurrence for bodily injury, death and damage to property, including loss of use thereof and limits of not less than \$2,000,000.00 for aircraft passenger hazard. Such insurance shall be in a form acceptable to the <i>Owner</i>. The policies shall be endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in advance of cancellation, change or <u>amendment</u> restricting coverage. .4 Property and Boiler and Machinery Insurance (1) Builder's Risk property insurance shall be in the name of the <i>Contractor</i> with the <i>Owner</i> and the <i>Consultant</i> named as <u>Additional</u> insureds. The policy shall



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		insure against all risks of direct physical loss or damage to the property insured which shall include all property included in the <i>Work</i>, whether owned by the <i>Contractor</i> or the owner or owned by others, so long as the property forms part of the <i>Work</i>. The property insured also includes all materials and supplies necessary to complete the work, whether installed in the work temporarily or permanently, in storage on the project site, or in transit to the project site, as well as temporary buildings, scaffolding, falsework forms, hoardings, excavation, site preparation and similar work. The insurance shall be for not less than the sum of the amount of the contract price and the full value of products that are specified to be provided by the owner for incorporation into the work, if applicable, with the deductible of \$10,000.00 payable by the contractor. The insurance shall include the foregoing and, otherwise, shall not be less than the insurance required by IBC Form 4042 or its equivalent <u>replacement</u> provided that the IBC Form 4042 shall include the latest <u>Addition</u> of the relevant CCDC endorsement form. The coverage shall be based on a completed value form and shall be maintained continuously until ten (10) days after the date of the final certificate of payment. (2) Boiler and machinery insurance shall be in the name of the <i>Contractor</i>, with the <i>Owner</i> and the <i>Consultant</i> named as <u>Additional</u> insureds, for not less than the <u>replacement</u> value of the boilers, pressure vessels and other insurable objects forming part of the <i>Work</i>. The insurance provided shall not be less than the insurance provided by the “Comprehensive Boiler and Machinery Form” and shall be maintained continuously from commencement of use or operation of the property insured and until 10 days after the date of the final certificate for payment. (3) The policies shall allow for partial or total use or occupancy of the <i>Work</i>. (4) The policies shall provide that, in the case of a loss or damage, payment shall be made to the <i>Owner</i> and the <i>Contractor</i> as their respective interests may appear. The <i>Contractor</i> shall act on behalf of the <i>Owner</i> for the purpose of adjusting the amount of such loss or damage payment with the insurers. When the extent of the loss or damage is determined, the <i>Contractor</i> shall proceed to restore the <i>Work</i>. Loss or damage shall not affect the rights and obligations of either party under the <i>Contract</i> except that the <i>Contractor</i> shall be entitled to such reasonable extension of the <i>Contract Time</i>, relative to the extent of the loss or damage, as determined by the <i>Owner</i>, in its sole discretion. (5) The <i>Contractor</i> shall be entitled to receive from the <i>Owner</i>, in <u>Addition</u> to the amount due under the <i>Contract</i>, the amount at which the <i>Owner's</i> interest in restoration of the <i>Work</i> has been appraised, such amount to be paid as the restoration of the <i>Work</i> proceeds and as provided in GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT and GC 5.3 – PROGRESS PAYMENT. In <u>Addition</u>, the <i>Contractor</i> shall be entitled to receive from the payments made by the insurer the amount of the <i>Contractor's</i> interest in the restoration of the <i>Work</i>. (6) In the case of loss or damage to the <i>Work</i> arising from the work of other contractors, or the <i>Owner's</i> own forces, the <i>Owner</i>, in accordance with the <i>Owner's</i> obligations under paragraph 3.2.2.4 of GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS, shall pay the <i>Contractor</i> the cost of restoring the <i>Work</i> as the restoration of the <i>Work</i> proceeds and as provided in GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT and GC 5.3 – PROGRESS PAYMENT. .5 Contractors' Equipment Insurance “All risks” contractors' equipment insurance covering construction machinery and equipment used by the <i>Contractor</i> for the performance of the <i>Work</i>, excluding boiler insurance, shall be in a form acceptable to the <i>Owner</i> and shall not allow subrogation claims by the insurer against the <i>Owner</i>. The policies shall be endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in



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		advance of cancellation, change or <u>amendment</u> restricting coverage. Subject to satisfactory proof of financial capability by the <i>Contractor</i> for self-insurance of his equipment, the <i>Owner</i> agrees to waive the equipment insurance requirement. 11.1.2 The <i>Contractor</i> shall be responsible for deductible amounts under the policies except where such amounts may be excluded from the <i>Contractor's</i> responsibility by the terms of GC 9.1 - PROTECTION OF WORK AND PROPERTY and GC 9.2 - DAMAGES AND MUTUAL RESPONSIBILITY. 11.1.3 Where the full insurable value of the <i>Work</i> is substantially less than the <i>Contract Price</i>, the <i>Owner</i> may reduce the amount of insurance required to waive the course of construction insurance requirement. 11.1.4 If the <i>Contractor</i> fails to provide or maintain insurance as required by the <i>Contract Documents</i>, then the <i>Owner</i> shall have the right to provide and maintain such insurance and provide evidence of same to the <i>Contractor</i>. The <i>Contractor</i> shall pay the costs thereof to the <i>Owner</i> on demand, or the <i>Owner</i> may deduct the amount that is due or may become due to the <i>Contractor</i>. 11.1.5 All required insurance policies shall be with insurers licensed to underwrite insurance in the jurisdiction of the <i>Place of the Work</i>."

SC52 *NEW* GC 11.2 CONTRACT SECURITY

SC52.1	GC 11.2	<u>Add</u> new GC 11.2 – CONTRACT SECURITY as follows: "GC 11.2 CONTRACT SECURITY 11.2.1 The <i>Contractor</i> shall, prior to the execution of the <i>Contract</i>, furnish a performance bond and labour and material payment bond which meets the requirements under paragraph 11.2.2. 11.2.2 The performance bond and labour and material payment bond shall: .1 be issued by a duly licensed surety company, which has been approved by the <i>Owner</i> and is permitted under the <i>Construction Act</i>, .2 be issued by an insurer licensed under the <i>Insurance Act</i> (Ontario) and authorized to transact a business of suretyship in the Province of Ontario; .3 shall be in the form prescribed by the <i>Construction Act</i>; .4 have a coverage limit of at least 50 per cent of the <i>Contract Price</i>, or such other percentage of the <i>Contract Price</i> as stated in the <i>Contract Documents</i>; .5 extends protection to <i>Subcontractors</i>, <i>Suppliers</i>, and any other persons supplying labour or materials to the <i>Project</i>; and .6 shall be maintained in good standing until the fulfillment of the <i>Contract</i>, including all warranty and maintenance periods set out in the <i>Contract Documents</i>. 11.2.3 It is the intention of the parties that the performance bond shall be applicable to all of the <i>Contractor's</i> obligations in the <i>Contract Document</i> and, wherever a performance bond is provided with language which conflicts with this intention, it shall be deemed to be amended to comply. The <i>Contractor</i> represents and warrants to the <i>Owner</i> that it has provided its surety with a copy of the <i>Contract Documents</i> prior to the issuance of such bonds.



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		11.2.4 Without limiting the foregoing in any way, the bonds shall indemnify and hold harmless the <i>Owner</i> for and against costs and expenses (including legal and <i>Consultant</i> services and court costs) arising out of or as a consequence of any default of the <i>Contractor</i> under this <i>Contract</i>. 11.2.4 The <i>Contractor</i> shall be responsible for notifying the surety company of any changes made to the <i>Contract</i> during the course of construction. 11.2.5 The premiums for bonds required by the <i>Contract Documents</i> shall be included in the <i>Contract Price</i>. 11.2.6 Should the <i>Owner</i> require additional bonds by the <i>Contractor</i> or any of his <i>Subcontractors</i>, after the receipt of bids for the <i>Work</i>, the <i>Contract Price</i> shall be increased by all direct costs attributable to providing such bonds. The <i>Contractor</i> shall promptly provide the <i>Owner</i>, through the <i>Consultant</i>, with any such bonds that may be required."

PART 12 OWNER TAKEOVER

SC53 GC 12.1 READY-FOR-TAKEOVER

SC53.1	12.1.1	<u>Delete</u> GC 12.1.1 in its entirety and <u>replace</u> it with the following: "12.1.1 <i>Ready-for-Takeover</i> shall be achieved when all of the following has occurred, as verified and approved by the <i>Owner</i>: .1 <i>Substantial Performance of the Work</i> has been achieved, as certified by the <i>Consultant</i>; .2 a permit for occupancy of the <i>Place of the Work</i> has been obtained from the authorities having jurisdiction; .3 the <i>Work</i> to be performed under the <i>Contract</i> has satisfied the requirements for deemed completion in accordance with Section 2(3) of the <i>Construction Act</i>; .4 final cleaning and waste removal, as required by the <i>Contract Documents</i>; .5 the <i>Contractor</i> has delivered to the <i>Consultant</i> and the <i>Owner</i> all inspection certificates from authorities having jurisdiction with respect to any component of the <i>Work</i> which has been completed; .6 subject only to GC 12.1.2, the entire <i>Work</i> has been completed to the requirements of the <i>Contract Documents</i>, including completion of all items on the punch list prepared at the time of <i>Substantial Performance of the Work</i> and the <i>Work</i> is being used for its intended purpose, and is so certified by the <i>Consultant</i>; .7 subject only to GC 12.1.2, the <i>Contractor</i> has submitted to the <i>Owner</i> and the <i>Consultant</i> in a collated and organized matter, all <i>Close-Out Documentation</i> and any other materials or documentation required by the <i>Contract Documents</i>; .8 subject only to GC 12.1.2, all <i>Products</i>, systems and components of the <i>Project</i> have been commissioned and certified for operation and accepted by the <i>Owner</i> and <i>Consultant</i>, and



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		9 subject only to GC 12.1.2, the <i>Contractor</i> has submitted to the <i>Owner</i> and the <i>Consultant</i> full and complete as-built drawings and <i>Specifications</i> revised by the <i>Contractor</i> to reflect the as-built state of the <i>Work</i> , clearly showing changes to the <i>Drawings</i> and <i>Specifications</i> from the original <i>Contract Documents</i> , all of which have been approved by the <i>Owner</i> acting reasonably.”
SC53.2	12.1.2	<u>Delete</u> GC 12.1.2 in its entirety and <u>replace</u> it with the following: “12.1.2 The <i>Owner</i> may, in its sole, absolute, and unfettered discretion, waive compliance with a requirement, or a part thereof, for achieving <i>Ready-for-Takeover</i> set out in GC 12.1.1.6 to 12.1.1.9 (inclusive). Where the <i>Owner</i> exercises the discretion afforded under this GC 12.1.2, the <i>Contractor</i> shall be required to comply with GC 5.5.1.2 as part of its application for final payment and the <i>Owner</i> and the <i>Contractor</i> , in consultation with the <i>Consultant</i> , shall establish a reasonable date for completing the <i>Work</i> .”
SC53.3	12.1.3	<u>Delete</u> GC 12.1.3 in its entirety and <u>replace</u> it with the following: “12.1.3 When the <i>Contractor</i> considers the <i>Work Ready-for-Takeover</i> , it shall submit a written application to the <i>Owner</i> and the <i>Consultant</i> for review.”
SC53.4	12.1.4	In GC 12.1.4, <u>delete</u> the words “list and” from the second line.
SC53.5	12.1.5	<u>Delete</u> GC 12.1.5 in its entirety and <u>replace</u> it with the following: “12.1.5 Following the confirmation of the date of <i>Ready-for-Takeover</i> by the <i>Consultant</i> and as confirmed by the <i>Owner</i> , the <i>Contractor</i> may submit a final application for payment in accordance with GC 5.5 – FINAL PAYMENT.”
SC53.6	12.1.6	<u>Delete</u> GC 12.1.6 in its entirety.

SC54 GC 12.2 EARLY OCCUPANCY

SC54.1	GC 12.2	<u>Delete</u> GC 12.2 – EARLY OCCUPANCY BY THE OWNER in its entirety, including all subparagraphs thereunder and <u>replace</u> it with the following: “12.2.1 The <i>Owner</i> reserves the right to take possession of and use for any intended purpose any portion or all of the undelivered portion of the <i>Project</i> even though the <i>Work</i> may not have reached Substantial Performance of the <i>Work</i> , provided that such taking possession and use will not unduly interfere, in any material way, with the progress of the <i>Work</i> . The taking of possession or use of any such portion of the <i>Project</i> shall not be deemed to be the <i>Owner</i> ’s acknowledgement or acceptance of the <i>Work</i> or <i>Project</i> nor shall it relieve the <i>Contractor</i> of any of its obligations under the <i>Contract</i> . 12.2.2 Whether the <i>Project</i> contemplates <i>Work</i> by way of renovations in buildings which will be in use or be occupied during the course of the <i>Work</i> or where the <i>Project</i> involves <i>Work</i> that is adjacent to a structure which is in use or is occupied, the <i>Contractor</i> , without in any way limiting its responsibilities under this <i>Contract</i> , shall take all reasonable steps to avoid interference with fire exits, building access and egress, continuity of electric power and all other utilities, to suppress dust and noise and to avoid conditions likely to propagate mould or fungus of any kind and all other steps reasonably necessary to promote and maintain the safety and comfort of the users and occupants of such structures or adjacent structures.”



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SC55 GC 12.3 WARRANTY

SC55.1	12.3.2	<u>Delete</u> from the first line of paragraph 12.3.2 the word “The” and <u>replace</u> it with the words “Subject to GC 1.1.3, the...”
SC55.2	12.3.7 to 12.3.12	<u>Add</u> new paragraphs 12.3.7 to 12.3.12 as follows: “12.3.7 Where required by the <i>Contract Documents</i>, the <i>Contractor</i> shall provide a maintenance bond as security for the performance of the <i>Contractor’s</i> obligations as set out in GC 12.3 WARRANTY. 12.3.8 The <i>Contractor</i> shall provide fully and properly completed and signed copies of all warranties and guarantees required by the <i>Contract Documents</i>, containing: .1 the proper name of the <i>Owner</i>; .2 the proper name and address of the <i>Project</i>; .3 the date the warranty commences, which shall be at the “<i>Ready-for-Takeover</i>” unless otherwise agreed upon by the <i>Consultant</i> in writing. .4 a clear definition of what is being warranted and/or guaranteed as required by the <i>Contract Documents</i>; and .5 the signature and seal (if required by the governing law of the <i>Contract</i>) of the company issuing the warranty, countersigned by the <i>Contractor</i>. 12.3.9 Should any <i>Work</i> be repaired or replaced during the time period for which it is covered by the specified warranty, a new warranty shall be provided under the same conditions and for the same period as specified herein before. The new warranty shall commence at the completion of the repair or replacement. 12.3.10 The <i>Contractor</i> shall ensure that its <i>Subcontractors</i> are bound to the requirements of GC 12.3 – WARRANTY for the <i>Subcontractor’s</i> portion of the <i>Work</i>. 12.3.11 The <i>Contractor</i> shall ensure that all warranties, guarantees or other obligations for <i>Work</i>, services or <i>Products</i> performed or supplied by any <i>Subcontractor</i>, <i>Supplier</i> or other person in connection with the <i>Work</i> are obtained and available for the direct benefit of the <i>Owner</i>. In the alternative, the <i>Contractor</i> shall assign to the <i>Owner</i> all warranties, guarantees or other obligations for <i>Work</i>, services or <i>Products</i> performed or supplied by any <i>Subcontractor</i>, <i>Supplier</i> or other person in connection with the <i>Work</i> and such assignment shall be with the consent of the assigning party, where required by law, or by the terms of that party’s contract. Such assignment shall be in addition to, and shall in no way limit, the warranty rights of the <i>Owner</i> under the <i>Contract Documents</i>. 12.3.12 The <i>Contractor</i> shall commence or correct any deficiency within 2 <i>Working Days</i> after receiving a <i>Notice in Writing</i> from the <i>Owner</i> or the <i>Consultant</i>, and shall complete the <i>Work</i> as expeditiously as possible, except in the case where the deficiency prevents maintaining security or where basic systems essential to the ongoing business of the <i>Owner</i> and/or its tenants cannot be maintained operational as designed. In those circumstances all necessary corrections and/or installations of temporary replacements shall be carried out immediately as an emergency service. Should the <i>Contractor</i> fail to provide this emergency service within 8 hours of a request being made during the normal business hours of the <i>Contractor</i>, the <i>Owner</i> is authorized, notwithstanding GC 3.1, to carry out all necessary repairs or replacements at the <i>Contractor’s</i> expense.”



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PART 13 INDEMNIFICATION AND WAIVER

SC56 GC 13.1 INDEMNIFICATION

SC56.1	GC 13.1	<u>Delete</u> GC 13.1 – INDEMNIFICATION in its entirety and <u>replace</u> it with the following: “13.1.1 The <i>Contractor</i> shall indemnify and hold harmless the <i>Owner</i>, its parent, subsidiaries and affiliates, their respective partners, trustees, officers, directors, agents and employees and the <i>Consultant</i> from and against any and all claims, liabilities, expenses, demands, losses, damages, actions, costs, suits, or proceedings (hereinafter called “claims”), whether in respect of claims suffered by the <i>Owner</i> or in respect of claims by third parties, that directly or indirectly arise out of, or are attributable to, the acts or omissions of the <i>Contractor</i>, its employees, agents, <i>Subcontractors</i>, <i>Suppliers</i> or any other persons for whom it is in law responsible (including, without limitation, claims that directly or indirectly arise out of, or are attributable to, loss of use or damage to the <i>Work</i>, the <i>Owner's</i> property or equipment, the <i>Contractor's</i> property or equipment or equipment or property adjacent to the <i>Place of the Work</i> or death or injury to the <i>Contractor's</i> personnel). 13.1.2 The <i>Owner</i> shall indemnify and hold the <i>Contractor</i>, its agents and employees harmless from and against claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the <i>Contractor's</i> performance of the <i>Contract</i> which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the <i>Place of the Work</i>. 13.1.3 The provisions of GC 13.1 - INDEMNIFICATION shall survive the termination of the <i>Contract</i>, howsoever caused and no payment or partial payment, no issuance of a final certificate of payment and no occupancy in whole or in part of the <i>Work</i> shall constitute a waiver or release of any of the provisions of GC 13.1 13.1.4 Notwithstanding the provisions of GC1.1 - CONTRACT DOCUMENTS, GC 1.1.6, GC13.1 - INDEMNIFICATION shall govern over the provisions of GC 1.3.1 of GC1.3 – RIGHTS AND REMEDIES.”

SC57 GC 13.2 WAIVER OF CLAIMS

SC57.13	13.2.1	In paragraph 13.2.1 in the third line after the word “limitation” <u>add</u> the words “claims for delay pursuant to GC 6.5 DELAYS” -and- <u>add</u> the words “(collectively “Claims”)” after “<i>Ready-for-Takeover</i>” in the fourth line.
SC57.14	13.2.1.1	In subparagraph 13.2.1.1, in each instance change the word “claims” to “Claims” and change the word “claim” to “Claim”.
SC57.15	13.2.1.2	In subparagraph 13.2.1.2 change the word “claims” to “Claims”.
SC57.16	13.2.1.3	<u>Delete</u> subparagraph 13.2.1.3 in its entirety.
SC57.17	13.2.1.4	In paragraph 13.2.1.4 change the word “claims” to “Claims”.
SC57.18	13.2.2.1	In paragraph 13.2.2.1 <u>delete</u> the words “in paragraphs 13.2.1.2 and 13.2.1.3” and <u>replace</u> them with “in paragraph 13.2.1.2” -and- change the word “claims” to “Claims” in both instances and change the word “claim” to “Claim”.



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SC57.19	13.2.3	<u>Delete</u> paragraph 13.2.3 in its entirety.
SC57.20	13.2.4	<u>Delete</u> paragraph 13.2.4 in its entirety.
SC57.21	13.2.5	<u>Delete</u> paragraph 13.2.5 in its entirety.
SC57.22	13.2.6	In paragraph 13.2.6 change the word “claim” to “Claim” in all instances in the paragraph.
SC57.23	13.2.8	In paragraph 13.2.8 change “The party” to “The <i>Contractor</i> ” -and- change the word “claim” to “Claim” in all instances in the paragraph.
SC57.24	13.2.9	In paragraph 13.2.9 <u>delete</u> the words “under paragraphs 13.2.1 or 13.2.3” and <u>replace</u> them with “under paragraph 13.2.1” -and- change both instances of the words “the party” to “the <i>Contractor</i> ”. Change the word “claim” to “Claim” in all instances in the paragraph.

SC58 *NEW* PART 14 OTHER PROVISIONS

SC58.1	14.1	<u>Add</u> new PART 14 – OTHER PROVISIONS as follows: “PART 14 OTHER PROVISIONS GC 14.1 OWNERSHIP OF MATERIALS 14.1.1 Unless otherwise specified, all materials existing at the <i>Place of the Work</i> at the time of execution of the <i>Contract</i> shall remain the property of the <i>Owner</i>. All <i>Work</i> and <i>Products</i> delivered to the <i>Place of the Work</i> by the <i>Contractor</i> shall be the property of the <i>Owner</i>. The <i>Contractor</i> shall remove all surplus or rejected materials as its property when notified in writing to do so by the <i>Consultant</i>.”
SC58.2	14.2	<u>Add</u> new GC 14.2 – CONSTRUCTION LIENS as follows: “GC 14.2 LIENS 14.2.1 Notwithstanding any other provision in the <i>Contract</i>, the <i>Consultant</i> shall not be obligated to issue a certificate, and the <i>Owner</i> shall not be obligated to make payment, subject to the <i>Owner’s</i> requirement to issue a <i>Notice of Non-Payment</i> (Form 1.1) to the <i>Contractor</i>, if at the time such certificate or payment was otherwise due: .1 a claim for lien has been registered against the <i>Project</i> lands by a <i>Subcontractor</i> or a <i>Supplier</i> that has not been vacated or discharged by the <i>Contractor</i> in accordance with the requirements of this <i>Contract</i>, or .2 if the <i>Owner</i> or a mortgagee of the <i>Project</i> lands has received a written notice of a lien that has not been resolved by the <i>Contractor</i> through the posting of security or otherwise. 14.2.2 In the event a construction lien arising from the performance of the <i>Work</i> is registered or preserved against the <i>Project</i> lands by a <i>Subcontractor</i> or a <i>Supplier</i>, or a written notice of a lien is given or a construction lien action is commenced



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		against the <i>Owner</i> by a <i>Subcontractor</i> or a <i>Supplier</i>, then the <i>Contractor</i> shall, at its own expense: .1 within 10 calendar days of registration of the construction lien, vacate or discharge the lien from title to the premises (i.e. the <i>Place of the Work</i>). If the lien is merely vacated, the <i>Contractor</i> shall, if requested, undertake the <i>Owner's</i> defence of any subsequent action commenced in respect of the lien, at the <i>Contractor's</i> sole expense; .2 within 10 calendar days of receiving notice of a written notice of a lien, post security with the Ontario Superior Court of Justice so that the written notice of a lien no longer binds the parties upon whom it was served; and .3 satisfy all judgments and pay all costs arising from such construction liens and actions and fully indemnify the <i>Owner</i> against all costs and expenses arising from same, including legal costs on a full indemnity basis.
	14.2.3	In the event that the <i>Contractor</i> fails or refuses to comply with its obligations pursuant to paragraph 14.2.2, the <i>Owner</i> shall, at its option, be entitled to take all steps necessary to address any such construction liens including, without limitation and in addition to the <i>Owner's</i> rights under paragraph 13.2.4, the posting of security with the Ontario Superior Court of Justice to vacate the claim for lien from title to the <i>Project</i> lands, and in so doing will be entitled to a full indemnity from the <i>Contractor</i> for all legal fees, security, disbursements and other costs incurred and will be entitled to deduct same from amounts otherwise owing to the <i>Contractor</i>.
	14.2.4	In the event that any <i>Subcontractor</i> or <i>Supplier</i> registers any claim for lien with respect to all or part of the <i>Place of Work</i>, the <i>Owner</i> shall have the right to withhold, in addition to the statutory holdback, the full amount of said claim for lien plus either: (a) \$250,000 if the claim for lien is in excess of \$1,000,000 or (b) 25% of the value of the claim for lien and to bring a motion to vacate the registration of said claim for lien and any associated certificate of action in respect of that lien, in accordance with Section 44 of the <i>Act</i>, by paying into court as security the amount withheld.
	14.2.5	Nothing in this GC 14.2 serves to preclude the <i>Contractor</i> from preserving and perfecting its lien in the event of non-payment by the <i>Owner</i>."



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APPENDIX 1
to the Supplementary Conditions

Project-specific requirements for a “Proper Invoice”

To satisfy the requirements for a *Proper Invoice*, the following criteria, as may be applicable in each case, must be included with the *Contractor's* application for payment:

- .1 the written bill or request for payment must be in writing;
- .2 the *Contractor's* name and current address;
- .3 the *Contractor's* HST registration number;
- .4 the date the application for payment was prepared by the *Contractor*;
- .5 the period of time in which the services or materials were supplied to the *Owner*;
- .6 the purchase order number provided by the *Owner*;
- .7 reference to the provisions of the *Contract* under which payment is being sought (e.g. GC 5.3 –PAYMENTS for progress payments, GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK GC 5.5 – FINAL PAYMENT for final payment, etc.);
- .8 a description, including quantities where appropriate, of the services or materials, or a portion thereof, that were supplied and form the basis of the *Contractor's* request for payment;
- .9 the amount the *Contractor* is requesting to be paid by the *Owner*, set out in a statement based on the schedule of values approved under GC 5.2.4, separating out any statutory or other holdbacks, set-offs and HST;
- .10 a sworn Statutory Declaration in the form CCDC 9A-2018, only for second and subsequent progress payments;
- .11 a current Workplace Safety Insurance Board clearance certificate;
- .12 a pre-approved schedule of values, supplied by the *Contractor*, for Divisions 1 through 14 of the *Specifications* (or equivalent Construction Specifications Institute Masterformat) of the *Work*, aggregating the total amount of the *Contract Price*, including all supporting invoicing;
- .13 a separate pre-approved schedule of values, supplied by each *Subcontractor*, for each of Division 15, 16, and 17 of the *Specifications* (or equivalent Construction Specifications Institute Masterformat) of the *Work*, aggregating the total amount of the *Contract Price*, including all supporting invoicing;
- .14 invoices and other supporting documentation for all claims against the cash allowance;
- .15 a current, acceptable, and up to date *Construction Schedule Update*;
- .16 if requested by the *Owner*, a current and valid certificate(s) of insurance as required under GC 11.1 – INSURANCE;
- .17 the name, title, telephone number and mailing address of the person at the place of business of the *Contractor* to whom payment is to be directed;
- .18 a current, up to date, and approved *Shop Drawing* log;
- .19 in the case of the *Contractor's* application for final payment, in addition to the foregoing requirements (as applicable):
 - (a) any *Close-Out Documentation*, together with complete and final as-built drawings;



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- (b) the *Contractor's* written request for release of the deficiency holdback, including a statement that no written notices of lien have been received by it;
- (c) the *Contractor's* written certification that there are no outstanding claims, pending claims or future claims from the *Contractor* or their *Subcontractors* or *Suppliers*; and
- (d) sufficient evidence of the *Contractor's* compliance with GC 3.11.



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APPENDIX 2
to the Supplementary Conditions

SPECIAL SUPPLEMENTARY CONDITIONS

The Standard Construction Document CCDC 2 2020 for a Stipulated Price Contract, English version, consisting of the Agreement Between *Owner* and Contractor, Definitions and General Conditions of the Stipulated Price Contract, Parts 1 to 12 inclusive, governing same, together with the changes with the new Construction Act is hereby made part of these Contract Documents, with the following amendments, additions and modifications:

SC59 ARTICLE A-10 TIME OF THE ESSENCE

SC59.1	Article A-10	<u>Delete</u> the header for Article A-10 being “ARTICLE A-10 TIME OF THE ESSENCE” and <u>replace</u> it with the following: “ ARTICLE A-10 TIME OF THE ESSENCE/LIQUIDATED DAMAGES ”.
SC59.2	Articles 10.3 to 10.7	<u>Insert</u> the following new Articles 10.3 to 10.7 as follows: 10.3 The <i>Contractor</i> further acknowledges that it understands that the <i>Owner</i> is responsible and must account to the students and staff of Waterloo Catholic District School Board. A failure by the <i>Contractor</i> to attain <i>Ready-for-Takeover</i> within the time prescribed in the Contract could result in damages to the <i>Owner</i> and to the students and staff of the Waterloo Catholic District School Board, which would be difficult or impractical to quantify but would nevertheless have a significant negative impact on the <i>Owner</i> and its ability to provide services the <i>Owner</i> is obliged to provide to the students and staff of the Waterloo Catholic District School Board. 10.4 Given the significance of the requirement for the Contractor to achieve <i>Ready-for-Takeover</i> , as described in Article A-10.3, without limiting the <i>Owner's</i> entitlement to any additional or other damages, if the <i>Contractor</i> fails to achieve <i>Ready-for-Takeover</i> by the time prescribed in Article A-1, the <i>Owner</i> will incur substantial damages and the extent of such damages shall be incapable or very difficult to accurately measure. Nonetheless, the parties acknowledge that as of the effective date of this <i>Contract</i> , the amount of liquidated damages set forth in Article A-10.5 below represents a good faith estimate on the part of the parties as to the actual potential damages that the <i>Owner</i> would suffer as a result of late completion of the <i>Project</i> . The amount of such liquidated damages does not include any penalty. Notwithstanding the foregoing, the <i>Owner</i> shall be entitled to the greater of (i) the liquidated damages as calculated pursuant to Article A-10.5, or (ii) in the event that the <i>Contractor</i> claims that this liquidated damages provision is invalid or unenforceable and the <i>Contractor</i> prevails on such a defence, the damages arising from the delay suffered by the <i>Owner</i> including, without limitation, consequential, special, incidental, and indirect damages, costs and expenses incurred or suffered by the <i>Owner</i> . 10.5 The <i>Contractor</i> shall pay to the <i>Owner</i> (or have deducted from <i>Contract</i> payments) liquidated damages of \$ [NTD: Include per diem rate] for each calendar day of delay beyond the prescribed date for <i>Ready-for-Takeover</i> , until <i>Ready-for-Takeover</i> is achieved and certified pursuant to the terms of the <i>Contract</i> . Liquidated damages will be assessed as incurred and reflected as deductions from amounts that may be due under any applications for payment pending at the time that such liquidated damages are assessed. 10.6 All liquidated damages that have not been deducted from payments prior to final payment shall be deducted from the final payment to be made by the <i>Owner</i> to the <i>Contractor</i> pursuant to GC 5.5 FINAL PAYMENT, and any amount of liquidated



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		damages in excess of the final payment amount, shall be paid by the <i>Contractor</i> to the <i>Owner</i>, within 30 calendar days following a written demand by the <i>Owner</i> for such payment.
	10.7	The liquidated damages payable under this Article A-10 are in addition to and without prejudice to any other remedy, action or any other alternative claim that may be available to the <i>Owner</i>.”

END OF AMENDMENTS TO CCDC 2 - 2020

00 21 14-List of Drawings

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 LIST OF DRAWINGS

CIVIL

C-100 SERVICING, GRADING & PAVEMENT PLAN

LANDSCAPE

L-100 LANDSCAPE PLAN, NOTES & DETAILS
L-101 EXISTING TREE INVENTORY & PRESERVATION PLAN

ARCHITECTURAL

A-100 LEGAL SURVEY
A-101 SITE DEMO
A-102 SITE PLAN
A-103 SITE PLAN DETAILS
A-104 WALL ASSEMBLIES & ROOM FINISH SCHEDULE, DOOR SCHEDULE, FRAME &
 SCREEN ELEVATIONS, JAMB DETAILS & FRAME TYPES

A-200 HEALTH & LIFE SAFETY PLANS & BUILDING CODE MATRIX
A-201 FLOOR PLANS & DETAILS
A-202 ROOF PLAN & DETAILS

A-300 REFLECTED CEILING PLANS

A-400 EXTERIOR ELEVATIONS & WINDOW ELEVATIONS
A-450 BUILDING SECTIONS

A-500 WALL SECTIONS
A-501 WALL SECTIONS
A-502 WALL SECTIONS
A-503 WALL SECTIONS
A-504 WALL SECTIONS

A-600 INTERIOR ELEVATIONS & MILLWORK DETAILS

STRUCTURAL

S-100 GENERAL NOTES

S-200 FOUNDATION PLAN

S-300 SLAB ON GRADE PLAN + NON LOAD BEARING MASONRY WALL, LOAD BEARING
MASONRY WALL PLAN

S-400 ROOF FRAMING PLAN

MECHANICAL

M-000 MECHANICAL, HVAC, & PLUMBING SCHEDULES

M-100 HVAC E/D/R PLAN

M-200 HVAC PLAN

M-300 BELOW SLAB PLUMBING PLAN

M-301 ABOVE SLAB PLUMBING PLAN

M-400 ROOF PLAN

ELECTRICAL

E-100 ELECTRICAL SITE PLAN

E-200 POWER PLANS

E-300 LIGHTING PLANS

E-400 ROOF ELECTRICAL PLANS

E-500 ELECTRICAL DETAILS

E-501 ELECTRICAL DETAILS

E-600 ELECTRICAL DEMOLITION PLANS

FIRE PROTECTION

FP-1 FIRE PROTECTION NOTES & DETAILS

FP-2 FIRE PROTECTION FLOOR PLANS

END OF SECTION

00 71 10-Contract Forms & Documentation

1.1 CONSTRUCTION AGREEMENT

- .1 A Construction Contract shall be executed and delivered by the Owner to the Contractor on the Canadian Standard Construction Document CCDC 2, 2020. The Construction Contract is amended in accordance with the Instructions to Bidders, Amended General Conditions, Supplementary General Conditions and the other Contract Documents as defined by the Amended General Conditions.

1.2 WORKERS' COMPENSATION

- .1 Refer to Article GC 10.4 "Worker's Compensation". At various stages of construction (at a minimum each application for payment) provide documentation of evidence of compliance with Provincial requirements if required, and The Workplace Safety & Insurance Act, most recent issue.

1.3 APPLICATION FOR PRE-RELEASE OF SUB CONTRACT HOLDBACKS

- .1 No pre-release of subcontract holdbacks will be approved.

1.4 INSPECTIONS FOR OCCUPANCY AND SUBSTANTIAL PERFORMANCE

- .1 When the contractor requests consideration of the work to be ready for occupancy and therein after substantially performed, the contractor shall provide a comprehensive list of items to be completed and/or corrected in accordance with "GC 5.4 Substantial Performance of the Work".
- .2 The Consultant shall determine when the project meets the requirements of Substantial Performance as defined in the Construction Lien Act and Article "GC 5.4 Substantial Performance of the Work".
- .3 The contractor shall execute an inspection and provide a list of all incomplete and unsatisfactory work for all trades. The list will be distributed to the consultant and a review will therein occur by an inspection team as follows.
- .4 The inspection team shall consist of:
 - .1 The Contractor and/or representative(s).
 - .2 The Owner and/or representative(s).
 - .3 The Consultant and/or representative(s).
 - .4 Such sub-contractors or their representatives as may be required by the Contractor.
- .5 Upon completion of this inspection a revised list of all incomplete and unsatisfactory work shall be prepared by the contractor and issued to those concerned, including the subtrades, Consultant and the Owner.

- .6 The inspection list (Deficiency List) shall be evaluated and a dollar value shall be agreed upon to be withheld until completion. This value is above and beyond the value of the Holdback.
- .7 The Contractor shall notify the Architect when all deficiencies are completed and provide a signed off list of the deficiencies as being complete. The Architect and/or consultants shall review and confirm the completed Deficiencies are acceptable. Subsequent deficiency reviews as required for outstanding items, unacceptable corrections to the deficiencies and/or requested by the Contractor will be charged back to the contractor at standard rates accepted by the owner.

1.5 OCCUPANCY AND APPLICATION FOR CERTIFICATE OF SUBSTANTIAL PERFORMANCE OF THE CONTRACT

- .1 The contractor shall request from the Chief Building Official (CBO) permission to occupy the work. Note: That only the Chief Building Official (CBO) can grant occupancy. The architect and consultants will be required to issue documentation to meet the requirements of the Commitment to Review to the Chief Building Official (CBO). The following inspection reports must be issued to the Consultants in order for such documentation to be issued as follows:
 - .1 The following test reports and inspection certificates must be submitted by and independent testing company approved by the Architect and Owner or the Inspection Officer as authorized by the appropriate governing agency:

.1	Proctor Tests	Section 32 11 23
.2	Concrete Tests	Section 03 30 00
.3	Mortar & Grout Tests	Section 04 80 00
.4	Structural Steel	Section 05 41 00
.5	Roof & Building Envelope Inspection	Section 07 54 19
.6	Plumbing Inspection Certificate (Permit)	Division 22
.7	Heating Inspection Certificate (Permit)	Division 23
.8	Air and Hydronic Balance Reports	Division 23
.9	Sprinkler Verification	Division 21
.10	Hydro Inspection Certificate	Division 26
.11	Fire Alarm Inspection Certificate	Division 28
.12	Additional testing requirements as specified in individual specification sections.	
 - .2 The consultants shall issue instructions to insure the all health and safety requirements are maintained to permit the completion of the work. The general contractor shall comply at no additional cost to the owner.
- .2 When the General Contractor has carried out the steps listed under Inspection for Substantial Performance and meet the requirements of Article "GC 5.4 Substantial Performance of the Work" as amended, he shall submit his application for Certificate of Substantial Performance of the Contract under Section 32 of The Construction Lien Act. This application shall be accompanied by the following documentation:
 - .1 Contractor's Statutory Declaration.

- .2 Certificate from The workers' Compensation Board certifying that the Contractor has paid all sums that the Contractor is liable to contribute to the Accident Fund and for which the Owner is responsible pursuant to Section 115 of The Workers' Compensation Act and that the Owner is released from all liability.

.3 Extended Warranties

In Addition to the standard construction warranty as listed under General Conditions GC 12.3, all additional written extended warranties specified within the various specification sections shall be submitted to the Owner.

All written warranties shall be dated the same date as the General Contractor's standard one year guarantee.

Definition: Warranty = guarantee.

.1 Submission Requirements:

- .1 Submit extended warranties as part of "Operating and Maintenance Manuals".
- .2 Arrange extended warranties in systematic order matching Specification format. Include a table of contents listing warranties in same order.
- .3 Each warranty must show:
 - .1 Name and address of Project.
 - .2 Name of Owner.
 - .3 Section of Number and Title.
- .4 All extended warranties must be presented under Contractor's letterhead, seal and signature and must be similar wording to that specified in Contract Documents.
- .5 Submit manufacturers' Product warranties in accordance with contract.

.4 Test Reports

Inspection and testing must be executed in accordance with the specifications. The General Contractor is responsible for advising the appointed companies timely when their services are required so that all work under their control may be approved prior to being concealed.

The following test reports and inspection certificates must be submitted by an independent testing company approved by the Architect and Owner or the Inspection Officer as authorized by the appropriate governing agency:

1. Proctor Tests	Section 32 11 23
2. Concrete Tests	Section 03 30 00

3.	Structural Steel	Section 05 41 00
4.	Roof & Building Envelope Inspection	Section 07 54 19
5.	Plumbing Inspection Certificate (Permit)	Division 22
6.	Heating Inspection Certificate (Permit)	Division 23
7.	Air and Hydronic Balance Reports	Division 23
8.	Sprinkler Verification	Division 21
9.	Hydro Inspection Certificate	Division 26
10.	Fire Alarm Inspection Certificate	Division 28
11.	Additional testing requirements as specified in individual specification sections.	

.5 Maintenance Manuals:

- .1 Draft Manuals: The Contractor shall provide to the Architect a complete copy of the operating and maintenance manuals in digital PDF format on jump drive or CD. Manuals to describe completely all equipment provided under this contract. Architectural, Mechanical and Electrical manuals are required. Refer to Mechanical and Electrical Divisions for additional manual requirements. This draft will be reviewed for completeness by the Architect and Consulting Team. Manuals shall include the following data:

- .1 Tables of Contents: provide title of project; names, addresses and telephone numbers of Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- .2 For each Product or System: list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Each item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics and limiting conditions. Include curves with engineering data and tests and complete nomenclature and commercial number of replaceable parts.
- .6 Panel board Circuit Directories: provide electrical service characteristics, controls and communications.
- .7 Include installed colour coded wiring diagrams.

- .8 Operating Procedures: include start-up, break-in and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down and emergency instructions. Include summer, winter and any special operating instructions.
- .9 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair and reassembly instructions and alignment, adjusting, balancing and checking instructions.
- .10 Provide servicing and lubrication schedule and list of lubricants required.
- .11 Include manufacturer's printed operation and maintenance instructions.
- .12 Include the sequence of operations by the controls manufacturer.
- .13 Provide original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
- .14 Provide installed control diagrams by controls manufacturer.
- .15 Provide Contractor's co-ordination drawings with installed colour coded piping diagrams.
- .16 Provide charts of valve tag numbers with location and function of each valve keyed to flow and control diagrams.
- .17 Provide list of original manufacturer's spare parts, current prices and recommended quantities to be maintained in storage.
- .18 Include test and balancing reports as specified in Division 15.
- .19 Additional Requirements: as specified in individual specification sections.
- .2 Final Manuals: The Contractor shall provide to the Architect a FINAL set of three (3) copies of the complete operating and maintenance manuals and one (1) digital PDF version on jump drive or CD based on above draft items. Manuals shall incorporate all comments provided by the Architect and consulting team reviewed during the draft submission. Manuals shall be 8 1/2" x 11" with hard covers securely bound. Data shall be contained in D-ring binders. Binders shall have clean plastic pocket at back of spine identification containing label "Operation and Maintenance Manual"

and project name and volume number, if applicable. Each manual shall contain a title sheet listing project name, date and volume number and names and addresses of Contractors and Subcontractors, Consultant and Sub-consultants. The same format and information shall be provided in the PDF file.

.6 Receipts for Equipment Marked “Paid in Full”

- .1 The Contractor shall provide a list of “Conditional Sales Contracts” incurred by himself and all sub-trades on this project.
- .2 The Contractor shall furnish to the Architect receipts marked, “Paid in Full” by the suppliers of same for articles incorporated into the building which the law does not classify as “building materials” including furnaces, boilers, air conditioning equipment and elevators.

.7 As-Built Drawings

- .1 The Contractor shall turn over to the Architect one set of complete marked prints showing alterations accepted by the Architect for as-built drawings. Drawings to include the following information which varies from the contract documents:
- .2 Record all information concurrently with the construction progress. Do not conceal work until required information is recorded.
- .3 Mark each item to record actual construction including:
 - .1 Measure the depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 The field changes of all dimensions and details.
 - .5 Changes made by Change Orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.

.8 Forms

- .1 Letter from The Workplace Safety & Insurance Board certifying that the Contractor has paid all sums that the Contractor is liable to

contribute to the accident fund and for which the Owner is responsible pursuant to Section 15 of The Workplace Safety & Insurance Act, 2012 Edition and that the Owner is released from all liability.

- .2 Upon the successful submission of forms for Substantial Performance of the Contract, the Architect will issue Government Form 6 and the General Contractor shall be responsible for publication under the terms of the Construction Lien Act.
- .3 The Contractor shall publish a copy of the Certificate of Substantial Performance once in a national construction trade newspaper, in accordance with the Construction Lien Act 1983 and all current amendments.

END OF SECTION

01 21 10-Allowances

1.1 GENERAL

- .1 Comply with GC 4.1 Cash Allowances and the Amended General Conditions.
- .2 Cash Allowances are designated for additional work and services deemed to be necessary by Owner, from time to time, throughout the execution of the Work. Where a Cash Allowance refers to an item or category of work already included in Contract Documents, it shall be assumed to cover work or services in addition to that indicated, unless specifically indicated otherwise.
- .3 The Contractor may be required from time to time to assist in tendering of certain items of work covered by Allowance, as directed by Consultant.

1.2 AUTHORIZATION

- .1 Expenditures from Allowances included in the contract must be authorized in writing by the Consultant issued as a Cash Allowance Disbursement Authorization (CADA).
- .2 Work covered by allowances shall be performed for such amounts and by such persons as directed by the Consultant.

1.3 CASH ALLOWANCES

- .1 Cash Allowances include supply and installation unless specifically indicated otherwise.
- .2 Supply only Allowances shall include:
 - .1 Net cost of products
 - .2 Delivery to site
 - .3 Applicable taxes and duties (excluding HST)
- .3 Supply and install Allowances shall include:
 - .1 Net cost of products
 - .2 Delivery to site
 - .3 Unloading, storing, handling of products on site
 - .4 Installation, finishing and commissioning of products
 - .5 Applicable taxes and duties (excluding HST)
- .4 Other costs related to work covered by Allowances are not covered by the Allowance but shall be included separately in Contract.
- .5 Include, in the Contract, the following Cash Allowances:

.1	Finish Hardware - Supply only
.2	Insufficient Soils
.3	Network Communications (includes data/cabling, terminations, P/A (new and old), phones, programming, IT Rack equipment. Conduit and box rough-in to all locations by Div. 26. Power for head end equipment by Div. 26) Public Address System (PA) (includes cabling, terminations, speakers, horns Main rack, amplifiers, Administration console, programming. Conduit and box rough-in to all locations by Div. 26. Power for head end equipment by Div. 26)
.4	Security System - Access Control & Intrusion Detection Systems (includes cabling, terminations, security equipment (card readers, electric strikes, panels etc.), programming. Conduit and box rough-in to all locations by Div. 26. Power for head end equipment by Div. 26) (by Owl Tech)
.5	Independent Testing & Inspection - Soil strength, compaction, concrete, mortar, structural steel and paving
.6	Exterior Signage (Cross and logo update)
.7	Interior Signage (Complete replacement of the entire school)
.8	Window coverings (Addition and Renovation only) (by 200 Vic)
.9	Building Automation - New addition actuators, sensors, controllers, tie-ins, graphics updates
.10	Miscellaneous Millwork & Shelving
.11	Hazardous Substances Abatement
.12	Phones (Telephones only) (By Network Telecom)
.13	Terrazzo Repairs
.14	UPS - Supplied under cash allowance and installation by Div. 26 trade
.15	Lighting Controls (Supply Only)

- .6 The **total of the above Cash Allowances**, to be included as part of the base bid, is Five Hundred and Fifty Thousand Dollars (\$550,000.00) (excludes HST).

END OF SECTION

| **01 21 15-Separate Prices**

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 Refer to Owner's Bid Form and documents.

END OF SECTION

01 22 00-Owner's Documents & Conditions

GENERAL NOTE

- .1 Division 1 requirements apply to all Sections of Work.
- .2 This section is an accounting of supplied information, reports, documents, instructions, policies, specifications etc. provided by the owner and/or authored by the owner forming part of this specification and the work.

1.0 GENERAL

1.1 OWNER'S DOCUMENTS AND CONDITIONS

- .1 Geotechnical Report – prepared by Chung & Vander Doelen, dated July 2, 2025 and File Number 2536.
- .2 2024 Asbestos Audit Update, prepared by MTE Consultants, dated March 21, 2024 and File Number C32961-959.
- .3 Legal Survey – Van Harten Land Surveyors – AOLS Plan Submission # V-99386 (Project # 34275-25).
- .4 Incentive Application Checklist
- .5 Heating and Cooling Equipment Start Up and Commissioning Report
- .6 Commissioning Plan – St. Gregory Catholic ES. Prepared by CFMS West Consulting Inc.
- .7 Section 00 91 00 – Commissioning Specification

END OF SECTION



CHUNG & VANDER DOELEN
ENGINEERING LTD.

**GEOTECHNICAL INVESTIGATION
PROPOSED BUILDING ADDITION
ST. GREGORY CATHOLIC ELEMENTARY SCHOOL
34 Osborne Street
Cambridge, Ontario**

SUBMITTED TO:

Waterloo Catholic District School Board
480 Dutton Drive
Waterloo, Ontario
N2L 4C6

ATTENTION:

Mr. Chandler Kinzie



CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

July 2, 2025
File No.: 2536

Waterloo Catholic District School Board
480 Dutton Drive
Waterloo, Ontario
N2L 4C6

Attention: Mr. Chandler Kinzie

RE: Geotechnical Investigation
Proposed Building Addition
St. Gregory Catholic Elementary School
34 Osborne Street, Cambridge, Ontario

We take pleasure in enclosing one (1) copy of our Geotechnical Investigation Report carried out at the above-referenced Site. Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

If you have any questions or clarifications are required, please contact the undersigned at your convenience.

We thank you for giving us this opportunity to be of service to you.

Yours truly,

CHUNG & VANDER DOELEN ENGINEERING LTD.

Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer

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1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained Waterloo Catholic District School Board to carry out a geotechnical investigation for the proposed Building Addition to be constructed at St. Gregory Catholic Elementary School located at 34 Osborne Street, Cambridge, Ontario.

It is understood that an 18± by 42± m building addition, without a basement, is proposed on the south side of the existing school building, followed by the construction of a parking lot. The proposed addition will be 1-storey high. However, a second storey is also being contemplated. The finished floor elevation is anticipated to match that of the existing building.

The purpose of this investigation is to provide geotechnical recommendations to address the following items:

- Foundation design recommendations
- Excavation condition and groundwater control during and following construction
- Engineered fill construction
- Slab on grade design
- Foundation soil classification for seismic design per OBC 2024
- Pavement design and construction
- Infiltration rate of soil deposits for storm water management features
- Preliminary assessment on excess soil disposal

2.0 FIELD WORK

Five (5) boreholes were drilled and sampled to depths between 3.50 and 6.55 metres below existing grade to investigate the subsurface conditions at the site. The borehole locations are illustrated on the appended Borehole Location Plan, Drawing No. 1.

The field work for this project was carried out on June 16, 2025, under the supervision of a member of our engineering team, who logged the boreholes in the field, effected the subsurface sampling and monitored the groundwater conditions. Underground utilities were located prior to commencing the field work program, by contacting Ontario-One-Call and a private locator.

The boreholes were advanced using a track-mounted CME 55 drill rig, supplied, and operated by a specialist drilling contractor. The drill rig was equipped with continuous flight hollow stem augers and standard soil sampling equipment. Standard penetration tests (SPTs) in accordance with ASTM Specification D1586, were carried out at frequent intervals of depth, and the results are shown on the Borehole Logs as Penetration Resistance or “N”-values.

The borehole locations and associated ground surface elevations were surveyed by CVD for the purposes of this report using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2_2010v70 (CGVD28).



3.0 LABORATORY TESTING

3.1 Geotechnical Laboratory Testing

Soil samples obtained from the in-situ tests were examined in the field and subsequently brought to our laboratory for visual and tactile examination to confirm field classification. Moisture content of all retrieved samples was determined.

One (1) grain size distribution analysis were carried out on representative soil samples of the major soil deposits to confirm field identification and to provide information on the soil hydraulic conductivity and engineering characteristics.

3.2 Analytical Laboratory Testing

Three (3) soil samples were submitted to AGAT Laboratories of Mississauga for analysis of Metals and Inorganics, Petroleum Hydrocarbons (PHCs) fractions F1-F4 and Benzene-Toluene-Ethylbenzene-Xylene (BTEX). The chemical testing was conducted to provide a preliminary assessment of the environmental quality of potential excess soil which may be generated and removed off-site during construction.

4.0 EXISTING SITE CONDITIONS

The proposed building addition and associated parking areas are planned at the south end of the existing school building, which is currently occupied by a paved playground and adjacent landscaped areas.

The site features relatively flat topography, with ground surface elevations at the borehole locations ranging from 288.41 and 289.04 m.



5.0 SUBSURFACE CONDITIONS

The detailed subsurface conditions encountered in the five (5) boreholes advanced as part of this investigation are shown on the Borehole Log Sheets, Enclosures 1 to 5. The following sections provide descriptions of the major soil deposits encountered in the boreholes. Enclosure A provides explanations of the various soil abbreviations and terms used on these borehole log sheets.

The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures and, therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions will vary between and beyond the borehole locations.

5.1 Pavement Structure and Topsoil

Asphalt pavement was contacted at the ground surface of Boreholes 1 and 2. The pavement structure was comprised of 65 to 75 mm thick asphalt underlain by 200 to 250 mm thick granular base materials, respectively.

Topsoil was encountered at the ground surface at Boreholes 3, 4 and 5 with thickness measured to be between 150 and 200 mm.

5.2 Fill

The pavement structure and topsoil were underlain by fill materials in all boreholes. The fill materials typically comprised of dark brown to brown sand and gravel / sand and silt / clayey silt / sandy silt materials which extended depths ranging from 0.8 to 3.8 m below existing grade. The 3.8 m deep fill was encountered locally at Borehole 1, which is located at the northwest corner of the proposed addition. The fill in Borehole 3 contained rootlets, organics and displayed a topsoil-like appearance.

The SPT “N”-values measured within the fill ranged from 3 to 17 blows per 300 mm of penetration, indicating a very loose to compact compactness condition. Natural moisture contents were measured between 3 and 17%, indicating a moist moisture condition.

5.3 Sand and Gravel to Gravelly Sand

The fill materials were underlain by a deposit of brown sand and gravel to gravelly sand at Boreholes 1 and 2. The deposit extended to at least the borehole termination depth of 6.55 m below existing grade in Borehole 1 and to top of native fine sand deposit at depth of 4.0 m below existing grade in Borehole 2. The deposit typically contained trace to some silt with occasional sand layers.

The SPT “N”-values measured within the sand and gravel to gravelly sand deposit generally ranged from 20 to 71 blows per 300 mm of penetration, indicating a compact to very dense compactness condition.



A localized loose sand layer was observed within the deposit in Borehole 1 at depth of 3.8 m below existing grade. Natural moisture contents were measured between 3 to 13%, indicating a damp to moist moisture condition.

5.4 Sand / Sand and Silt

Sand deposit was encountered below the coarse granular deposit in Borehole 2 and beneath the fill materials in Boreholes 3, 4 and 5. The brown fine granular deposit extended to at least borehole termination depths of 3.5 and 6.55 m below existing grade. The deposit contained trace to some silt and trace gravel within the deposits. Occasional cobbles were encountered in Borehole 2. A sand and silt layer was encountered below the sand deposit at Borehole 3 and extended to at least 6.55 m depth.

One (1) grain size distribution analysis was conducted on a representative sample of sand collected from Borehole 4 and the results are graphically presented on Enclosure 6.

The SPT “N”-values measured within the sand deposit ranged from 11 to 65 mm blows per 300 mm of penetration, indicating a compact to very dense compactness condition. Natural moisture contents were measured between 1 and 13%, indicating a damp to moist moisture condition.

5.5 Groundwater

Groundwater conditions were monitored during and immediately following the withdrawal of the drilling augers at each borehole location. Upon auger withdrawal, all boreholes were noted to be dry at the time of completion. Dry cave-in depths ranged between 2.4 and 5.3 m below existing grade.

The long-term groundwater table generally corresponds to the depth where the soil deposit changes in colour from brown to grey. No colour transition was observed in any of the boreholes. Based on the above, measured moisture contents and tactile examination, the long-term groundwater table is expected to lie below the borehole exploration depths. It is noted that the groundwater table will fluctuate seasonally, and in response to major weather events.



5.6 Soil Chemistry

Three (3) soil samples were submitted to AGAT Laboratories in Mississauga, Ontario for analysis of Metals and Inorganics, Petroleum Hydrocarbons (PHCs) fractions F1-F4 and Benzene-Toluene-Ethylbenzene-Xylene (BTEX). The chemical testing was conducted to provide a preliminary assessment of the environmental quality of potential excess soil which may be generated and removed off-site during construction.

The following table presents the location, depth, description, and parameters analysed for each soil sample collected and submitted.

Sample I.D.	Sample Depth (mbgs)	Sample Description	Parameters Analysed
BH1 (SA1)	0.075 – 0.675	FILL – granular base & sand and gravel	Metals and Inorganics, PHCs F1-F4 and BTEX
BH3 (SA1)	0.000 – 0.600	FILL – topsoil & sandy silt	Metals and Inorganics, PHCs F1-F4 and BTEX
BH5 (SA1)	0.000 – 0.600	FILL – topsoil & sand and silt	Metals and Inorganics, PHCs F1-F4 and BTEX

mbgs– denotes metres below ground surface

The laboratory certificates of chemical analysis and results provided by AGAT Laboratories are enclosed in Appendix B.



6.0 DISCUSSION AND RECOMMENDATIONS

6.1 General

It is understood that an 18± by 42± m building addition, without a basement, is proposed on the south side of the existing school building, followed by the construction of a parking lot. The proposed addition will be 1-storey high. However, a second storey is also being contemplated. The finished floor elevation is anticipated to match that of the existing building.

In general, pavement structure / topsoil was encountered at the ground surface of the boreholes, underlain by fill which extended to depths ranging from 0.8 to 3.8 m below existing grade. The fill was typically underlain by loose to very dense granular deposits which extended to at least borehole termination depths between 3.5 and 6.55 m below existing grade.

The long-term groundwater table generally corresponds to the depth where the soil deposit changes in colour from brown to grey. No colour transition was observed in any of the boreholes. Based on the above, measured moisture contents and tactile examination, the long-term groundwater table is expected to lie near or below the borehole exploration depths. It is noted that the groundwater table will fluctuate seasonally, and in response to major weather events.

6.2 Footing Foundations

Conventional strip and spread footing foundations can be used to support the proposed school building addition. Footings placed on the compact native undisturbed soil deposits and on the well-compacted fill materials or suitably placed and compacted engineered fill per Section 6.3 can be designed using a Net Geotechnical Reaction of 200 kPa at the Serviceability Limit State (SLS) and a Factored Net Geotechnical Bearing Resistance of 300 kPa at the Ultimate Limit State (ULS). The SLS value given above is based on a maximum settlement of 25 mm under the footing foundations.

The following table summarizes the highest founding level and elevation for the footing at each borehole location:

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
1	288.48	3.98	284.50
2	288.69	1.09	287.60
3	288.84	1.54	287.30



These soil bearing pressures can be achieved provided that the founding subgrade is undisturbed during construction. Spacing between adjacent footing steps should not be steeper than 10H to 7V.

The maximum total and differential settlements of footings designed to the above recommended soil bearing pressures are expected to be less than 25 and 20 mm, respectively, and these are considered tolerable for the structure being contemplated. The majority of the settlements will take place during construction and the first loading cycle of the building.

New footings should be founded below any existing fill, building foundations and utility trenches, on competent native undisturbed granular deposits.

Exterior footings and footings in unheated portions of the building should be provided with a soil cover of not less than 1.2 m or equivalent synthetic thermal insulation for adequate frost protection. The founding subgrade soils must be protected from frost penetration during winter construction.

It is recommended that the footing excavations be inspected by the geotechnical engineer to ensure adequate soil bearing and proper subgrade preparation.

6.3 Engineered Fill

Fill materials were encountered to depths between 0.8 and 3.8 m and could be deeper near the existing utility trenches and foundations. The existing fill is typically in very loose to compact compactness condition and is not suitable to support the floor slab and footing foundations in their present condition. Removal of the fill materials and the loose native granular soils and constructing engineered fill could prove to be an effective and economical method to repair poor bearing soil areas to provide suitable bearing at more desirable elevations. The majority of the existing fill materials are not suitable to be reused as engineered fill.

Imported sand and gravel or approved excavated inorganic materials can be used to construct the engineered fill under controlled and supervised conditions. The existing fill which contains topsoil/organics is not considered suitable for re-use as engineered fill. The moisture content of the soil requires to be within 3% dry of its optimum moisture condition to achieve the specified degree of compaction.

Engineered fill is to be constructed in accordance with the following procedures to support the future foundations and floor slabs, if adopted:

1. All existing pavement, fill materials, loose granular soils and otherwise deleterious materials are to be excavated/removed to expose the underlying competent native subgrade;
2. The exposed subgrade surface is to be thoroughly recompacted by large heavy compaction equipment (10 tonne recommended) and inspected by qualified geotechnical personnel. Any loose or soft areas identified should be excavated to the level of competent soil;



3. The required grades can then be achieved by placing imported sand and gravel (OPSS Granular “B”) in maximum 300 mm thick lifts and compacted to no less than 100% Standard Proctor maximum dry density (SPMDD) under the footing areas, and to 95% SPMDD to support the floor slab. The moisture content of the soil requires to be within 3% dry of its optimum moisture condition to achieve the specified degree of compaction;
4. Engineered fill must be placed such that the fill pad extends horizontally outwards from all footings/foundation at least the same distance as how thick the engineered fill pad will exist between the underside of future footings and the approved native subgrade; and
5. All fill placement and compaction operations must be supervised on a full-time basis by qualified geotechnical personnel to approve fill material and ensure the specified degree of compaction has been achieved.

Foundations supported on approved engineered fill constructed in accordance with the procedures given above can be designed to bearing capacities at SLS and ULS as outlined in Section 6.2. Vibration could be generated from various construction equipment, such as compactors/rollers and ground improvement methods, which could be harmful to potential surrounding structures and buildings during construction.

Peak particle velocity (PPV) of ground motion is widely accepted as the best descriptor of potential for vibration damage to structures. The safe vibration limit can be set to 8 to 25 mm/s PPV, depending on the frequency of vibrations and sensitivity of any potential surrounding structures to vibration. Vibration monitoring can be carried out to measure the PPV of ground motion from vibration generated from typical compaction equipment at the beginning of the project in the potentially critical areas. This will set criteria and establish the type of equipment to be used for this project.

A pre-construction condition survey should be conducted to document the condition of the existing structures within the possible zone of influence, if necessary.

6.4 Earthquake Considerations

In accordance with The Ontario Building Code 2024 (OBC), the proposed building structures should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8.

Based on the soils condition encountered at the boreholes and our experience with the top 30 m of soil condition in the general area of the site, the site can be classified as a **Site Class C** as per OBC Table 4.1.8.4.B.

6.5 Floor Slab Construction

The existing fill is typically in very loose to compact compactness condition and is not suitable to support the floor slab. The floor slab for the proposed building addition can be constructed as a conventional slab-on-grade on suitably placed and compacted engineered fill as described in Section 6.3.



The exposed subgrade should be inspected by the geotechnical engineer at the time of floor slab construction. At the time of floor slab construction, the exposed subgrade should consist of the engineered fill compacted to at least 95% SPMDD. Following the proof-rolling of the subgrade, it is recommended that a minimum 150 mm thick layer of OPSS Granular “A” be placed and compacted to at least 100% SPMDD beneath the concrete floor slabs to provide uniform support.

A modulus of subgrade reaction (k_s) of 30 MN/m^3 may be used for the design of the floor slabs, assuming sand/silt subgrade. Where the floor subgrade consists of engineered fill (well-compacted Granular “B” at least 0.6 m thick), the modulus of subgrade reaction can be taken as 80 MN/m^3 .

The floor slabs should be separated structurally from the columns and foundation walls. Sawcut control joints should be provided at regular spacing (less than 30 times the concrete slab thickness) and to depths between one-third to one-quarter of the slab thickness.

Care should be taken to ensure that the backfill against foundation walls, interior piers/columns and concrete pits are placed in thin layers and each layer compacted to at least 95% SPMDD. These types of confined areas should be backfilled with imported granular soils such as OPSS Granular B Type I or approved on-site granular soils.

6.6 Lateral Earth Pressure

The unbalanced foundation walls and any other soil retaining structures should be designed to resist the lateral earth pressure acting against these walls. The following formula may be used to calculate the unfactored earth pressure distribution. The factored resistance can be calculated by using a factor of 0.8.

$$P = K (\gamma H + q)$$

Where:

P =	Lateral earth pressure	kPa
K =	earth pressure coefficient, 0.5 for non-yielding foundation wall earth pressure coefficient, 0.3 for yielding retaining wall	
γ =	unit weight of granular backfill, compacted to 95% SPMDD	21 kN/m^3
H =	unbalanced height of wall	m
q =	surcharge load at ground surface	kPa

The backfill for the foundation walls and retaining walls should be free-draining granular materials which should have less than 8% silt particles (OPSS Granular “B” Type I). The backfill should be placed in thin layers and compacted to 95% SPMDD. Over-compaction adjacent to the foundation/retaining walls should be avoided.



Compaction should be carried out with hand operated equipment within 1 m of the foundation wall or retaining wall. Weeping tiles leading to a frost-free outlet or weep holes should be installed to effect drainage behind the retaining wall.

The sliding resistance of the retaining wall footings should be checked. The unfactored horizontal resistance against sliding between cast-in-place concrete and the various soils can be calculated using a friction coefficient as follows:

Soil	Unit Weight (kN/m ³)	Friction Coefficient
Native Granular Deposits (Sand, Sand and Silt, Sand and Gravel / Gravelly Sand)	20.0	0.40
Well-Compacted Granular Backfill and Engineered Fill	21.0	0.45

6.7 Open Cut Excavation and Groundwater Control

Excavations are expected to be in the order of 1.2 to 4.0± m deep for footing foundation construction and site servicing. The excavations for the footings are expected to penetrate the existing pavement structure, topsoil, fill to reach competent native undisturbed granular deposits.

These materials are considered to be Type 3 Soils in accordance with the latest Occupational Health and Safety Act. Excavations in the Type 3 Soils are expected to remain stable during the construction period provided that side slopes are cut to 1H : 1V from the bottom of the excavation. Where excessively loose/soft soils and/or seepage zones or groundwater are intersected, side slopes should be cut to more stable angles of 3H : 1V. The side slopes should be suitably protected from erosion processes.

Care must be taken to ensure that the existing neighbouring building foundations are not undermined during excavations/construction. Excavations can also be supported using a trench box or timber lagging.

It is anticipated that no significant amount of groundwater ingress into the excavations would be encountered. Storm water runoff and local perched groundwater conditions at site can be controlled by pumping from filtered sump pits as and where required.

It is further recommended that a lean concrete mat be placed over approved footing subgrade in wet or saturated areas to prevent further disturbance to the bearing soils resulting from construction activities.

It is recommended that excavation for the future development be done during the typically drier summer months when ground water conditions would be expected to lie at lower elevations.



6.8 Pavement Design and Construction

Based on the results of the field work, the predominant subgrade materials at the site will consist of fine granular materials. The following flexible pavement structures are recommended based on the grain size distribution results, assumed CBR values, groundwater conditions, frost susceptibility of subgrade soils and traffic volume.

Component	Light Duty Pavement (mm)	Heavy Duty Pavement (mm)
Asphaltic Concrete HL3	40	40
Asphaltic Concrete HL8	50	50
Granular “A” Base	150	150
Granular “B” Sub-base	300	400

A light-duty pavement structure is recommended for all car parking areas, while a heavy-duty pavement structure should be implemented for access driveways and zones subjected to heavier loads, such as fire trucks, garbage trucks, and delivery vehicles.

The pavement design considers that pavement construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable following proof-rolling, additional granular sub-base and/or placement of a geogrid/geotextile material may be required.

Prior to placement of the granular subbase materials, all topsoil and other deleterious materials must be stripped from the proposed pavement areas to expose inorganic subgrade soils. The exposed subgrade surface must be thoroughly proof-rolled and recompacted with a heavy vibratory compactor and inspected by qualified geotechnical personnel. Any soft spots encountered during the process should be excavated to the level of competent soil.

Bulk fill placed to raise site grades in pavement areas should consist of select approved inorganic fill or imported sand and gravel (OPSS Granular “B” Type I), placed in maximum 300 mm thick lifts, and compacted to no less than 95% Standard Proctor maximum dry density (SPMDD). The moisture content of the soil requires to be within 3% dry of its optimum moisture condition to achieve the specified degree of compaction.

The Granular “A” and Granular “B” Type I materials should be produced in accordance with the current OPSS specifications and placed and uniformly compacted to at least 100% SPMDD. The placing and rolling of the asphalt mixture should conform to OPSS.MUNI 310 Table 10 and should be compacted to no less than 92% of the Marshall density (MRD). Frequent in situ density testing by this office should be carried out to verify that the specified degree of compaction is being achieved and maintained.



SS-1 or SS-1HH tack coat should be applied to all binder course surfaces and vertical surfaces (i.e., curbs, pavement joints, etc.) prior to placement of asphalt. Refer to OPSS 310 and OPSS 1101 for additional details.

It should be noted that even well compacted trench backfill could settle for a period of time after construction. In this regard, the surface course of the asphaltic concrete should be placed at least one (1) year after trench backfill is completed to allow any minor settlements to occur within the trench backfill. The incomplete pavement structure may not be capable of supporting construction traffic. Consequently, minor repairs of the sub-base, base and asphaltic concrete may be required prior to paving with the base course and/or the surface course asphaltic concrete.

The prepared earth subgrade and final pavement surfaces should be graded to direct water runoff away from buildings, sidewalks, and other similar pertinent structures.

Positive drainage outlets should be provided at all low points of the prepared earth subgrade, such as stub drains and/or longitudinal subdrains extended from the catch-basins. Systematic drainage of the granular base materials will promote the longevity of the pavement structures.

6.9 Hydraulic Conductivity and Infiltration Rates

It is understood that the potential for an at-source storm water management feature may be considered at the site.

The top of the infiltration feature should be located below the footing drain/weeper and at least 5 m away from the proposed building footprints. It is noted that infiltration features should have the base located at least 1.0 m above the groundwater table and that a minimum infiltration rate of 15 mm/hr is required.

Based on the results of grain size analyses and our experience, the hydraulic conductivity and infiltration rate of the native inorganic soil types encountered at the boreholes are estimated and provided in the following table and may be used for storm water management purposes:

Material	Hydraulic Conductivity (K) (cm/sec)	Infiltration Rate (mm/hr)
Sand, some silt (Enclosure 6)	2×10^{-3}	75 to 100
Sand and Gravel to Gravelly Sand, trace to some silt	3×10^{-3}	100 to 150
Sand and Silt, trace gravel	1×10^{-3}	30

The granular deposits have high infiltration rates, and the ground water table is located below 6.55 m depth. The site is considered suitable for low impact development infiltration features.



7.0 GEOENVIRONMENTAL CONSIDERATIONS

Excess soil may be generated and removed off-site during the construction activities associated with the proposed site works. The management of excess soil is now governed by Ontario Regulation 406/19 (O. Reg. 406/19), MECP document titled “On-Site and Excess Soil Management Regulation”.

In accordance with the regulation, the Project Leader is responsible for the handling, storage, reuse, transportation, and removal of all soil. Furthermore, the analytical results must be disclosed with and approved by the owner(s) of the receiving site before exporting the soil.

The following planning documents may be required for on-site and excess soil management:

- Planning Documentation
 - Assessment of Past Uses
 - Sampling and Analysis Plan
 - Soil Characterization Report
 - Excess Soil Destination Assessment Report
- Tracking
- Registry
- Record Keeping

An initial testing program was conducted during the geotechnical investigation and the analytical results are discussed in the following sections of this report. Additional soil sampling and analysis may be required as per the above-noted MECP document and/or as per the requirement of the receiving site owner(s), depending on the volume of excess soil generated during construction.

Any soils identified during construction to have been environmentally impacted are to be separately stockpiled and analysed to determine the appropriate measures for handling and disposal. Waste characterization testing (TCLP) to classify the material for disposal as prescribed in O.Reg. 347/558 is required.

Leachate analysis (mSPLP) is to be carried out if the excess soil is to be disposed to receiving sites under O.Reg. 406/19. Similarly, groundwater encountered during construction works must also be suitably assessed and handled.

7.1 Applicable Regulatory Standards

The Soil, Ground Water and Sediment Standards for Use Under the New Soil Rules and Excess Soil Quality Standards established in accordance with the O. Reg. 406/19 as amended were consulted in the assessment of the soil at the project site.



The analytical results for soils were compared to the following O. Reg. 406/19 regulatory standards:

- Table 1 (Full Depth Background Site Condition Standards) for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use (Table 1 RPIICC ESQS)
- Table 2.1 (Full Depth Generic Excess Soil Quality Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use (Table 2.1 RPI ESQS)
- Table 2.1 (Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition) for Industrial/Commercial/Community Property Use (Table 2.1 ICC ESQS)

7.2 Handling of Excess Soil

In support of on-site and excess soil management, an initial chemical testing program was conducted as part of this geotechnical investigation. Three (3) soil samples were submitted to AGAT Laboratories in Mississauga, Ontario for analysis of Metals and Inorganics, Petroleum Hydrocarbons (PHCs) fractions F1-F4 and Benzene-Toluene-Ethylbenzene-Xylene (BTEX).

The table below outlines a summary of the samples submitted for chemical analysis and all exceedances:

Sample ID	Table 1 RPIICC ESQS	Table 2.1 RPI ESQS	Table 2.1 ICC ESQS	Exceedance Parameter(s)
BH1 (SA1)	✓	✓	✓	EC and SAR
BH3 (SA1)	✓	✓	✓	SAR
BH5 (SA1)	✓	✓	✓	-

✓ - Meets applicable standard for all parameters analyzed

The measured concentrations for the samples met Table 1 RPIICC and Table 2.1 RPIICC Excess Soil Quality Standards (ESQS) for all tested parameters, except for BH1 (SA1) and BH3 (SA1), which exceeded the allowable Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) limit for Table 2.1 ICC ESQS and Table 2.1 RPI ESQS, respectively.

It is noted that the soil conditions may differ between and beyond the sample locations. If environmentally impacted soil is encountered during construction, the soil should be segregated, stockpiled and CVD should be contacted for further assessment of the impacted soils.



Management of Salt-Impacted Soils

Under O. Reg. 406/19, excess soil with salt exceedances can only be considered for beneficial reuse in the following conditions:

- The excess soil is finally placed at one of the following locations:
 - Where it is reasonable to expect that the soil will be affected by the same chemicals as a result of continued application of a substance for the safety of vehicular or pedestrian traffic under conditions of snow or ice
 - At industrial or commercial property use and to which non-potable standards would be applicable
 - At least 1.5 m below the surface of the soil
- The excess soil is not finally placed at any of the following locations:
 - Within 30 m of a waterbody
 - Within 100 m of a potable water well or area with an intended property use that may require a potable water well
 - At a location that will be used for growing crops or pasturing livestock unless the excess soil is placed 1.5 m or greater below the soil surface (at a Stratified Site)

The results and laboratory certificates of chemical analysis provided by AGAT Laboratories are enclosed in Appendix “B”. A comparison of the soil chemistry results to the applicable regulatory standard is included in Appendix “C”.

CVD further recommends that a disposal plan for excess soils be established to manage the quantity, as well as where and how the excess soils can be disposed of off-site.



8.0 CLOSURE

The Limitations of Report, as quoted in Appendix A, is an integral part of this report.

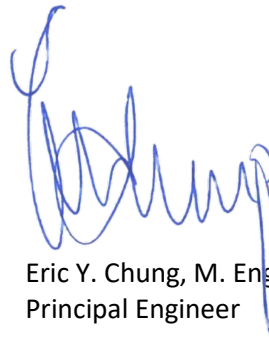
We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,

CHUNG & VANDER DOELEN ENGINEERING LTD.



Deepika Subburaj, M.Eng., E.I.T.
Geotechnical Engineering Intern



Eric Y. Chung, M. Eng., P.Eng.
Principal Engineer



APPENDIX A

Limitations of Report



APPENDIX “A”

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

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. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.



APPENDIX B

Soil Chemistry Results



CLIENT NAME: CHUNG AND VANDER DOELEN
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ATTENTION TO: Nandou Zhao

PROJECT: 2536

AGAT WORK ORDER: 25T311126

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganic Team Lead

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Jun 26, 2025

PAGES (INCLUDING COVER): 11

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.
- This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.



Certificate of Analysis

AGAT WORK ORDER: 25T311126

PROJECT: 2536

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CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Nandou Zhao

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

SAMPLED BY: DS

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2025-06-17

DATE REPORTED: 2025-06-26

Parameter	Unit	SAMPLE DESCRIPTION:				BH1 (SA1)	BH3 (SA1)	BH5 (SA1)
		SAMPLE TYPE:				Soil	Soil	Soil
		DATE SAMPLED:				2025-06-16	2025-06-16	2025-06-16
		G / S: A	G / S: B	G / S: C	RDL	6822207	6822210	6822211
Antimony	µg/g	1.3	40	7.5	0.8	<0.8[<A]	<0.8[<A]	<0.8[<A]
Arsenic	µg/g	18	18	18	1	5[<A]	3[<A]	4[<A]
Barium	µg/g	220	670	390	2.0	46.5[<A]	29.6[<A]	44.0[<A]
Beryllium	µg/g	2.5	8	4	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]
Boron	µg/g	36	120	120	5	<5[<A]	<5[<A]	<5[<A]
Boron (Hot Water Soluble)	µg/g	NA	2	1.5	0.10	<0.10[<C]	0.17[<C]	0.12[<C]
Cadmium	µg/g	1.2	1.9	1.2	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]
Chromium	µg/g	70	160	160	5	15[<A]	9[<A]	11[<A]
Cobalt	µg/g	21	80	22	0.8	5.0[<A]	3.0[<A]	3.6[<A]
Copper	µg/g	92	230	140	1.0	11.8[<A]	10.7[<A]	12.5[<A]
Lead	µg/g	120	120	120	1	15[<A]	14[<A]	20[<A]
Molybdenum	µg/g	2	40	6.9	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]
Nickel	µg/g	82	270	100	1	12[<A]	7[<A]	8[<A]
Selenium	µg/g	1.5	5.5	2.4	0.8	<0.8[<A]	<0.8[<A]	<0.8[<A]
Silver	µg/g	0.5	40	20	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]
Thallium	µg/g	1	3.3	1	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]
Uranium	µg/g	2.5	33	23	0.50	0.52[<A]	<0.50[<A]	<0.50[<A]
Vanadium	µg/g	86	86	86	2.0	38.0[<A]	16.9[<A]	21.7[<A]
Zinc	µg/g	290	340	340	5	74[<A]	76[<A]	88[<A]
Chromium, Hexavalent	µg/g	0.66	8	8	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]
Cyanide, WAD	µg/g	0.051	0.051	0.051	0.040	<0.040[<A]	<0.040[<A]	<0.040[<A]
Mercury	µg/g	0.27	0.27	0.27	0.10	<0.10[<A]	<0.10[<A]	<0.10[<A]
Electrical Conductivity (2:1)	mS/cm	0.57	1.4	0.7	0.005	3.96[>B]	0.140[<A]	0.099[<A]
Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	12	5	N/A	39.5[>B]	6.92[C-B]	0.599[<A]
pH, 2:1 CaCl2 Extraction	pH Units				NA	6.99	6.30	6.55

Certified By:



Nine Basil



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 25T311126

PROJECT: 2536

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CLIENT NAME: CHUNG AND VANDER DOELEN

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

ATTENTION TO: Nandou Zhao

SAMPLED BY: DS

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2025-06-17

DATE REPORTED: 2025-06-26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

6822207-6822211 EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl₂ extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Nivine Basly



Certificate of Analysis

AGAT WORK ORDER: 25T311126

PROJECT: 2536

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CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Nandou Zhao

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

SAMPLED BY: DS

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2025-06-17

DATE REPORTED: 2025-06-26

		SAMPLE DESCRIPTION:				BH1 (SA1)	BH3 (SA1)	BH5 (SA1)
		SAMPLE TYPE:				Soil	Soil	Soil
		DATE SAMPLED:				2025-06-16	2025-06-16	2025-06-16
Parameter	Unit	G / S: A	G / S: B	G / S: C	RDL	6822207	6822210	6822211
Benzene	µg/g	0.02	0.02	0.02	0.02	<0.02[<A]	<0.02[<A]	<0.02[<A]
Toluene	µg/g	0.2	0.2	0.2	0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]
Ethylbenzene	µg/g	0.05	0.05		0.05	<0.05[<B]	<0.05[<B]	<0.05[<B]
m & p-Xylene	µg/g				0.05	<0.05	<0.05	<0.05
o-Xylene	µg/g				0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	0.05	0.091	0.091	0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]
F1 (C6 to C10)	µg/g	25			5	<5[<A]	<5[<A]	<5[<A]
F1 (C6 to C10) minus BTEX	µg/g	25	25	25	5	<5[<A]	<5[<A]	<5[<A]
F2 (C10 to C16)	µg/g	10	26	10	10	<10[<A]	<10[<A]	<10[<A]
F3 (C16 to C34)	µg/g	240	240	240	50	<50[<A]	<50[<A]	<50[<A]
F4 (C34 to C50)	µg/g	120	3300	2800	50	<50[<A]	<50[<A]	<50[<A]
Gravimetric Heavy Hydrocarbons	µg/g	120			50	NA[B]	NA[B]	NA[B]
Moisture Content	%				0.1	13.5	6.5	6.4
Surrogate	Unit	Acceptable Limits						
Toluene-d8	% Recovery	60-140				115	99	93
Terphenyl	%	60-140				88	73	86

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PROJECT: 2536

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CLIENT NAME: CHUNG AND VANDER DOELEN

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

ATTENTION TO: Nandou Zhao

SAMPLED BY: DS

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2025-06-17

DATE REPORTED: 2025-06-26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

6822207-6822211 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

**Exceedance Summary**

AGAT WORK ORDER: 25T311126

PROJECT: 2536

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CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Nandou Zhao

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
6822207	BH1 (SA1)	ON 406/19 T2.1 IC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	3.96
6822207	BH1 (SA1)	ON 406/19 T2.1 IC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	12	39.5
6822207	BH1 (SA1)	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.7	3.96
6822207	BH1 (SA1)	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	5	39.5
6822207	BH1 (SA1)	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.57	3.96
6822207	BH1 (SA1)	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	39.5
6822210	BH3 (SA1)	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	5	6.92
6822210	BH3 (SA1)	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	6.92

Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 25T311126

PROJECT: 2536

ATTENTION TO: Nandou Zhao

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

SAMPLED BY: DS

Soil Analysis

RPT Date: Jun 26, 2025			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	6823963		<0.8	<0.8	NA	< 0.8	114%	70%	130%	106%	80%	120%	92%	70%	130%
Arsenic	6823963		1	1	NA	< 1	119%	70%	130%	102%	80%	120%	104%	70%	130%
Barium	6823963		30.7	30.9	0.5%	< 2.0	101%	70%	130%	86%	80%	120%	89%	70%	130%
Beryllium	6823963		<0.5	<0.5	NA	< 0.5	108%	70%	130%	93%	80%	120%	98%	70%	130%
Boron	6823963		<5	<5	NA	< 5	83%	70%	130%	87%	80%	120%	90%	70%	130%
Boron (Hot Water Soluble)	6824516		0.34	0.33	NA	< 0.10	88%	60%	140%	103%	70%	130%	96%	60%	140%
Cadmium	6823963		<0.5	<0.5	NA	< 0.5	108%	70%	130%	102%	80%	120%	104%	70%	130%
Chromium	6823963		8	9	NA	< 5	97%	70%	130%	87%	80%	120%	86%	70%	130%
Cobalt	6823963		3.1	3.1	NA	< 0.8	82%	70%	130%	101%	80%	120%	102%	70%	130%
Copper	6823963		5.8	5.7	1.5%	< 1.0	88%	70%	130%	88%	80%	120%	81%	70%	130%
Lead	6823963		3	3	NA	< 1	101%	70%	130%	87%	80%	120%	83%	70%	130%
Molybdenum	6823963		<0.5	<0.5	NA	< 0.5	109%	70%	130%	102%	80%	120%	110%	70%	130%
Nickel	6823963		6	6	4.2%	< 1	93%	70%	130%	101%	80%	120%	98%	70%	130%
Selenium	6823963		<0.8	<0.8	NA	< 0.8	88%	70%	130%	105%	80%	120%	103%	70%	130%
Silver	6823963		<0.5	<0.5	NA	< 0.5	82%	70%	130%	85%	80%	120%	83%	70%	130%
Thallium	6823963		<0.5	<0.5	NA	< 0.5	111%	70%	130%	119%	80%	120%	119%	70%	130%
Uranium	6823963		<0.50	<0.50	NA	< 0.50	92%	70%	130%	86%	80%	120%	88%	70%	130%
Vanadium	6823963		16.1	16.0	0.1%	< 2.0	91%	70%	130%	107%	80%	120%	110%	70%	130%
Zinc	6823963		17	22	NA	< 5	110%	70%	130%	99%	80%	120%	97%	70%	130%
Chromium, Hexavalent	6821632		<0.2	<0.2	NA	< 0.2	101%	70%	130%	97%	80%	120%	85%	70%	130%
Cyanide, WAD	6824518		<0.040	<0.040	NA	< 0.040	104%	70%	130%	100%	80%	120%	90%	70%	130%
Mercury	6823963		<0.10	<0.10	NA	< 0.10	109%	70%	130%	101%	80%	120%	102%	70%	130%
Electrical Conductivity (2:1)	6823236		0.552	0.607	9.4%	< 0.005	100%	80%	120%						
Sodium Adsorption Ratio (2:1) (Calc.)	6823236		0.178	0.167	6.0%	NA									
pH, 2:1 CaCl2 Extraction	6824309		6.97	6.97	0.0%	NA	97%	80%	120%						

Comments: NA signifies Not Applicable.

pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:


Nivine Basily

Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 25T311126

PROJECT: 2536

ATTENTION TO: Nandou Zhao

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

SAMPLED BY: DS

Trace Organics Analysis

RPT Date: Jun 26, 2025			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	6819124		<0.02	<0.02	NA	< 0.02	78%	60%	140%	104%	60%	140%	73%	60%	140%
Toluene	6819124		<0.05	<0.05	NA	< 0.05	78%	60%	140%	105%	60%	140%	72%	60%	140%
Ethylbenzene	6819124		<0.05	<0.05	NA	< 0.05	73%	60%	140%	104%	60%	140%	66%	60%	140%
m & p-Xylene	6819124		<0.05	<0.05	NA	< 0.05	81%	60%	140%	100%	60%	140%	82%	60%	140%
o-Xylene	6819124		<0.05	<0.05	NA	< 0.05	64%	60%	140%	100%	60%	140%	63%	60%	140%
F1 (C6 to C10)	6819124		<5	<5	NA	< 5	104%	80%	120%	90%	60%	140%	94%	60%	140%
F2 (C10 to C16)	6822207	6822207	< 10	< 10	NA	< 10	91%	80%	120%	118%	60%	140%	122%	60%	140%
F3 (C16 to C34)	6822207	6822207	< 50	< 50	NA	< 50	103%	80%	120%	117%	60%	140%	125%	60%	140%
F4 (C34 to C50)	6822207	6822207	< 50	< 50	NA	< 50	95%	80%	120%	118%	60%	140%	106%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:



Method Summary

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 25T311126

PROJECT: 2536

ATTENTION TO: Nandou Zhao

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

SAMPLED BY: DS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, WAD	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	SEGMENTED FLOW ANALYSIS
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES
pH, 2:1 CaCl ₂ Extraction	INOR-93-6075	modified from EPA 9045D, MCKEAGUE 3.11 E3137	PC TITRATE

Method Summary

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 25T311126

PROJECT: 2536

ATTENTION TO: Nandou Zhao

SAMPLING SITE: 34 Osborne Street, Cambridge, Ontario

SAMPLED BY: DS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Toluene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Ethylbenzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
m & p-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
o-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Xylenes (Total)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
F1 (C6 to C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID



Laboratory Use Only

Work Order #: 257311126

Cooler Quantity: 119

Arrival Temperatures: 6.4 | 6.2 | 6.0

Depot Temperatures: _____

Custody Seal Intact: ☐ Yes ☒ No ☒ N/A

Notes: CHI

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Chung & Vander Doelen Engineering Ltd.

Contact: Nandou Zhao

Address: 311 Victoria Street North, Kitchener, Ontario

Phone: 519 742 8979 Fax: _____

Reports to be sent to: nandou.zhao@cvdengineering.com

1. Email: _____

2. Email: deepika.subburaj@cvdengineering.com

Regulatory Requirements:

(Please check all applicable boxes)

☒ Regulation 153/04

Table 1 Indicate One

☒ Ind/Com

☒ Res/Park

☐ Agriculture

Soil Texture (Check One)

☐ Coarse

☐ Fine

☒ Regulation 406

Table 2.1 Indicate One

☒ Ind/Com

☒ Res/Park

☐ Agriculture

☐ Regulation 558

☐ CCME

☐ Sewer Use

☐ Sanitary

☐ Storm

Region _____

☐ Prov. Water Quality

Objectives (PWQO)

☐ Other

Indicate One

Is this submission for a Record
of Site Condition (RSC)?

☐ Yes ☒ No

Report Guideline on
Certificate of Analysis

☐ Yes ☐ No

Legal Sample ☐

Sample Matrix Legend

GW Ground Water SD Sediment
O Oil SW Surface Water
P Paint R Rock/Shale
S Soil

Project Information:

Project: 2536

Site Location: 34 Osborne Street, Cambridge, Ontario

Sampled By: DS

AGAT Quote #: _____ PO: _____

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: _____

Contact: _____

Address: _____

Email: _____

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Field Filtered - Metals, Hg, CrVI, DOC	O. Reg 153	O. Reg 406	O. Reg 558	Excess Soil Package 1	Excess Soil Package 2	Potentially Hazardous or High Concentration (Y/N)
1. BH1 (SA1)	JUNE 16-25	12:00 AM	4	SOIL									
2. BH3 (SA1)	JUNE 16-25	12:00 AM	4	SOIL									
3. BH5 (SA1)	JUNE 16-25	12:00 AM	4	SOIL									
4.		AM											
5.		AM											
6.		AM											
7.		AM											
8.		AM											
9.		AM											
10.		AM											
11.		AM											

Samples Relinquished By (Print Name and Sign): DEEPIKA SUBBURAJ	Date June 17, 2025	Time 9:00 AM	Samples Received By (Print Name and Sign): <i>[Signature]</i>	Date June 17	Time 5:03 PM
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

APPENDIX C

Comparison of the Soil Chemistry Results to the Applicable Regulatory Standards



ANALYTICAL RESULTS FOR SOIL

2536

Ontario Regulation 406/19 (as amended) - Excess Soil Quality Standards

		Sample ID			BH1 (SA1)	BH3 (SA1)	BH5 (SA1)
		Depth (m)			0.075 - 0.675	0.0 - 0.6	0.0 - 0.6
		Date			June 16-2025	June 16-2025	June 16-2025
		Lab Sample ID			6822207	6822210	6822211
		T1 RPIICC ¹	T2.1 RPI ²	T2.1 ICC ³			
Metals & Inorganics	Antimony (Sb)	1.3	7.5	40	<0.8	<0.8	<0.8
	Arsenic (As)	18	18	18	5	3	4
	Barium (Ba)	220	390	670	46.5	29.6	44
	Beryllium (Be)	2.5	4	8	<0.5	<0.5	<0.5
	Boron (B)	36	120	120	<5	<5	<5
	Boron, Hot Water Soluble	-	1.5	2	<0.10	0.17	0.12
	Cadmium (Cd)	1.2	1.2	1.9	<0.5	<0.5	<0.5
	Chromium (Cr)	70	160	160	15	9	11
	Cobalt (Co)	21	22	80	5	3	3.6
	Copper (Cu)	92	140	230	11.8	10.7	12.5
	Lead (Pb)	120	120	120	15	14	20
	Molybdenum (Mo)	2	6.9	40	<0.5	<0.5	<0.5
	Nickel (Ni)	82	100	270	12	7	8
	Selenium (Se)	1.5	2.4	5.5	<0.8	<0.8	<0.8
	Silver (Ag)	0.5	20	40	<0.5	<0.5	<0.5
	Thallium (Tl)	1	1	3.3	<0.5	<0.5	<0.5
	Uranium (U)	2.5	23	33	0.52	<0.50	<0.50
	Vanadium (V)	86	86	86	38	16.9	21.7
	Zinc (Zn)	290	340	340	74	76	88
	Chromium, Hexavalent - Cr(VI)	0.66	8	8	<0.2	<0.2	<0.2
	Cyanide	0.051	0.051	0.051	<0.040	<0.040	<0.040
	Mercury (Hg)	0.27	0.27	0.27	<0.10	<0.10	<0.10
	Electrical Conductivity (EC)	0.57	0.7	1.4	3.96	0.14	0.099
	Sodium Adsorption Ratio (SAR)	2.4	5	12	39.5	6.92	0.599
	pH	-	-	-	6.99	6.3	6.55
BTEX	Benzene	0.02	0.02	0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	0.05	0.05	<0.05	<0.05	<0.05
	Toluene	0.2	0.2	0.2	<0.05	<0.05	<0.05
	Xylenes (Total)	0.05	0.091	0.091	<0.05	<0.05	<0.05
Petroleum Hydrocarbons (F1-F4)	F1 (C6-C10)	25	25	25	<5	<5	<5
	F2 (C10-C16)	10	10	26	<10	<10	<10
	F3 (C16-C34)	240	240	240	<50	<50	<50
	F4 (C34-C50)	120	2800	3300	<50	<50	<50
	F4G-SG (GHH-Silica)	120	2800	3300	NA	NA	NA

NOTES:

¹ Table 1: Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Uses

² Table 2.1: Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition (Volume Independent) for Residential / Parkland / Institutional Uses

³ Table 2.1: Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition (Volume Independent) for Industrial / Commercial / Community Uses

1. Units = ug/g (excluding pH/EC/SAR)

2. "-" = Parameter not included in chemical analysis

3. Test results exceed Table 1 RPIICC ESQS

4. Test results exceed Table 2.1 RPI ESQS

5. Test results exceed Table 2.1 ICC ESQS

ENCLOSURES



Soil Abbreviations and Terms Used on Record of Borehole Sheets

TERMINOLOGY DESCRIBING COMMON SOIL TYPES:

Topsoil	-	mixture of soil and humus capable of supporting vegetation
Peat	-	mixture of visible and invisible fragments of decayed organic matter
Till	-	unstratified glacial deposit which may range from clay to boulders
Fill	-	soil materials identified as being placed anthropologically

CLASSIFICATION (UNIFIED SYSTEM)

Clay	<0.002mm
Silt	0.002 to .075mm
Sand	0.075 to 4.75mm
	Fine 0.075 to 0.425 mm
	Medium 0.425 to 2.0 mm
	Coarse 2.0 to 4.75 mm
Gravel	4.75 to 75mm
	Fine 4.75 to 19 mm
	Coarse 19 to 75 mm
Cobbles	75 to 300mm
Boulders	>300mm

TERMINOLOGY

Soil Composition	% by Weight
"traces"	<10%
"some"(eg. some silt)	10-20%
Adjective (eg. sandy)	20-35%
"and"(eg. sand and gravel)	35-50%

Standard Penetration Resistance (SPT): Standard Penetration Resistance ('N' Values) refers to the number of blows required to advance a standard (ASTM D1586) 51 mm Ø (2 inch) split-spoon sampler by the use of a free falling, 63.5 Kg (140lbs) hammer. The number of blows from the drop weight is recorded for every 15 cm (6 inches). The hammer is dropped from a distance of 0.76m (30 inches) providing 474.5 Joules per blow. When the sampler is driven a total of 45 cm (18 inches) into the soil, the standard penetration index ('N' Value) is the total number of blows for the last 30 cm (12 inches).

Dynamic Cone Penetration Resistance (DCPT): Dynamic Cone Penetration Resistance is similar to a SPT with the 474.5 Joule/blow impulse provided by the free falling hammer where the split-spoon sampler is replaced by a 51 mm Ø, 60° conical point and the number of blows is recorded continuously for every 30 cm (12 inches).

COHESIVE SOILS CONSISTENCY

	(kPa)	(P.S.F.)	Nominal 'N' Value
Very Soft	<12	<250	0-2
Soft	12-25	250-500	2-4
Firm	25-50	500-1000	4-8
Stiff	50-100	1000-2000	8-15
Very Stiff	100-200	2000-4000	15-30
Hard	>200	>4000	>30

RELATIVE DENSITY OF COHESIONLESS SOIL

	'N' Value
Very Loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

MOISTURE CONDITIONS:

Cohesive Soil
DTPL- Drier than plastic limit
APL- About plastic limit
WTPL- Wetter than plastic limit
MWTPL- Much wetter than plastic limit

Cohesionless Soil
Damp
Moist
Wet
Saturated

SAMPLE TYPES AND ADDITIONAL FIELD TESTS

SS	Split Spoon Sample (obtained from SPT)	GS	Grab Sample	PP	Pocket Penetrometer
AS	Auger Sample	BS	Bulk Sample	VANE	Peak & Remolded shear
		TW	Thin Wall Sample or Shelby Tube	DMT	Flat Plate Dilatometer

LABORATORY TESTS

SG	Specific Gravity	S	Sieve Analysis	W	Water Content
H	Hydrometer	P	Field Permeability	K	Lab Permeability
W_p	Plastic Limit	W_l	Liquid Limit	I_p	Plasticity Index
GSA	Grain Size Analysis	C	Consolidation	UNC	Unconfined compression



CHUNG & VANDER DOELEN
ENGINEERING LTD.

Enclosure A

FILE No: 2536**BOREHOLE No. 1**Client: **Waterloo Catholic District School Board**Project: **Proposed Building Addition**Location: **34 Osborne Street, Cambridge, Ontario****EQUIPMENT DATA**Machine: **CME 55 Track**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Jun 16 - 25 TO Jun 16 - 25**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80									
Ground Elevation: 288.48 m																
288.21 0.28	75 mm ASPHALT 200 mm GRANULAR BASE			1	SS	5	●									
	loose to compact dark brown to brown	0.5														
	FILL, sand and gravel trace to some silt moist	1.0		2	SS	11	●							○		
286.98 1.50		1.5		3	SS	10	●							○		
	loose to compact brown	2.0														
	FILL, sity sand to sand and silt trace to some gravel occ. silt lumps moist	2.5		4	SS	8	●							○		
		3.0		5	SS	10	●							○		
		3.5														
284.68 3.80	loose sand layer	4.0		6	SS	8	●							○		
	----- compact brown	4.5														
	SAND AND GRAVEL trace to some silt damp to moist	5.0		7	SS	27	●							○		
		5.5														
		6.0														
	----- very dense	6.5		8	SS	71	●							○		
281.93 6.55	End of Borehole.															
		7.0														
		7.5														

dry cave-in at 5.0 m depth
upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 2536**BOREHOLE No. 2**Client: **Waterloo Catholic District School Board**Project: **Proposed Building Addition**Location: **34 Osborne Street, Cambridge, Ontario****EQUIPMENT DATA**Machine: **CME 55 Track**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Jun 16 - 25 TO Jun 16 - 25**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS				
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □				PENETRATION RESISTANCE STANDARD ● DYN. CONE ○									
							50	100	150	200	20	40	60				80	W _p	W	W _L
Ground Elevation: 288.69 m											10 20 30									
288.38 0.32	65 mm ASPHALT 250 mm GRANULAR BASE																			
	compact, dark brown FILL, clayey silt some sand, trace gravel	0.5		1	SS	17							○							
287.69 1.00	sand and silt, trace gravel trace clay, moist	1.0		2	SS	31							○							
	compact to very dense brown	1.5																		
	SAND AND GRAVEL to GRAVELLY SAND	2.0		3	SS	20							○							
	trace to some silt occ. sand layers damp to moist	2.5		4	SS	70							○							
		3.0																		
		3.5		5	SS	48							○							
		4.0																		
284.69 4.00	compact to very dense brown	4.5																		
	Fine SAND	5.0		6	SS	28							○							
	trace gravel, trace silt	5.5																		
	occ. cobbles occ. silty layer	6.0																		
	damp to moist	6.5		7	SS	65							○							
282.14 6.55	End of Borehole.																			
		7.0																		
		7.5																		

dry cave-in at 5.3 m depth
upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 2536**BOREHOLE No. 3**Client: **Waterloo Catholic District School Board**Project: **Proposed Building Addition**Location: **34 Osborne Street, Cambridge, Ontario****EQUIPMENT DATA**Machine: **CME 55 Track**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Jun 16 - 25 TO Jun 16 - 25**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ — ○ ↖					
Ground Elevation: 288.84 m							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
288.69 0.15	150 mm TOPSOIL		⊗													
	very loose to compact dark brown	0.5	⊗	1	SS	12	●						○			
	FILL, sandy silt trace gravel, trace clay occ. rootlets, trace organics moist	1.0	⊗	2	SS	3	●						○			
287.34 1.50	compact to dense brown	1.5	⊗	3	SS	17	●						○			
	Fine SAND trace gravel, trace silt moist	2.0	⊗													
	gravelly layer occ. cobbles	2.5	⊗	4	SS	38	●						○			
285.74 3.10	compact to dense brown	3.0	⊗	5	SS	29	●						○			
	SAND AND SILT trace gravel	3.5	⊗													
	damp to moist	4.0	⊗													
		4.5	⊗													
		5.0	⊗	6	SS	35	●						○			
		5.5	⊗													
		6.0	⊗													
282.29 6.55	End of Borehole.	6.5	⊗	7	SS	31	●						○			
		7.0														
		7.5														

dry cave-in at 4.9 m depth upon withdrawal of drilling augers

PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
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FILE No: 2536**BOREHOLE No. 4**Client: **Waterloo Catholic District School Board**Project: **Proposed Building Addition**Location: **34 Osborne Street, Cambridge, Ontario****EQUIPMENT DATA**Machine: **CME 55 Track**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Jun 16 - 25 TO Jun 16 - 25**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↔ ○ ↔					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80									
Ground Elevation: 289.04 m																
288.89 0.15	150 mm TOPSOIL															
	compact, dark brown			1	SS	15	●						○			
	FILL, sand and silt trace gravel, trace clay moist	0.5														
288.24 0.80	silty layer	1.0		2	SS	11	●						○			

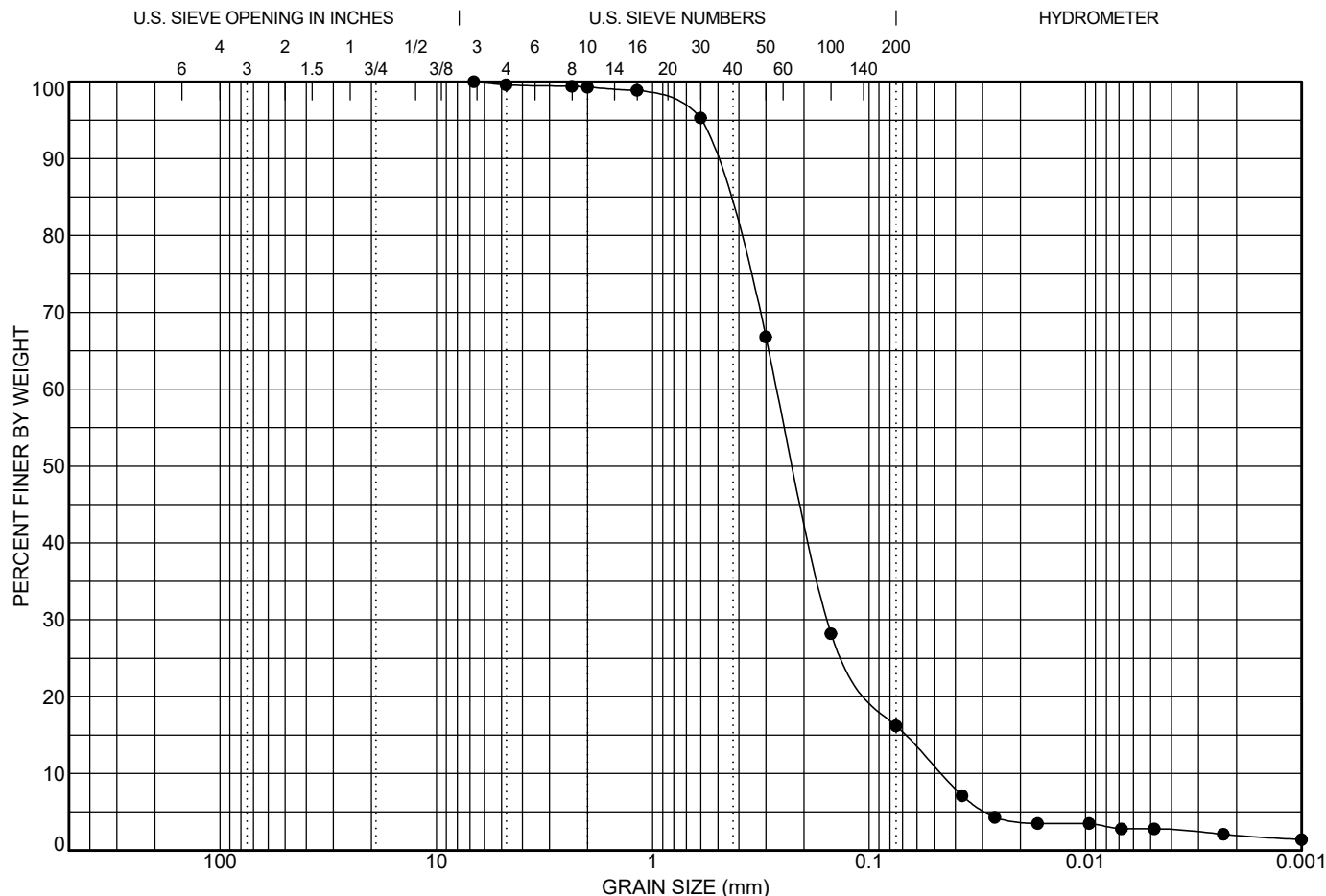
	compact to dense brown	1.5		3	SS	20	●						○			
	Fine SAND trace gravel trace to some silt damp to moist	2.0														
		2.5		4	SS	19	●						○			
		3.0														
				5	SS	42							○			
285.54 3.50	End of Borehole.	3.5														
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														

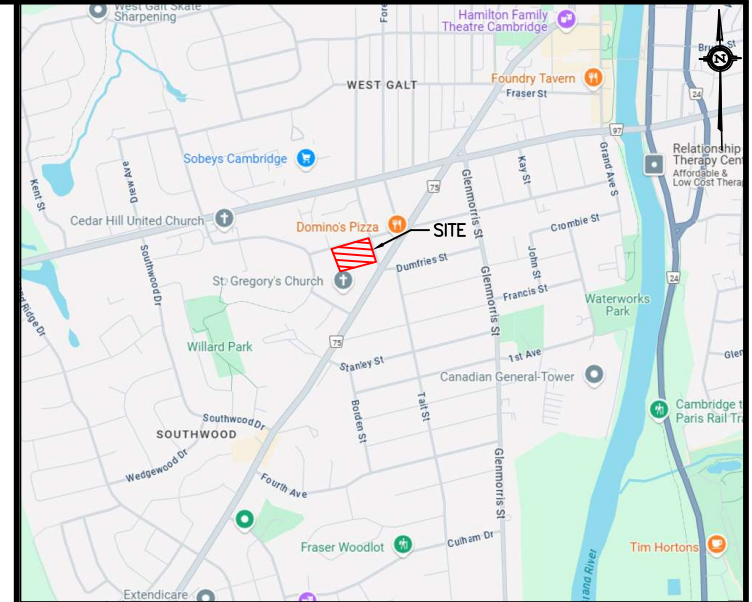
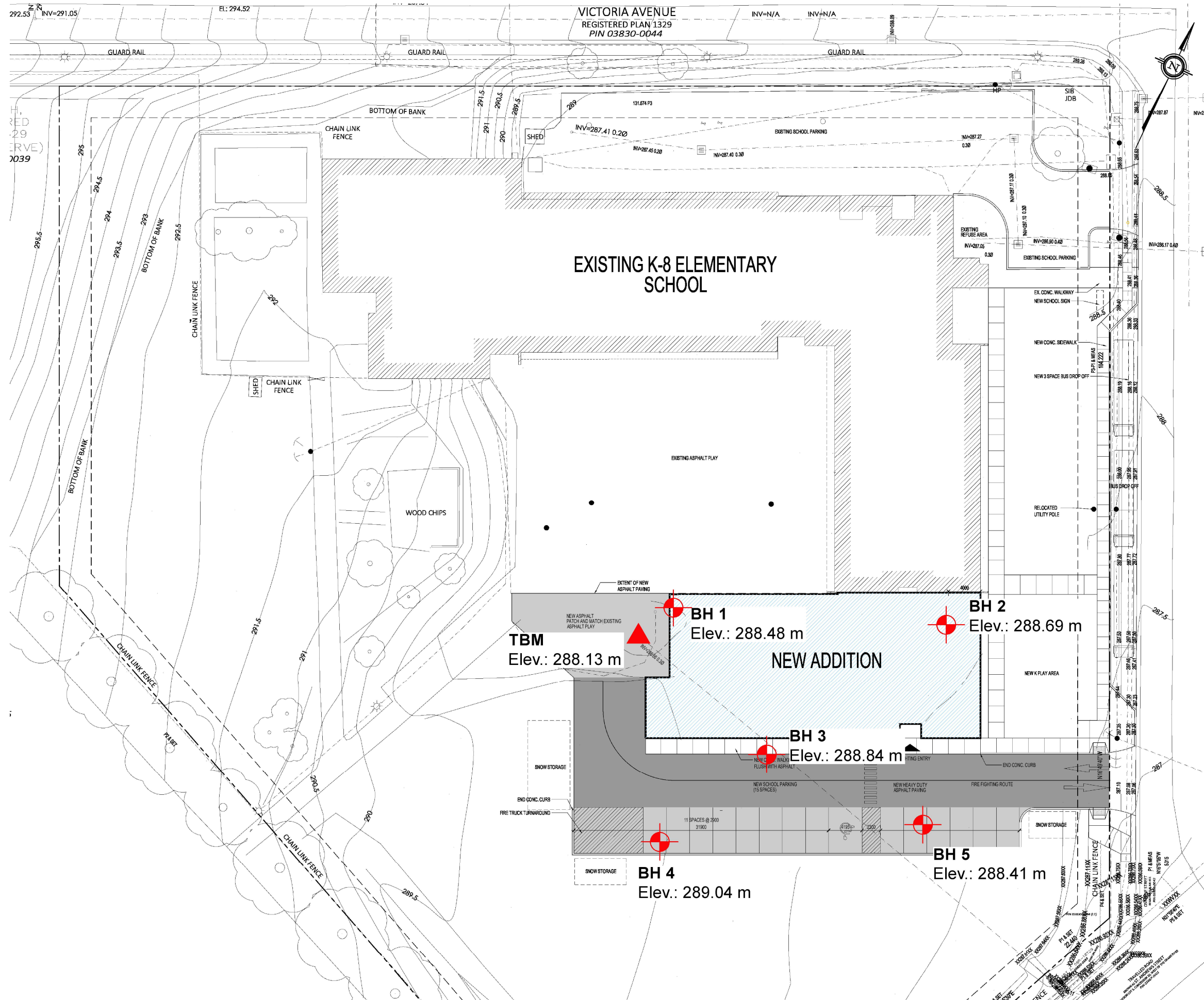
dry cave-in at 2.4 m depth
upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
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FILE No: 2536**BOREHOLE No. 5**Client: **Waterloo Catholic District School Board**Project: **Proposed Building Addition**Location: **34 Osborne Street, Cambridge, Ontario****EQUIPMENT DATA**Machine: **CME 55 Track**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Jun 16 - 25 TO Jun 16 - 25**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □				PENETRATION RESISTANCE STANDARD ● DYN. CONE ○					
							50	100	150	200						
							20	40	60	80	10	20	30			
Ground Elevation: 288.41 m																
288.21 0.20	200 mm TOPSOIL															
	loose dark brown to brown	0.5		1	SS	9										
	FILL, sand and silt trace to some gravel trace clay moist	1.0		2	SS	5										
286.91 1.50	compact, brown	1.5		3	SS	13										
	Fine SAND trace gravel trace to some silt damp to moist	2.0														
		2.5		4	SS	28										
		3.0														
284.91 3.50	occ. silty layers	3.5		5	SS	24										
	End of Borehole.	3.5														
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														

dry cave-in at 2.7 m depth
upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739





KEY PLAN SOURCE: Google Earth

LEGEND

TBM: Top of existing catch basin located in the existing asphalt play area.
Elev.: 288.13 m (Geodetic)

Borehole Location

Elev. Ref.: CVD borehole locations and associated ground surface elevations were surveyed using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using UTM Zone 17N Projection, NAD83(CRS)v7-2010 datum and Canada Geoid Model HT2_2010v70 (CGVD28).

DWG. Ref.: JP Thomson Architects Ltd.; "Site Plan Option C"; WCDSB, St. Gregory Catholic Elementary School Addition, 34 Osborne Street, Cambridge, Ontario; Dated: 2025-05-13.

BOREHOLE LOCATION PLAN

Proposed Building Addition

34 Osborne Street
Cambridge, Ontario

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: DS	Date: July 2025	File No.: 2536
Checked By: EYC	Scale: N.T.S	Drawing No.: 1



St. Gregory CES

Designated Substance Audit Report

Project Location:

34 Osborne Street, Cambridge, ON

Prepared for:

Waterloo Catholic District School Board
480 Dutton Drive
Waterloo, ON N2L 4C6

Prepared by:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

February 9, 2026

MTE File No.: 64457_004



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Appendices

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1.0 INTRODUCTION

1.1 Authorization

MTE Consultants Inc. (MTE) was retained by the Waterloo Catholic District School Board (WCDSB) to conduct a Designated Substance Audit for the St. Gregory Catholic Elementary School building located at 34 Osborne Street in Cambridge, Ontario.

The purpose of the audit was to identify the presence of Designated Substances within the building(s) in accordance with Section 30 of the Occupational Health & Safety Act (OHSA), in advance of building addition. This report meets the requirements of Section 30 of the OHSA and the requirements of Ontario Regulation (O. Reg.) 278/05.

2.0 SCOPE OF WORK

As requested by the Client, this assessment was limited to the proposed addition connection locations and adjacent areas of the existing building where impact may occur. These include the Entrance/Vestibule Rooms 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1012, 1038, 1039, 1040, and 1041. These areas are referred to in the following sections as the “Subject Areas”.

The Scope of Work for this assessment was completed by MTE and included the following activities:

- Review of existing or historical reports and documentation pertaining to Designated Substances within the building and project scope;
- Visual inspection of accessible locations within the Subject Area to identify the following suspect Designated Substances and Hazardous Building Materials:
 - Asbestos;
 - Lead;
 - Mercury;
 - Silica;
 - Mould growth;
 - Ozone Depleting Substances; and
 - Polychlorinated Biphenyls limited to fluorescent light ballasts.
- The following Designated Substances are not expected to be present due to the building use or in a form that is hazardous: Acrylonitrile, Arsenic, Benzene, Coke Oven Emissions, Ethylene Oxide, Isocyanates, and Vinyl Chloride;
- Collection of bulk building material samples suspected to contain asbestos;
- Collection of paint scrape samples suspected to contain lead;
- Submission of samples to an accredited and/or qualified laboratory;
- Interpretation of laboratory results; and
- Preparation of this report of findings and recommendations.

3.0 METHODOLOGY AND ASSESSMENT CRITERIA

This audit was conducted using visual and laboratory identification methods for the assessment of materials outlined in Section 2.0 and their corresponding location and use. Materials that are determined to be asbestos-containing materials (ACM) are further classified by their friability and condition. The areas outlined in Section 2.0 were inspected and limited to building components, materials and service connections. Notwithstanding that reasonable attempts were made to identify all Designated Substances the possibility of concealed substances and material exists and may not become visible until substantial demolition has occurred and therefore are currently undocumented. All work was conducted in accordance with industry accepted methods and MTE Standard Operating Procedures and did not include the following:

- Materials indicated in this report as “Potentially Concealed”;
- Locations that may be hazardous to the surveyor (located at heights, electrical equipment, confined spaces);
- Where invasive inspection could cause consequential damage to the property or impair the integrity of the equipment, such as underground services or components of mechanical equipment;
- Locations concealed by building finishes that require substantial demolition or removal for access or determination of quantities (plumbing or electrical lines);
- Non-permanent items or personal contents, furnishings; and
- Settled dust or airborne agents unless otherwise stated.

4.0 ASSESSMENT AND RESULTS

An inspection of the building was conducted by MTE on January 15, 2026.

The proposed addition project is expected to disturb exterior doors, windows, building façade, roofing materials and associated structure, walls, millwork, associated hardware, sealants, and electrical/mechanical equipment within the Subject Areas.

A description of the building and assessed finishes is provided below. Refer to Section 4.1 for a summary of findings.

Building Element	Description
Construction Date	1958
Addition Date(s)	1964 and 1967
Levels	1
Exterior Finishes	Concrete Brick Sealants Flat roof system
Building Structure	Wood Frame Concrete Concrete block
Building Insulations	Not inspected

Building Element	Description
Mechanical Systems/Insulations	Gas fired hot water heating Roof mounted air conditioning Metal Duct
	Parging on pipe fittings Fibreglass insulation on pipe straights Fiberglass insulation covered with Polyvinyl Chloride (PVC)
Electrical/Plumbing Systems	Fluorescent Light tubes, bulbs T8/T4 light ballasts
Floor Finishes	12"x12" Vinyl floor tiles white with grey flecks 12"x12" Vinyl floor tiles grey oatmeal pattern 12"x12" Vinyl floor tiles blue oatmeal pattern Carpet Concrete Terrazzo
Wall Finishes	Concrete Brick and Mortar Concrete Block Plaster
Ceiling Finishes	2' x 4' Random pin holes ceiling tiles (2015 date stamp) 1' x 1' Random Large & Small pin holes ceiling tiles Wood Deck and supports Concrete Deck

As part of this assignment, MTE reviewed "2025 Asbestos Audit Update, St. Gregory Catholic Elementary School" which was prepared by MTE Consultants and dated May 14, 2025. Review of this report indicated the following asbestos-containing materials has been confirmed or suspected present within the Subject Areas (main building):

Item	Material Description	Location
Confirmed ACMs	Parged pipe fittings	Storage 1037 and Corridor 1041

4.1 Findings and Analytical Results

A summary of sampling locations and analytical results are included in **Appendix A** and is inclusive of historical sampling, as outlined in Section 4.0.

Laboratory certificates of analysis are included in **Appendix B**.

A Field Figure of inspected areas and sample locations are included in **Appendix C**.

A detailed summary of findings and recommended actions is provided in **Table 4.3 of Appendix A**.

4.1.1 Asbestos

Asbestos was used in building materials throughout the years with peak usage in the 1950s and 1960s. While the manufacture of most ACM was banned in the 1970s, buildings constructed in the 1980s have the potential for ACM as well. In 1986, legislation limiting the use of asbestos in consumer products was introduced.

As part of this inspection, a total of 9 bulk samples of suspect ACM were submitted for asbestos analysis with a total of 9 analyses being performed. The difference between the number of samples submitted and the number of samples analysed can be a function of either the stop-positive method or the requirement of analyzing multiple layers, performed by the laboratory, from a single sample reported as additional samples or subsets of a sample.

Bulk samples were submitted for asbestos analysis to Paracel Laboratories Ltd. (Paracel), in Mississauga, Ontario. Paracel is certified under the Canadian Association of Laboratory Accreditation to perform asbestos analysis of bulk samples (accreditation number A3762). Laboratory analysis was conducted in accordance with the United States Environmental Protection Agency (USEPA), Test Method EPA/600-R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, June, 1993 by Polarized Light Microscopy (PLM) as prescribed by O. Reg. 278/05.

Based on the building construction date and presence of concrete block walls, invasive inspection was also conducted for vermiculite loose-fill insulation. Representative invasive testing locations were selected based on location, function and wall construction type and included the following:

- Corridor 1007 at mechanical wall penetrations – no vermiculite identified;
- Areas were excluded where concrete block was not present or concealed by building finishes, or where invasive inspection may either be hazardous to building occupants or cause significant aesthetic damage to building finishes;

Based on the laboratory results and visual identification, ACM was confirmed present at the time of the inspection. In addition, suspect ACM was either observed or may potentially be concealed by building finishes.

The roof system could not be accessed for sampling at the time of the inspection due to heavy snow loading and icy conditions. Roofing materials are to be sampled and analyzed for asbestos content in the Spring of 2026 prior to demolition.

4.1.2 Lead

Lead was historically used in mortar pigments, ceramic glazing; plumbing solder, electrical equipment and electronics solder, in pipe gaskets as packing in cast iron bell and spigot joints of sanitary drains, flexible plumbing connections, flashing panels, acoustical dampeners, phone cable casing and some architectural applications. In buildings constructed after 1990, these applications are no longer applicable outside of specialized uses (shielding for medical imaging etc.).

As part of this inspection, a total of 3 paint scrape samples were collected from surfaces and represent the paint colours which may be disturbed during the proposed project.

Samples were submitted for laboratory analysis by ASTM D3335-85A “Standard Method to Test for Low Concentrations of Lead in Paint by Atomic Absorption Spectrophotometry” following MOE Method E3470 Inductively Coupled Plasma Optical Emission Spectrometry to Paracel Laboratories Ltd., in Ottawa, Ontario. Paracel is accredited by the Canadian Association of Laboratory Accreditation to perform bulk lead analysis of paint.

Based on the laboratory results and visual identification, lead-containing materials were confirmed present at the time of the inspection. In addition, lead-containing solder on copper pipe connections or lead pipe gaskets may potentially be concealed in buried lines or wall cavities.

4.1.3 Mercury

Mercury is typically used in building service applications such as fluorescent light tubes, compact fluorescent bulbs, metal halide (sodium halide) lamp bulbs, and neon lights as a vapour. Mercury may exist in thermostats and pipe or mechanical equipment thermometers as a liquid. Mercury is presumed to be present in the above materials.

Mercury-containing materials were visually identified at the time of the inspection.

4.1.4 Silica

Silica is present in rock, stone, soil, and sand. Masonry products such as concrete block, brick, and mortar, as well as concrete and associated products contain silica. Due to its ubiquitous nature, silica was historically used in a wide variety of building materials and is still used today in new construction.

Building materials that are presumed to contain silica were visually identified at the time of the inspection.

4.1.5 Mould

No water damaged or mould impacted building materials were observed during the inspection.

4.1.6 Polychlorinated Biphenyls (PCB)

Suspect PCB-containing light ballasts were visually identified during the inspection. All live electrical equipment that could not be properly and safely de-energized were not assessed, therefore light ballasts were not inspected. Fluorescent light ballasts which were not accessed, will require additional investigation to determine their PCB content when removed from service.

4.1.7 Ozone-Depleting Substances (ODS)

ODS are chemical compounds that include chlorofluorocarbons (cfcs), hydrochlorofluorocarbons (hcfcs), halons, methyl bromide, carbon tetrachloride, hydrobromofluorocarbons, chlorobromomethane, and methyl chloroform which are widely used in cooling and refrigeration. The use of ODS is regulated under Ontario Regulation 463/10 *Ozone Depleting Substances and Other Halocarbons Made under the Environmental Protection Act*.

Building components presumed to contain ODS were identified at the time of the inspection.

4.2 Conclusions and Recommendations

A detailed summary of recommended actions is provided in **Table 4.3 of Appendix A**.

In accordance with Section 30 of OHSA and Section 8 of O. Reg. 278/05, the Owner must provide a copy of this report to all contractors doing work at the building. The Owner must also provide a copy of this report to all prospective contractors.

Should any additional suspect Designated Substances be discovered during building renovation demolition, work in the vicinity should cease and the materials should not be disturbed until proper notification, testing and abatement instructions are provided. All waste generated as a result of any and all work at the Site must be handled, transported and disposed of in accordance with Ontario Regulation 347 made under the Environmental Protection Act and local by-laws. Based on the assessment findings and analytical results, the following abatement measures are presented. It should be noted that the recommended actions are the minimum required actions, as prescribed by the appropriate Acts, regulations, guidelines, standards, codes and general best practice measures.

4.2.1 Asbestos

ACMs were identified during the assessment. If these materials, including those deemed or suspected, will be disturbed, or will likely be disturbed, during building maintenance, renovations, construction, or demolition activities, they must be handled and disposed of in accordance with the procedures prescribed by O. Reg. 278/05.

At the time of the audit, all inspected ACM within the Subject Areas was noted to be in good condition and no remedial abatement action is required at this time.

All asbestos work must be conducted by contractors who are trained in the type of asbestos operations required and should be overseen by a qualified third party Health, Safety and Environmental Professional. To conduct Type 3 asbestos operations, contractors must be certified as Asbestos Abatement Workers AAW (Trade code 253W) and Asbestos Abatement Supervisors AAS (Trade code 253S) by The Ministry of Training, Colleges and Universities (Ministry of Advanced Education and Skills Development) as prescribed by Section 20 of O. Reg. 278/05. Suspect or visually confirmed ACM must be deemed to be asbestos-containing and treated as if they contain a type of asbestos other than Chrysotile.

ACM may be present in concealed locations and if construction, renovation, alteration, or maintenance activities are planned, invasive inspections of concealed locations for potential ACM must be performed prior to such activities.

Should any suspect ACM be discovered during construction, renovation, alteration, or maintenance activities, work which disturbs the material must cease immediately. Suspect ACM must be treated as asbestos-containing or sampled prior to disturbance to assess the presence of asbestos.

There are no requirements under current legislation to remove ACM from a building simply because it is present. However, O. Reg. 278/05 requires that an Asbestos Management Program be implemented and maintained by the owner/employer where ACM is identified or suspected present.

4.2.2 Lead

Lead-containing paint, suspect lead-containing solder on plumbing connections were identified. As such special requirements for the management, handling and disposal of lead-containing materials by the owner, constructor, contractor, sub-contractors and workers apply. The abatement contractor should consult Environmental Abatement Council of Canada's (EACC) *Lead Guideline for Construction, Renovation, Maintenance or Repair (October 2014)* for the procedures and methods required to remove and dispose of lead-containing materials.

Low level lead-containing paint is also present and the following general procedures are recommended as a precautionary measure as per Environmental Abatement Council of Canada's (EACC) *Lead Guideline for Construction, Renovation, Maintenance or Repair (October 2014)*:

- General dust control;
- The washing of hands and face at on-site facilities;
- No smoking, eating, chewing gum or drinking in the work area; and
- No removal of painted surfaces by means of abrasive blasting.

4.2.3 Mercury

Mercury-containing materials were identified. All mercury containing materials or sources should be removed, intact, prior to any work which may disturb or damage them and cause worker exposure to mercury liquid and/or vapour.

On-site crushing of mercury-containing materials should not occur. Care should be taken to ensure safe storage of the above until recycling or disposal can be coordinated. Under current legislation, mercury waste requires handling and disposal in accordance with Ontario Regulation 490/09 of the OHSA and Ontario Regulation 347 of the Environmental Protection Act.

4.2.4 Silica

Silica is presumed to be present; therefore, special requirements for management and handling are required. The contractor should also consult MOL Occupational Health and Safety Branch's Guideline: *Silica on Construction Projects* (April 2011) for the procedures and methods required to remove and dispose of silica-containing materials.

4.2.5 Mould

No water damage or suspect mould growth was observed during the assessment therefore no special management and handling requirements are warranted.

It should be noted that the passage of time can alter conditions as they existed at the time the assessment and future water intrusions, water damage and associated mould growth may occur. Immediate response to future water intrusions by a professional consultant or restoration contractor is recommended.

4.2.6 Polychlorinated Biphenyls (PCB)

Suspect PCB-containing fluorescent light ballasts were identified but could not be conclusively classified as PCB-containing or non-PCB-containing.

It is the responsibility of the owner to inspect, or ensure the inspection of all light ballasts as they are removed from service to make certain they are properly classified as PCB-containing or non-PCB containing. Fixtures will require dismantling to access date stamps (located on the back of the ballast) in order to be correctly classified in accordance with Environment Canada's document "*Identification of Lamp Ballasts Containing PCBs, Report EPS 2/CC/2 (revised), August 1991*".

Statutory Orders and Regulations (SOR)/2008-273, the *PCB Regulations*, made under the *Canadian Environmental Protection Act*, permits continued use of in-service PCB-containing light ballasts until the end of service life or until December 31, 2025.

4.2.7 Ozone Depleting Substances (ODS)

Building components presumed to contain ODS were identified and special requirements for management, handling and disposal by the owner, constructor, contractor, sub-contractors and workers apply.

Under current legislation, there are no requirements to remove ODSs from service simply because they are present. However, prior to commencing any work where this equipment will be dismantled, destroyed or disposed of, the refrigerant must be drained by a licensed technician and tagged with a notice indicating that the equipment no longer contains refrigerant. The appropriate notices or records shall be maintained in accordance with O. Reg. 463/10 for a minimum of two (2) years and shall include, but not be limited to, service records, transfers/releases of refrigerants, refrigerant types and refrigerant systems.

5.0 LIMITATIONS

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and the Client. It was completed in accordance with the approved Scope of Work referred to in Section 2.0. As such, this report may not deal with all issues potentially applicable to the site and may omit issues that are or may be of interest to the reader. MTE makes no representation that the present report has dealt with all-important environmental features, except as provided in the Scope of Work. All findings and conclusions presented in this report are based on site conditions, as they existed during the time period of the investigation. This report is not intended to be exhaustive in scope or to imply a risk-free facility.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by any third party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time might affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may re-assess the contents of this report.

All of which is respectfully submitted,

MTE Consultants Inc.

Martin Mielke, B.Sc.

Tech. Practice Leader, Indoor Environments

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JAS: jmm

https://mte85.sharepoint.com/sites/64457_004/Shared Documents/03- Reports/report/64457_004_2026-02-09_rpt_LDSA_St. Gregory.docx

Appendix A

Tables

TABLE 4.1: BULK ASBESTOS SAMPLE SUMMARY TABLE					
Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
2006 Asbestos Audit Update					
STGREG-HAL-CT	1022	Ceiling tile	ND	-	No
STGREG-EXIT4-TC-01	1030	Textured ceiling	0.1	Chrysotile	No
STGREG-EXIT4-TC-02	1030		0.2	Chrysotile	No
STGREG-EXIT4-TC-03	1030		0.1	Chrysotile	No
STGREG-BOYSCR-PL-01	1037		Plaster	ND	-
STGREG-BOYSCR-PL-02	1037	ND		-	No
STGREG-BOYSCR-PL-03	1037	ND		-	No
STGREG-RM1-PL1	1001	ND		-	No
STGREG-RM1-PL2	1001	ND		-	No
STGREG-RM1-PL3	1001	ND		-	No
STGREG-TEACHROOM-CT	1013	Ceiling tile		ND	-
STGREG-GIRLSWASH-PL-01	1009	Plaster	ND	-	No
STGREG-GIRLSWASH-PL-02	1009	Plaster	ND	-	No
STGREG-GIRLSWASH-PL-03	1009	Plaster	ND	-	No
STGREG-CUST-TC-01	1033	Textured Ceiling	ND	-	No
STGREG-CUST-TC-02	1033		ND	-	No
STGREG-CUST-TC-03	1033		ND	-	No
STGREG-FRENCHOFFICE-CT	1019		Ceiling tile	ND	-
STGREG-HALL-CPANEL	1007	Transite panel	5	Chrysotile	Yes
2009 Asbestos Audit Update					
32961-101STG-S01A	1021	Ceiling Tile - 2'x4' Long Fissure Random Pinhole	ND	-	No
32961-101STG-S01B	1021	Ceiling Tile - 2'x4' Long Fissure Random Pinhole	ND	-	No
32961-101STG-S01C	1021	Ceiling Tile - 2'x4' Long Fissure Random Pinhole	ND	-	No
StGreg-Hall-CT2	1022	Ceiling Tile - 2'x4' Long Fissure Random Pinhole (Side Pattern)	ND	-	No
StGreg-Hall-CT3	1022	Ceiling Tile - 2'x4' Long Fissure Random Pinhole (Side Pattern)	ND	-	No
2013 Asbestos Audit Update					
32961-600 S01A	Washroom	Drywall Joint Compound	ND	-	No
32961-600 S01B	Washroom		ND	-	No
32961-600 S01C	Washroom		ND	-	No
2015 Limited Designated Substance Audit					
S01A	1005	Plaster	Plaster: ND	-	No
			Skim Coat: ND	-	No
			Plaster: ND	-	No
S01B	1010		Skim Coat: ND	-	No
S01C	1048	Drywall Joint Compound	Plaster: ND	-	No
			Skim Coat: ND	-	No
S01D	1035		Plaster: ND	-	No
			Skim Coat: ND	-	No
S01E	1036		Plaster: ND	-	No
			Skim Coat: ND	-	No
S02A	1003		ND	-	No
S02B	1015		Joint Compound: ND	-	No
S02C	1041		Plaster: ND	-	No
			ND	-	No
S03A	1016	9"x9" Vinyl Floor Tile - Beige with Brown Streaks	Tile: 1	Chrysotile	Yes
			Mastic: 1	Chrysotile	Yes
S03B	1016		Tile: NA	Chrysotile	Yes
			Mastic: NA	Chrysotile	Yes
S03C	1016		Tile: NA	Chrysotile	Yes
			Mastic: NA	Chrysotile	Yes
S04A	1044	12"x12" Vinyl Floor Tile - Light Green with White Fleck	Tile: ND	-	No
S04B	1044		Tile: ND	-	No
			Mastic: ND	-	No
S04C	1044		Tile: ND	-	No
		Mastic: ND	-	No	
S05A	1045	2'x2' Ceiling Tile - Dense Fissure Pinhole	ND	-	No
S05B	1045		ND	-	No
S05C	1045		ND	-	No
S06A	1027	9"x9" Vinyl Floor Tile - Light Green with Cream Streak	Tile: 3	Chrysotile	Yes
			Mastic: ND	-	No
S06B	1027		Tile: NA	-	Yes
			Tile: NA	-	Yes
S06C	1027		Mastic: ND	-	No
S07A	1027	Texture Coat	0.5	Chrysotile	Yes
S07B	1043		NA	-	Yes
S07C	1043		NA	-	Yes
S08A	1027		70	Chrysotile	Yes
S08B	1027	Pipe Fitting - Parged Cement	NA	-	Yes
S08C	1027		NA	-	Yes
			Tile: 1	Chrysotile	Yes
S09A	1037	9"x9" Vinyl Floor Tile - Grey with White Streak	Mastic: ND	-	No
			Tile: NA	-	Yes
S09B	1037		Mastic: ND	-	No
			Tile: NA	-	Yes
S09C	1037		Mastic: ND	-	No
S10A	1036		1	Chrvsotile	Yes

TABLE 4.1: BULK ASBESTOS SAMPLE SUMMARY TABLE					
Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
S10B	1036	9"x9" Vinyl Floor Tile - Cream with Brown Streak	NA	-	Yes
S10C	1036		NA	-	Yes
S11A	1034	12"x12" Vinyl Floor Tile - Green with Black Streak	Tile: 1	Chrysotile	Yes
			Mastic: ND	-	No
S11B	1034		Tile: NA	-	Yes
			Mastic: ND	-	No
S11C	1034		Tile: NA	-	Yes
			Mastic: ND	-	No
2015 Designated Substance Audit					
S01A	Exterior	Sealant - White	ND	-	No
S01B	Exterior	Sealant - White	ND	-	No
S01C	Exterior	Sealant - White	ND	-	No
S02A	Exterior	Sealant - Dark Brown	ND	-	No
S02B	Exterior	Sealant - Dark Brown	ND	-	No
S02C	Exterior	Sealant - Dark Brown	ND	-	No
S03A	Exterior	Sealant - Off-White	3	Chrysotile	Yes
S03B	Exterior	Sealant - Off-White	NA	Chrysotile	Yes
S03C	Exterior	Sealant - Off-White	NA	Chrysotile	Yes
2016 Asbestos Audit Update					
S01A	1013	Pink Vinyl Sheet Flooring	ND	-	No
S01B	1013	Pink Vinyl Sheet Flooring	ND	-	No
S01C	1013	Pink Vinyl Sheet Flooring	ND	-	No
S02A	1036	Brown Floor Tile Mastic	ND	-	No
S02B	1036	Brown Floor Tile Mastic	ND	-	No
S02C	1036	Brown Floor Tile Mastic	ND	-	No
2017 Asbestos Audit Update					
S01A	1012	Hard Texture Coat	ND	-	No
S01B	1012	Hard Texture Coat	ND	-	No
S01C	1012	Hard Texture Coat	ND	-	No
2019 Asbestos Audit Update					
S01A	1003	Drywall Joint Compound (1958 Original Building)	ND	-	No
S01B	1003	Drywall Joint Compound (1958 Original Building)	ND	-	No
S02A	1041	Drywall Joint Compound (1967 Addition)	ND	-	No
S02B	1041	Drywall Joint Compound (1967 Addition)	ND	-	No
2019 Asbestos Audit Update Additional Sampling					
S01A	Exterior	White Sealant on Door Frame (1958 Original Building)	ND	-	No
S01B			ND	-	No
S01C			ND	-	No
S02A	Exterior	Beige Sealant on Overhang (1958 Original Building)	ND	-	No
S02B			ND	-	No
S02C			ND	-	No
S03A	Exterior	Black Sealant on Window Pane (1958 Original Building)	ND	-	No
S03B			ND	-	No
S03C			ND	-	No
S04A	Exterior	Light Grey Sealant on Window Frame (1958 Original Building)	ND	-	No
S04B			ND	-	No
S04C			ND	-	No
S05A	Exterior	Hard Texture Coat on Wall (1958 Original Building)	ND	-	No
S05B			ND	-	No
S05C			ND	-	No
S06A	Interior	Grey Sealant on Door Frame (1967 Addition)	1	Chrysotile	Yes
S06B			NA	Chrysotile	Yes
S06C			NA	Chrysotile	Yes
S07A	Interior	Black on Door Pane (1967 Addition)	ND	-	No
S07B			ND	-	No
S07C			ND	-	No
S08A	Exterior	Black on Exterior Pane (1967 Addition)	ND	-	No
S08B			ND	-	No
S08C			ND	-	No
S09A	1036	Floor Tile Mastic	ND	-	No
S09B			ND	-	No
S09C			ND	-	No
S10A	Exterior	Off-White Sealant on Door Frame (1967 Addition)	ND	-	No
S10B			ND	-	No
S10C			ND	-	No
S11A	Exterior	Brown on Door Frame (1958 Original Building)	ND	-	No
S11B			ND	-	No
S11C			ND	-	No
2019 Designated Substance Audit Additional Sampling					
S01A	-	VFT	ND	-	No
S01B	-	VFT	ND	-	No
S01C	-	VFT	ND	-	No
S01A	-	Mastic	3	Chrysotile	Yes
S01B	-	Mastic	NA	Chrysotile	Yes
S01C	-	Mastic	NA	Chrysotile	Yes
2026 Designated Substance Audit					
S01A	1001	1'x1' Textured Ceiling Tile	ND	-	No
S01B	1001	1'x1' Textured Ceiling Tile	ND	-	No
S01C	1001	1'x1' Textured Ceiling Tile	ND	-	No
S02A	1001	1'x1' Random Large and Small Pinholes	ND	-	No
S02B	1001	1'x1' Random Large and Small Pinholes	ND	-	No
S02C	1001	1'x1' Random Large and Small Pinholes	ND	-	No
S03A	1003	1x1 Grid large and Small Pinholes	ND	-	No
S03B	1003	1x1 Grid large and Small Pinholes	ND	-	No
S03C	1005	1x1 Grid large and Small Pinholes	ND	-	No
NA: Not Analyzed due to stop positive method ND: No asbestos fibres detected above the laboratory minimum detection limit					

NA: Not Analyzed due to stop positive method ND: No asbestos fibres detected above the laboratory minimum detection limit

TABLE 4.1: BULK ASBESTOS SAMPLE SUMMARY TABLE					
Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
A bulk material sample containing 0.5% or more asbestos therefore establishes that material as asbestos-containing. In accordance with Table 1 of O. Reg. 278/05, a minimum number of samples for the material to be classified as non asbestos. A homogeneous material is defined by O. Reg. 278/05 "as material that is uniform in colour and texture". Homogeneous samples are identified by an alphabetical suffix to sample names to represent multiple samples of a homogeneous material. When a homogeneous material is analysed it is determined to be asbestos-containing upon the first positive detection of asbestos equal to or greater than 0.5%. Subsequent samples of the same material are therefore not analysed. Some bulk samples are comprised of multiple layers and as such will require multiple analysis. In such cases each layer is isolated at the laboratory and analysed individually to determine asbestos content. As a result the laboratory may report additional samples beyond the submitted number of samples or include multiple analyses as subsets within a sample.					

TABLE 4.2: LEAD IN PAINT SAMPLE SUMMARY TABLE

Sample #	Location	Colour	Material	Lead Content (ug/g)	Classification
LP1	1037 - Gym Storage	Beige	Wall	29	LOW LEVEL LEAD-CONTAINING
LP2	1037 - Gym Storage	Blue	Wall	296	LOW LEVEL LEAD-CONTAINING
LP3	1002	White	Wall	1,270	LEAD-CONTAINING
"<": The samples analysed reported concentrations of lead to be less than 1000 ug/g and are therefore classified as low level lead-containing. However, no lead concentrations were reported above the sample specific laboratory detection limit. As outlined in EACO's Lead Guideline for Construction, Renovation, Maintenance or Repair (October 2014), for the purpose of classifying surface coatings and mortars by laboratory analysis, any material containing lead at a concentration: • Greater than 0.5% by weight (5,000 µg/g, mg/kg, ppm) is considered lead-based; • Between 0.1 % and 0.5% by weight (1,000 to 5,000 µg/g, mg/kg, ppm) is considered lead-containing; or • Less than 0.1% (1,000 µg/g, mg/kg, ppm) is considered low level lead-containing.					

Table 4.3 - Summary of Designated Substances and Recommended Actions

St. Gregory Catholic Elementary School - 34 Osborne Street, Cambridge

Material	Location(s)	Material Description	Approximate Quantity	Photograph	Management Requirements If No Impacts to Material	Recommended Actions If Material Will Be Or Likely Be Impacted By Maintenance, Renovation, Construction or Demolition Activities
Asbestos Friable	MTE Room 1037 and 1041	Insulation on Pipe Fittings	12		In place management in accordance with O. Reg. 278/05	Removal in accordance with O. Reg. 278/05 < 1m ² as a Type 2 or Type 2 Glove Bag Operation and for > 1m ² as a Type 2 Glove Bag or Type 3 Operation
Suspect Asbestos Non-Friable	Exterior	Roofing Materials (Paper/Felts/Mastics/Sealants)	-	-	In place management in accordance with O. Reg. 278/05	Due to heavy snow load and ice build-up access to the roof and roof materials sampling was not completed. These materials are to be sampled and submitted for asbestos content analysis in the Spring prior to maintenance/renovations/construction/demolition activities and if confirmed ACM, removal in accordance with O. Reg. 278/05
Potentially Concealed Asbestos	Concealed Beneath Flooring Finishes	Floor Paper, Mastics and Levelling compounds	-	-	In place management in accordance with O. Reg. 278/05	Invasive sampling prior to maintenance/renovations/construction/demolition activities, if sampling confirms as ACM, removal in accordance with O. Reg. 278/05
Potentially Concealed Asbestos	Exterior Concrete Block/Brick Wall Cavities	Vermiculite Loose-Fill Insulation	-	-	In place management in accordance with O. Reg. 278/05	Invasive inspection prior to maintenance/renovations/construction/demolition activities, if present and sampling confirms as ACM, removal in accordance with O. Reg. 278/05
Potentially Concealed Asbestos	Underground Piping Systems	Asbestos Cement (Transite) Pipe	-	-	In place management in accordance with O. Reg. 278/05	Invasive inspection prior to maintenance/renovations/construction/demolition activities, if present and sampling confirms as ACM, removal in accordance with O. Reg. 278/05
Lead-Containing Paint	Interior	White Paint on Walls	-		In place management in accordance with EACC's Lead Guideline	Removal as required prior to maintenance, renovations, construction or demolition activities in accordance with EACC's Lead Guideline as a: Class 1, Class 2A, Class 3A, or a Class 3B Operation
Low Level Lead-Containing Paint	Storage	Beige Paint on Walls	-	-	None	General hygiene procedures during renovation activities: • General dust control, • Washing of hands and face at on-site facilities, • No smoking, eating, chewing gum or drinking in the work area, • No abrasive blasting.
	Storage	Blue Paint on Walls	-	-		

Table 4.3 - Summary of Designated Substances and Recommended Actions						
St. Gregory Catholic Elementary School - 34 Osborne Street, Cambridge						
Material	Location(s)	Material Description	Approximate Quantity	Photograph	Management Requirements If No Impacts to Material	Recommended Actions If Material Will Be Or Likely Be Impacted By Maintenance, Renovation, Construction or Demolition Activities
Lead	Throughout Interior of Building on Plumbing Connections	Lead Solder on Copper Pipe	-		In place management in accordance with EACC's Lead Guideline	Removal prior to renovation/demolition activities in accordance with EACC's Lead Guideline as a: Class 1 Operation
Potentially Concealed Lead	Concealed on Sanitary/Waste Lines	Lead Packed Pipe Gaskets	-	-	None	Invasive inspection prior to renovation or demolition activities. If confirmed present, removal in accordance with EACC's Lead Guideline as a: Class 1 Operation
Mercury	Throughout Interior of Building in Light Fixtures	Fluorescent Light Tubes and Bulbs in Light Fixtures	-		None	Intact removal and storage with no on-site crushing and disposal of materials to a licensed facility
Mercury	Throughout Interior of Building in Light Fixtures	Compact Fluorescent Bulbs Metal Halide (sodium halide) Lamp Bulbs Neon Lights	-	-	None	Intact removal and storage with no on-site crushing and disposal of materials to a licensed facility
Silica	Throughout Interior and Exterior of Building	Brick and Mortar, Terrazzo, Stucco, Concrete, Fill and Hardscaping	-	-	None	Conduct any work during renovation, demolition activities in accordance with the Ministry of Labour Guideline Silica on Construction Projects
PCBs	Light Fixtures Throughout	Fluorescent Light Ballasts in Light Fixtures	-		SOR/2008-273, the PCB Regulations, permits continued use of in-service PCB-containing light ballasts until the end of service life or until December 31, 2025	Assess Each Ballast Upon Removal From Service Appropriate storage and disposal of any PCB-containing ballasts in accordance with SOR/2008-273
ODS	Rooftop	Rooftop Air Conditioning Unit(s)	7		None	Prior to the removal and disposal of equipment suspected of containing ODS, a licensed technician should be retained to drain and tag the equipment in a manner authorized under O. Reg. 463/10
Notes: 1) A copy of this report should be provided to all prospective contractors prior to quotation, in accordance with Section 30 of the Occupational Health and Safety Act. 2) Recommended actions are the minimum required actions, as prescribed by the appropriate Acts, regulations, guidelines, standards, codes and general best practice measures. Prior to demolition, the Contractor may choose to alter the approach and combine or break out sections of work. This is acceptable provided that the appropriate Acts, regulations, guidelines, standards and codes are followed and afford protection for the health and safety of workers, occupants and the public that is at least equal to the protection that would be provided by complying with the minimum requirements. 3) All waste generated is subject to characterization and disposal in accordance with Ontario Regulation 347.						

Appendix B

Laboratory Certificates of Analysis

Certificate of Analysis

MTE Consultants Inc. (Kitchener)

520 Bingemans Centre Dr.
Kitchener, ON N2B 3X9
Attn: Paul Semeniuk

Client PO: 64457-004

Project: 64457-004 St Gregory CES

Custody:

Report Date: 14-Jan-2026

Order Date: 8-Jan-2026

Order #: 2602277

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
2602277-01	S01A
2602277-02	S01B
2602277-03	S01C
2602277-04	S02A
2602277-05	S02B
2602277-06	S02C
2602277-07	S03A
2602277-08	S03B
2602277-09	S03C

Approved By:



Emma Diaz

Lab Manager

Certificate of Analysis

Report Date: 14-Jan-2026

Client: MTE Consultants Inc. (Kitchener)

Order Date: 8-Jan-2026

Client PO: 64457-004

Project Description: 64457-004 St Gregory CES

Asbestos, PLM Visual Estimation MDL - 0.5%

Parcel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
2602277-01	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S01A	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-02	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S01B	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-03	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S01C	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-04	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S02A	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-05	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S02B	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-06	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S02C	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-07	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S03A	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-08	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S03B	
					Material:	
					Cellulose	95
					Non-Fibers	5
2602277-09	17-Dec-25	Brown	Ceiling Tile	No	Client ID: S03C	
					Material:	
					Cellulose	95
					Non-Fibers	5

Certificate of Analysis

Client: MTE Consultants Inc. (Kitchener)

Client PO: 64457-004

Report Date: 14-Jan-2026

Order Date: 8-Jan-2026

Project Description: 64457-004 St Gregory CES

Total Analyses = 9

Analysis Summary Table

Analysis	Method Reference/Description	Lab Location	Lab Accreditation	Analysis Date
Asbestos, PLM Visual Estimation	EPA 600/R-93/116	1 - Mississauga	CALA 3762	14-Jan-26

Mississauga Lab: 15 - 6800 Kitimat Rd Mississauga, Ontario, L5N 5M1

Work Order Revisions | Comments

None

Other Report Notes

Samples were analysed as received. Paracel is not responsible for inherent analytical limitations. Analytes in bold indicate asbestos mineral content. All samples where asbestos is detected below 1% include quantity verification with additional analysis steps including gravimetric reduction and/or point counting. Problem matrices, such as those high in cellulose and/or non-friable organically bound materials, routinely include additional gravimetric reduction to remove interfering fibers/binders. Content denoted as '<MDL' indicates trace asbestos was observed below the noted detection limit, but could not be accurately quantified. Content denoted as 'Present' indicates that only a qualitative analysis was possible as a consequence of the sample matrix. Sample collection according to the regulation/method recommendations is the responsibility of the client.

MMVF: Man Made Vitreous Fibers: Fiberglass, Mineral Wool, Rockwool, Glasswool



Client Name: MTE Consultants Inc.	Project Reference: St Gregory CES	Turnaround Time: ☐ Immediate ☐ 1 Day -EOD ☐ 4 Hour ☐ 2 Day -EOD ☐ 24 Hour ☐ 3 Day -EOD ☒ Regular
Contact Name: Paul Semeniuk	Quote #: 24-042 MTE Standing Offer	
Address: 520 Bingmans Centre Drive Kitchener ON N2B 3X9	PO #: 64457-004	
Telephone: 519-743-6500	Email Address: psemeniuk@mte85.com jscozzafava@mte85.com	
		Date Required:

ASBESTOS & MOLD ANALYSIS

Matrix: ☐ Air ☒ Bulk ☐ Tape Lift ☐ Swab ☐ Other Regulatory Guideline: ☒ ON ☐ QC ☐ AB ☐ SK ☐ Other:

Analyses: ☐ Microscopic Mold ☐ Culturable Mold ☐ Bacteria GRAM ☐ PCM Asbestos ☒ PLM Asbestos ☐ Chatfield Asbestos ☐ TEM Asbestos

Parcel Order Number:		Asbestos - Bulk		Sampling Date	Air Volume (L)	Analysis Required
2602277		Materials to Be Analyzed * If Positive Stop requested, indicate if by Sample (SMP) or Material (MAT)	POS STOP			
Sample ID			SMP	MAT		
1	See Attached	☐	☐			
2		☐	☐			
3		☐	☐			
4		☐	☐			
5		☐	☐			
6		☐	☐			
7		☐	☐			
8		☐	☐			
9		☐	☐			
10		☐	☐			

* If left blank, all lab identified distinct materials in each sample will be analyzed and reported separately, as per EPA 600/R-93/116. Additional charges will apply.
Manufactured multi-layered building materials will be analyzed as one sample, unless requested by client.

Comments:	Method of Delivery: Truck

Submitting adequate sample volume is the responsibility of the client. Refer to the reverse of this CoC for recommended sample volumes. Signing this CoC authorizes Paracel to complete the analysis on the sample as submitted.

Relinquished By (Sign): <i>[Signature]</i>	Received at Depot:	Received at Lab: <i>[Signature]</i>	Verified By: <i>[Signature]</i>
Relinquished By (Print): Jason Scozzafava			
Date/Time: Dec 24, 2025	Date/Time:	Date/Time: Jan 8/26	Date/Time: Jan 8/26

13:00

14:26

PARACEL LABORATORIES LTD. ASBESTOS ANALYSIS

Sample ID	Location	Matrix Description	Sampling Date	Positive Stop (Y/N)	Layered? (Y/N)	Layer Descriptions
S01A	1001	1x1 Textured Ceiling Tile	12/17/2025	y	n	
S01B	1001	1x1 Textured Ceiling Tile	12/17/2025	y	n	
S01C	1001	1x1 Textured Ceiling Tile	12/17/2025	y	n	
S02A	1001	1x1 Random Large and Small Pinholes	12/17/2025	y	n	
S02B	1001	1x1 Random Large and Small Pinholes	12/17/2025	y	n	
S02C	1001	1x1 Random Large and Small Pinholes	12/17/2025	y	n	
S03A	1003	1x1 Grid large and Small Pinholes	12/17/2025	y	n	
S03B	1003	1x1 Grid large and Small Pinholes	12/17/2025	y	n	
S03C	1005	1x1 Grid large and Small Pinholes	12/17/2025	y	n	

2602277



JK
for 8/26
13.00

JK
for 8/26
14.26

Certificate of Analysis

MTE Consultants Inc. (Kitchener)

520 Bingemans Centre Dr.
Kitchener, ON N2B 3X9
Attn: Paul Semeniuk
Client PO: 64457-004
Project: 64457-004 - St Gregory
Custody: -

Report Date: 14-Jan-2026
Order Date: 8-Jan-2026

Order #: 2602251

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2602251-01	LP1
2602251-02	LP2
2602251-03	LP3

Approved By:



Alex Enfield, MSc
Lab Manager

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis

Report Date: 14-Jan-2026

Client: MTE Consultants Inc. (Kitchener)

Order Date: 8-Jan-2026

Client PO: 64457-004

Project Description: 64457-004 - St Gregory

Analysis Summary Table

Analysis	Method Reference/Description	Lab Location	Extraction Date	Analysis Date
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	Hamilton	8-Jan-26	8-Jan-26

Qualifier Notes:**Sample Data Revisions**

None

Work Order Revisions/Comments:**Other Report Notes:**

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

Certificate of Analysis

Report Date: 14-Jan-2026

Client: MTE Consultants Inc. (Kitchener)

Order Date: 8-Jan-2026

Client PO: 64457-004

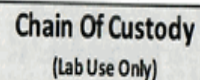
Project Description: 64457-004 - St Gregory

Sample Results

Lead					Matrix: Paint
Parcel ID	Client ID	Sample Date	Units	MDL	Result
2602251-01	LP1	17-Dec-25	ug/g	5	29
2602251-02	LP2	17-Dec-25	ug/g	5	296
2602251-03	LP3	17-Dec-25	ug/g	5	1270

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Blank									
Lead	ND	5	ug/g						
Matrix Duplicate									
Lead	463	5	ug/g	449			3.15	50	
Matrix Spike									
Lead	63.8	5.00	ug/g	18.0	91.7	70-130			

Revision 3.0

PARACEL LABORATORIES LTD. LEAD ANALYSIS					
Sample ID	Location	Colour	Substrate/Matrix Type	Sampling Date	Notes
LP1	1037 - gym storage	Beige	Wall	12/17/2025	
LP2	1037 - gym storage	Blue	Wall	12/17/2025	
LP3	1002	White	Wall	12/17/2025	

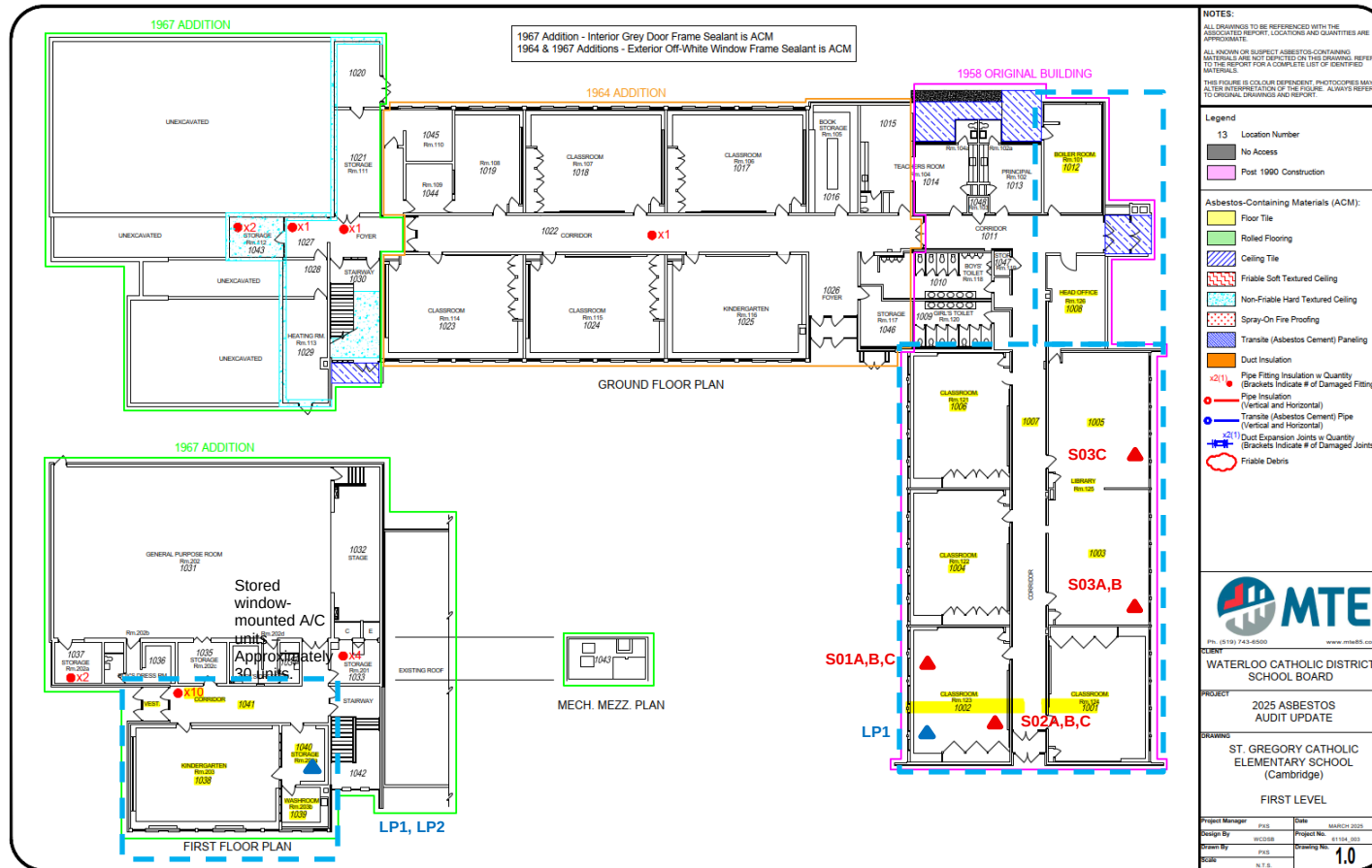
Paracel ID: 2602251



Appendix C

Field Figure

F64457_004 Field Figure 1: St. Gregory CES Addition Project – Designated Substance Audit – January 15, 2026



LEGEND:

- x2 Approximate location and quantity of asbestos insulated fittings. Damaged fittings shown in brackets.
- Approximate location of asbestos pipe insulation on pipe straight runs
- x2 Approximate location and quantity of lead-containing pipe gaskets on cast iron sanitary/roof drainpipes.
- ▲ S01ABC Bulk Asbestos Sample Locations and sample set
- ▲ LP01 Lead-in Paint Sample locations and sample
- Scope of Work

NOTES:

ALL DRAWINGS TO BE REFERENCED WITH THE ASSOCIATED PMA. LOCATIONS AND QUANTITIES ARE APPROXIMATE. THIS FIGURE IS COLOUR DEPENDENT. PHOTOCOPIES MAY ALTER INTERPRETATION OF THE FIGURE.

ADDITIONAL INSTRUCTIONS:

INCENTIVE APPLICATION CHECK LIST

Please ensure that the following information is submitted to the Waterloo Catholic District School Board:

1. **Energy Efficient Equipment:** To be eligible for an incentive, all proposed equipment has to have an **ENERGY STAR or DLC label** on it.
2. **Proposed Equipment:** Submit proposed equipment including: spec sheets and quantities per equipment type. Documentation must include: make and model of equipment such as motors, roof top units, chillers, VFDs, lamp, and ballast etc.
3. **Initial Quote:** Initial quote and any additional invoices must reflect the proposed equipment and should include a detailed breakdown of the equipment proposed to be installed, quantity per equipment type, and equipment and labor costs. The invoice also has to include the make and model number, and type of proposed equipment as shown in the *"Initial Quote (Proposed Equipment)"* form.
4. **Equipment Disposal and Decommissioning:** The intent of this procedure is to remove the old equipment from the system thereby realize the energy savings provided by the new or retrofitted material. The existing equipment that is being retrofitted **must not** be disposed of in the landfill.

The Contractor must submit written proof or evidence or acknowledgement that the disposal of all materials was done so in accordance with all current disposal requirements (see attached). Acceptable Documents: Invoices OR Disposal Certificates OR Disposal Declaration Form. This documentation must be on the disposal facility's letterhead or invoice, or the Contractor's letterhead or invoice. The Disposal Certificate/ Invoice/ Declaration must indicate the total number of old equipment.

Note: During the construction phase, some of the equipment (e.g., bulbs, lamps, ballasts etc.) when removed might break and will not be recyclable. It is important that the number of total recycled equipment and the total number of broken equipment is noted on the disposal certificate.

5. **Confirmation:** The Contractor will take all necessary steps to have equipment that was removed or replaced as part of any Work disposed of or decommissioned in accordance with appropriate disposal or decommissioning processes, applicable laws, and in accordance with commercially reasonable environmental practices.

Initial Quote (Proposed Equipment)

Date:			
School Board:			
School Name:			
School Address:			
List of proposed equipment:			
Product name <i>(e.g., lamp, ballast, boiler, heat pump, roof top units, etc.)</i>	Quantity	Model number and Manufacturer	Cost Breakdown for equipment & labor
<i>Example: Lamps</i>	<i>30 lamps</i>	<i>Sylvania F032/841/ECO</i>	<i>Equipment: \$2,000 Labor: \$1,000</i>

Disposal Declaration Form

Date:		
School Board:		
School Name:		
School Address:		
Application #:		
LDC#:		
ISEO#:		
Equipment	Quantity	Comments
<i>Lighting example:</i> <i>Manufacturer: Sylvania</i> <i>Model #: F032/841/ECO</i> <i>Wattage: 32W</i>	<i># of fixtures: 15</i> <i># of lamps: 30</i>	
(Modify as required) Manufacturer: Model #: Wattage:		
(Modify as required) Manufacturer: Model #: Wattage:		
Disposal Facility:		
Contractor Company Name:		
Name and Title:		
Signature:		
The undersigned Contractor warrants that they have taken all necessary steps to dispose of equipment that was removed or replaced (listed below) as part of this Retrofit Program Application in accordance with appropriate disposal or decommissioning processes, applicable laws, and in accordance with commercially reasonable environmental practices.		



Heating and Cooling Equipment Start up and Commissioning Report

Date:	
Project Name	
Address	
Installing Contractor	
TSSA Registration (if appliance)	
Gas Technician # (if appliance)	

Y	N	N/A

Is gas tag attached to Unit?

Unit Information

Type:

Model:

Make:

Serial:

	Y	N	N/A
Is the unit damaged or are there missing parts?			
Does the unit installation location provide adequate clearance for proper operation & maintenance			
Has the ductwork been properly connected & complete			
Have all shipping brackets been removed			
Are condensate drains properly trapped, installed correctly, filled and			
Has the unit been grounded			
Has the gas supply line been properly sized & connected to the			
Have all the gas piping joints been sealed			
Has a gas leak check been done			
Has gas pipe been tagged			
Economiser Installed and Setup			
Power Exhaust Installed and Setup			
Has B.A.S. control been verified			
Fan Rotation Verified			
Compressor Rotation Verified			
Belt Size and quantity			
Filter Size and quantity			
Have all the water connections/piping been installed			

Supply Voltage	Nameplate Voltage	V:	Ph:	Hz:
	Measured Voltage	L1:	L2:	L3:
Temperature Readings	Outside air		°F	
	Supply Air (Heating)		°F	
	Supply Air (Cooling)		°F	
	Return Air		°F	

	Water in Temp	Water Out Temp	
Boiler	T:	T:	△
Heat Pump	T:	T:	△
Unit Vent	T:	T:	△
Chillers	T:	T:	△
Cooling Tower	T:	T:	△
Type of Gas		Supply Gas Pressure	
	Low Fire	High Fire	
Manifold gas Pressure	"w.c.	"w.c.	
Gas Input Rate	BTU/h	BTU/h	
CO2 in Flue Gas	%	%	
CO in Flue Gas	ppm	ppm	
Flue Gas Temperature	°F	°F	
Combustion Analysis Report Attached			
Required for all gas fired appliances		Y / NA	
Flame Signal			
Circuit	1	Refrigerant Type and Charge	
	2	Factory	Field
Circuit 1	Cooling	Heating	
Suction Pressure	PSI °F	PSI °F	
Suction Line Temp	°F	°F	
Superheat Temp	°F	°F	
Liquid Pressure	PSI °F	PSI °F	
Liquid Line Temp	°F	°F	
Sub Cooling Temp	°F	°F	
Cond Temp IN	°F	°F	
Cond Temp OUT	°F	°F	
Circuit 2	Cooling	Heating	
Suction Pressure	PSI °F	PSI °F	
Suction Line Temp	°F	°F	
Superheat Temp	°F	°F	
Liquid Pressure	PSI °F	PSI °F	
Liquid Line Temp	°F	°F	
Sub Cooling Temp	°F	°F	
Cond Temp IN	°F	°F	
Cond Temp OUT	°F	°F	
Supply Fan Amps			
Low Speed:			
High Speed:			
VFD:	YES / NO		
If Yes, what is the controlling fan speed?			
Unit? BAS			

One copy of this report submitted with final invoice, 1 copy must be left with each individual unit. This does not substitute Manufacturer's commissioning Reports, or gas tags, as required by local codes.

COMMISSIONING PLAN

ST. GREGORY CATHOLIC ES. ADDITION & RENOVATIONS

CFMS-West Consulting Inc.

2 Pelham Town Square
Fonthill, Ontario L0S 1E0

905 304 3644
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PARTNERING TO PROVIDE QUALITY CONTROL

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1. INTRODUCTION & CONTENT

When implemented effectively, a thorough Commissioning Program contributes towards reducing facility life cycle costs, facilitates the establishment of measurable benchmark standards for all energy related systems, and validates that the project's mechanical, electrical and other building systems have been installed, operated, calibrated and are capable of performing as intended and stated in the Owners Project Requirements.

The Commissioning Plan document has been prepared for the St. Gregory Catholic E.S Addition and Renovations project. hereby titled the Commissioning Authority (CxA), to provide the owner with a detailed description of the building systems commissioning process and the responsibilities of the commissioning team.

The CxA will update the document several times throughout the commissioning process and provide the team with information in a timely manner. As the plan evolves, information to be added will include definitions of commissioning terms, descriptions of project commissioning processes, a comprehensive team directory, detailed information on roles & responsibilities, project and system descriptions, lists of documents related to commissioning, details of commissioning documents, commissioning schedule milestones, detailed commissioning forms, and coordination, communications and resolution pathways.

The commissioning plan will be completed and delivered to the owner with the final commissioning report. This final report will contain a history of all test results and will provide a valuable reference to the owner.

2. COMMISSIONING OBJECTIVES & GOALS

The commissioning process is a quality control program which will be implemented on the project during the Construction and Occupancy & Operation phases.

The commissioning process is conducted by the commissioning team which is made up of the design team, the construction team, CxA, and the Owner's project team. The process is managed by the CxA who will also conduct tasks within the commissioning process.

The commissioning process will begin at the Pre-Construction Phase (Planning & Design) and continues through the first year of operation. The objective is to verify the design intent performance during the heating and cooling seasons and under varying load conditions.

The overall benefits of the commissioning process include:

- Additional control over quality.
- Additional control over construction costs
- Additional control over the construction schedule
- Smooth turnover process.
- Building systems that work.
- Well trained operating staff
- Proper and useful O&M manuals
- Reduced number of problems and complaints

The commissioning plan that follows outlines the process to achieve these objectives and goals.

3. PROJECT INFORMATION AND DESCRIPTION

Refer to the below fact sheet for the building information:

Project Name	St. Gregory Catholic E.S. Addition and Renovations
Project Address	34 Osborne St., Cambridge, Ontario
Owner /Client	Waterloo Catholic District School Board

4. DOCUMENTATION PROGRESS UPDATE

Refer to the table below for the status of documents pertaining to the project:

	DOCUMENT	STATUS
1	Commissioning Plan	March 22, 2026
2	Commissioning Kickoff Meeting	TBA
3	Shop Drawing Review Reports	TBA
4	Construction Checklists	TBA
5	Equipment Startup Reports	TBA
6	O & M Manuals Review Report	TBA
7	Training Matrix	TBA
8	Functional Performance Test Reports	TBA
9	Final Commissioning Report	TBA

5. COMMISSIONING TEAM & RESPONSIBILITIES

The commissioning team consists of representatives from the owner, the design team, the construction (contractors) team, and the CxA. The CxA will manage the commissioning team and the commissioning process and reporting directly to the owner.

Owner Representative

The owner has overall responsibility for this project and has engaged a Commissioning Authority (CxA) that does not include individuals directly responsible for project design or construction management. The CxA reports directly to the owner and takes direction from project team.

Commissioning Team

Key members of the integrated commissioning team are listed below. These individuals will be extended invitations to all commissioning meetings, as well as testing and training:

Role	Primary Contact	Company	Contact (Email, Cell)
Owner			
Project Manager			
Design Team			
Consultant Representative			
Consultant Representative			
Architect Representative			
Cx Team			
Commissioning Agent	Kevin Pellerin	CFMS-W	kevinpellerin@cfmswest.ca
General Contractor and Subcontractors			
Project Manager			
Site Superintendent			
Mechanical Representative			
Electrical Representative			
BAS/Controls			

Responsibilities

The Owner

The owner's responsibilities consist of:

- Engaging a Commissioning Authority that does not include individuals directly responsible for project design or construction management
- CxA reports directly and receive directions from the Owner /representatives(s) team.
- Attending commissioning meetings (as required)
- Receive commissioning reports and final commissioning report
- Supporting the commissioning process

The Design Team

The design team consists of ME Consultants. Their responsibilities in the commissioning process include:

- Prepare project specifications, including testing requirements
- Providing the design brief for mechanical, electrical and other building systems
- Reviewing shop drawings
- Reviewing test reports from the contractors and verifying results
- Receiving commissioning reports from the CxA
- Inspecting the installations for general conformance with the contract documents, codes and standards
- Review operating and maintenance manuals
- Witnessing selected contractor's acceptance/demonstration tests
- Review/approve as-built documentation
- Review performance testing results for general conformance with the contract documents

The Building Commissioning Authority (CxA)

- Develop and implement the commissioning plan
- Prepare and issue the team responsibility matrix
- Review equipment and systems submittals
- Chairs the commissioning meetings and records/ distributes meeting minutes
- Assisting with the commissioning schedule
- Conducting select installation reviews and issuing deficiency reports
- Review and monitor equipment start-up process
- Receiving and evaluating the contractors' test forms
- Preparing FPT forms for contractor (s) use
- Issuing commissioning progress reports
- Witness and verify contractor's performance verification tests (sampling technique)
- Co-ordinating with the TAB, BAS contractors and M&E Contractors
- Reviewing O&M manuals
- Review training schedule and agenda.
- Final commissioning reporting
- Verifying seasonal performance during the opposite season of original performance testing

Building Automation System Contractor:

- Cooperate fully with CxA in execution of the Commissioning Plan.
- Incorporate all commissioning related activities and milestones in the construction/project schedule
- Directs all subcontractors to provide resolution to constructions issues
- Schedule all related commissioning activities in coordination with subcontractors and vendors
- Participating in commissioning meetings
- Distribution of shop drawings
- Include the CxA in all correspondences that affect the commissioning process and activities (e.g. schedules, site instructions, change orders, meeting minutes, etc.)
- Collects, assembles and manages commissioning documentation
- Provides support and participate for functional testing as needed
- Corrects any installation deficiencies in a timely manner with cooperation with other related contractors
- Provide the CxA with a copy of the O&M manuals for review
- Coordinates owner training with CxA
- The BAS Contractor will install, commission, and demonstrate their system to the requirements of the specification.
- The BAS Contractor will coordinate closely with the mechanical contractor, electrical contractor, the TAB Contractor, and the CxA
- Completing and sign off all PFT (Pre-Functional Test) forms for CxA review and approval
- Provides detailed O&M manuals for all aspects related to Building Automation system
- Provide list of all schedules and set points
- Coordinates control system functional checks with the CxA and demonstrates the sequences of operation to the CxA as required in the functional check sheets
- The BAS contractor and in cooperation with other contractors and vendors shall perform a complete 100% functional performance test for all equipment and systems related to the BAS and provide completed and signed off FPT sheets

Testing Adjusting & Balancing Contractor:

- Complete an initial project review prior to start any TAB activity to attempt to identify any construction issues preventing proper balancing of the systems
- The TAB contractor will test and balance the mechanical systems to the requirements of the project specification and in line with TAB standards
- TAB contractor will prepare a schedule for their work and coordinate with the GC to include these activities with in the construction schedule
- Provides all TAB documentation and associated reports
- Reports on operation and programming issues discovered in the field while balancing
- Issue report for the initial project review to the general contractor/mechanical contractor and copied CxA and mechanical engineer
- The TAB contractor will attend selected commissioning/construction meetings
- TAB contractor to submit valid calibration certificate for all instruments to be used
- Coordinate with CxA to witness selective percentage of water and air balancing process

Responsibility Matrix

Product	Description	Responsibility of:							
		CxA	OR	A/E	GC	MC	EC	BAS	TAB
System design and schematics	Single line diagram, flow diagram and other design considerations, floor plans indicating location of equipment and configuration of system installation.	R		P					
Commissioning Plan	Document includes, commissioning process, team, responsibilities and deliverables.	P	R/A	R/I	R/I	R	R	R	R
Commissioning schedule	Commissioning schedule included in the project work schedule. Including all milestones, other M&E activities.	I/R	R	R	P	P	I	I	I
Commissioning meetings	Cx meetings will be scheduled as needed or on regular basis.	Pe	At	At	At	At	At	At	At
Shop Drawings /Submittals	Reviewing the shop drawings for all equipment under the commissioning scope. Review will be conducted after final approval of the EOR.	R		R		S	S	S	
Pre-Functional Test Forms	Static and dynamic test forms. Will not replace the OEM test sheets.	R		R		Pe	Pe	P/Pe	Pe
Functional test Forms	Performance verification test forms used by the Cx A to verify system operation with the BAS.	P/A				Pe		Pe	
Static testing	Includes, pipe pressure tests, air duct pressure test, flushing and cleaning	R				Pe	Pe		
Installation & above ceiling inspections	Reviewing equipment installation and above ceiling M/E services inspections	R		Pe					
Dust free environment (Clean building)	Achieving a dust free environment is a key step to start air moving devices (AMD)/Equipment.	A			Pe	Pe			
Equipment Start-up and start-up plans, check sheets	This is the OEM starting-up mechanical /electrical equipment and issue report.	R		R		P/Pe			Pe
BAS Programming, Point to point verification and Graphics	This is a process by the BAS vendor to verify all equipment are communicating to BAS	R/W						Pe	
System Air and Water balancing	Process to balance the air and water volume and set the correct designed pressure in the system. Verify the outlet and terminals air quantities.	R		R				Pe	Pe
Functional Performance testing	Complete verification and testing of the system and individual components and as integrated systems.	Pe/W/A		W		Pe		Pe	
Final Commissioning report	Report will outline the commissioning activities and the outcome of this process, listing of all concerns and pending issues.	P/A	R/A						
O & M manuals	This is the equipment and systems operating and maintenance manuals as per technical specifications.	R				P/S	P/S	P/S	I
Training Program	Topics to be covered during the training session	R	At	Pe /W	Pe	Pe	Pe	Pe	
Seasonal Testing	Opposite season test	Pe	At	W	At	At	At	Pe	

Legend:

A	Responsible to Approve	Pe	Responsible to Perform	I	Responsible to give Input	S	Responsible to Submit
At	Responsible to Attend	R:	Responsible for Review	P	Responsible to Prepare	W:	Responsible to Witness

6. BUILDING COMMISSIONING PROCESS

Building Commissioning is the process of bringing the project from a static state to a dynamic operating condition to meet the intended use. More specifically, commissioning includes bringing the project to a working and fully operational condition in compliance with the design intent and project documents. Therefore, commissioning involves those actions and activities that convert the buildings mechanical & electrical components into a fully functioning facility.

Design Phase (Pre-Construction Phase)

Development of Design Documents:

The Design Team shall generate several phases of design documents, including schematics, design development, and various levels of construction documents.

The Construction Phase

Development of the Commissioning Plan:

The Commissioning Plan will be developed for the Cx Team to review. The Commissioning Plan provides an overview of the commissioning process and responsibilities. The Commissioning Plan includes preliminary project specific information on the team, systems to be commissioned, and project schedule milestones. The team shall review the plan and provide comments to the CxA. This plan will continue to be developed and refined through the commissioning process.

Commissioning Kick-off Meeting:

The CxA will schedule a kick-off meeting with the entire Commissioning Team to introduce the players, review commissioning scope, review the commissioning process, discuss team responsibilities, and develop a team specific approach to commissioning.

Submittal Review:

A review encompassing aspects from a commissioning perspective shall be conducted to the submittals of all systems to be commissioned. CxA review of submittals does not relieve the design team of their submittal review responsibilities.

Review of Contractor and Vendor Startup Forms:

The contractor shall provide any standard forms wished to be used during the commissioning process of the project such as contractor standard pressure test documentation, equipment start-up forms, etc. The CxA will review/approve the forms and incorporate them into the Commissioning Plan. Startup forms can be provided by the contractor or equipment manufacturer. In cases where forms do not exist but are required, the CxA shall provide start-up forms.

Static Test Forms and Reports include:

- Pipe pressure testing
- Flushing and cleaning reports
- Chemical treatment sign off

Dynamic Test Forms are required for all systems identified under submittal review:

- Mechanical Equipment Startup
- BAS Point to Point and Functional Testing Report

Managing the Construction Schedule:

The general contractor develops the project schedule for the project and the CxA shall provide list for commissioning milestones and testing. The CxA also reviews the schedule to look for potential conflicts and to ensure there is sufficient time for testing towards the end of the project.

The CxA will work with the project team to help in preparing contractors commissioning schedules. The schedules will identify equipment and systems by area and the various commissioning tasks. The schedules will include key starting dates such as 'power availability' and 'clean building'. Each Contractor's schedule will be reviewed, and updated as required, at the construction meetings or the commissioning meetings.

Preliminary Commissioning Schedule milestones for the project:

Commissioning Activity	Duration	Estimated Start Date	Estimated Completion Date
Document design intent and basis of design			
Commissioning Plan			
Preliminary Commissioning Plan			
Scoping Meeting			
Final Commissioning Plan			
Submittals and test writing			
Review mechanical submittals			
Write Startup and PF checklists			
DDC program review meeting			
Write FPT Tests			
Construction Observation			
Site observations			
Equipment PF checklist completion			
Equipment startup			
Startup documentation			
Controls system checkout			
Test and Balance			
TAB air side			
TAB water side			
HVAC functional performance testing			
Substantial Completion			
Post Acceptance Phase			
Short-term diagnostic monitoring			
O&M, training, reporting, warranty			
O&M Manuals submitted			
Review O&M manuals			
Review as-built documentation			
Seasonal testing			
Final commissioning report			

Functional Test Sheets:

The functional performance test (FPT) sheets will be developed by the CxA – CFMS West Consulting and to be used with the contractors to fully test the sequences of operation of all commissioned systems. The test forms will include the test procedure and expected results of each test point. The contractors shall review the forms and confirm functional tests can be performed in a manner that does not compromise the safety of the equipment or personnel performing the test. FPT sheets shall be prepared for all systems identified under submittal review.

Commissioning Meetings:

During the early stages of the construction process, the CxA will integrate the first commissioning discussions at the regular site meetings; attendance as required. The initial meetings will deal with the commissioning process, responsibilities, and the reporting methodology.

During the construction process, commissioning issues, scheduling, pre-functional test forms, functional test forms and results will be discussed as required at the construction meetings; attendance as required. During the dynamic testing process and the time leading up to substantial performance, separate commissioning meetings shall be held if required.

On-going Construction Observations & Installation Checks:

The CxA will conduct periodic jobsite visits. During these visits the CxA will perform site inspections, commenting on installation quality and attend site meetings to remain informed on construction progress and to update parties involved in commissioning process. A written jobsite inspection report shall be provided and distributed to the contractors, owner and other team members as determined during the kick-off meeting.

The following list of activities will be performed by the CxA during a visit to the jobsite:

- Attending jobsite meeting
- Complete equipment installation check and above ceiling inspections
- Witness static and dynamic activities
- Verify site cleanliness and dust free environment
- Complete required checklists;(PFT)
- Conduct Functional performance test (FPT)

Static & Dynamic Testing:

The CxA will review the static and dynamic testing reports and report on any items of concern from a commissioning or operations point of view.

Air and Water Balancing:

The CxA will co-ordinate with the Balancing Contractor to ensure that a balancing plan and schedule are prepared and reports are submitted. The TAB contractor shall visit the site and issue a report for the visit listing any comments, concerns or requirements for the balancing process. CxA will review the final balancing report and comment.

Functional Performance Test:

The FPT is to verify that equipment, systems, and sub-systems functions and perform to meet the OPR and project documents. They are means to determine that different systems interact as required to achieve an overall operating and functioning facility.

The FPT typically involve forcing the system into a series of operating modes, and observing the system's response. The CxA will accurately record all their activities and observations on the FPT sheets and then ensure all systems returned to a "normal" state. The CxA will use the Issue list to log any performance issues might arise during the test and their resolutions.

If desired, it is possible to have the current or future building operators attend the Functional Performance Testing. *“Having the building operators participate in testing enhances the process and is a unique opportunity to deepen their understanding of the systems and controls”.*

Prior to conducting FPT, the following must be satisfied:

- All static and dynamic start-up reports completed successfully;
- Controls system with all its graphics, verifications, calibrations, schedules, alarms and programs are completed and relevant reports and check sheets completed
- Air and water balancing process completed and reports submitted
- All corrections and re starting of start-ups completed successfully
- Maintaining a dust free environment in the building
- Availability of an experienced BAS contractor personnel during the test time
- Test requirements and BAS sequence of operation is provided for FPT form generation
- Occupancy and other schedules are provided
- Set points provided
- Ensuring the FPT can be performed in a manner that does not compromise the safety of the equipment or personnel performing the test or witnessing it

Development of the Commissioning Issues List:

The Cx A will manage, distribute and review a Commissioning Issues of Concern List (IOC) with the team. The Commissioning Issues Log will document all issues impacting the successful completion of the commissioning process. The CxA will assist the commissioning team to bring resolution to commissioning issues in a timely manner.

Operator Training Program:

Operations and maintenance documentation and training are vital to the long-term operational health of the facility. The Commissioning Authority (CxA) reviews agenda with the owner’s representative(s) -operators- to ensure that training agendas meet the specifications in the contract documents and the OPR.

The following steps will help the development and implementation of the training program

- The GC shall develop and submit a Training Plan to the project team for review and approve.
- The training plan shall identify systems requiring training, required instructor (s), time period for training, and location of training;
- Technical content for the training exercises shall be provided by a combination of the equipment manufacturers, Sub-trade contractors, and design team personnel;
- The GC shall coordinate with the relevant personnel – including at minimum the OR, A/E, CxA to schedule required training exercises and confirm appropriate personnel to receive training;
- Detailed training agendas will be issued to the commissioning team prior to the scheduled sessions;
- Training Agenda will include at the minimum the following:
 - Review of drawings to demonstrate the relationship between the installed devices and the drawings
 - Provide walk through outlining the major components associated with the training session
 - Overview of the operation of system/component, and its interface with the Building Automation System
 - Preventative maintenance procedures & routines. (Dealing with alarms and trends)
 - Review the SOO and describe the adjustments that can be made by an operator
 - Review system adjustment and calibration
 - Troubleshooting procedure and system diagnostic
 - Review of BAS graphics, programs and trends
 - Attendees Q & A

O&M Manuals Review:

The CxA will review the submitted O&M manuals for commissioned systems to verify compliance with the OPR and contract document. CxA - CFMS West Consulting – will review the O&M manuals for warranty certificates, availability of all reports, maintenance requirements, single line diagrams, valve charts, TAB reports, BAS point list and check sheets, sequence of operation, required contact information and warranties.

The O & M manuals shall include at the minimum the following sections:

- Basis of design document as issued by the EOR
- Warranties and applicable to the project
- Contractors contact list
- Equipment start up reports
- Test reports (Authority test Reports)
- Shop drawings, troubleshooting and PM literatures for all equipment and systems
- Air and water balancing reports and single line diagrams
- Building Automation System shop drawings and sequence of operation

Commissioning Report:

The CxA- CFMS West Consulting will provide a Final Commissioning Report upon completion of all commissioning activities. The final commissioning report will contain the executive summary, summary of the design review process, summary of the submittal review process, the current copy of the Commissioning Plan, completed commissioning issues list, meeting minutes, completed check forms, and O&M documentation and training process.

Occupancy and Operation Phase

The following activities will be performed during the Occupancy and Operation Phase of the project:

Completion of Seasonal and Deferred Systems tests:

The CxA may determine that certain sequences may not be thoroughly tested unless the ambient conditions are correct. These functional tests may be deferred until the appropriate conditions are available. The BAS and mechanical contractors will be conducting this test along with the CxA.

7. SYSTEM INCLUDED IN THE COMMISSIONING

Refer to below list for a full list of the equipment included in the project:

Equipment
Rooftop Units
VVT Terminal Units
Heat Pump
Exhaust Fans
Unit Ventilators
Building Automation System
Lighting Controls

8. COMMUNICATIONS PROTOCOL

CFMS West Consulting as the Commissioning Authority, our primary focus is to act as an advocate for the owner ensuring that modern methods of construction and leading-edge commissioning are successfully delivered. Essential to this process is the establishment of a communications protocol – prepared for and reviewed during the commissioning kick-off session. Below is the communications protocol:

Issue	Communication Protocol
Requests for information (RFI) or formal documentation requests	The CxA goes first: through OR and copied GC, A/E
Minor or verbal information and clarifications:	The CxA goes direct to the GC, with correspondence copied to the OR/ A/E
Notifying contractors of noted Cx issues	The CxA documents issues through the OR & GC, but may not discuss issues with contractors prior to notifying the GC and A/E. Issues Logs are issued regularly to the Commissioning Team.
Scheduling functional tests	The CxA may provide input for and coordination of testing through the OR & GC, but does not directly schedule contractors or subs.
Scheduling commissioning meetings	The CxA with GC selects the date and schedules the meetings with the Owner and Design Team
Making requests for significant changes:	The CxA has no authority to issue change orders or direct the contractors or their subs as it pertains to design related modifications. Design Team issues instructions.
Making small changes in specified sequences of operations	The CxA may not make small sequences of operations changes to improve efficiency or control or to correct issues, through the responsible contractor. The CxA shall document the change and provide all information of specified sequences to the OR, GC and A/E. The CxA may not make changes to specified sequences without approval from the A/E.
Contractors or Subs disagreeing with requests, findings or interpretations by the CxA:	Contractors or Subs will not try and resolve with the CxA first. Contractors or Subs will work through the GC who will work with the CxA directly. The OR will be included in the correspondence /discussion as needed.
Witnessing systems and equipment training	The CxA may provide input for and assistance in the coordination of training and testing through the GC, but does not directly schedule contractors or subs.
Weekly site reports and updates	The CxA issues site reports and update documents through the OR, with copy to the, GC and A/E.
Suspected design issues found during the Cx process	The CxA documents issues first through the GC and A/E, but may not discuss design issues with contractors or subs prior to notifying the OR and GC.

9. NEXT STEP

The Commissioning plan is a live document that will be updated throughout the project. The OR, A/E, contractors and other project team shall be responsible for providing updates for the information in this document. CFMS West Consulting will review the updates and issue revisions accordingly.

Revision No.	Date Issued	Issued By
R00	March 22, 2026	CFMS-West Consulting

01 31 10-Project Coordination

1.1 GENERAL PROJECT COORDINATION AND MANAGEMENT

- .1 The Consultant keeps project records under its proprietary tracking system. The Consultant will not use or engage with any Contractor project management system or third-party project management system used by the Contractor. All project communication will be via e-mail.
- .2 Access by the Contractor to non-construction zones shall be at the discretion of School Board and in coordination with school administration. Where access is required during construction, work shall be conducted after hours.
- .3 The Owner's Project Representative shall develop, in conjunction with the Contractor, school administration and the Municipal Fire Department, a temporary Fire Safety Plan to be implemented during the duration of the project which is to the satisfaction of the Fire Department.

1.2 SITE MEETINGS

- .1 The General Contractor shall chair and convene a 'Job Site' meeting every two weeks.
- .2 Ensure that persons, whose presence is required, are present and that relative information is available to allow meetings to be conducted efficiently.
- .3 The General Contractor shall issue and review an updated construction schedule at the first meeting of each month for review at the job meeting.
- .4 The General Contractor shall record minutes of each meeting and promptly distribute copies to be received by all participants not later than seven days after meeting has been held. Distribute minutes of meetings to the Owner, all Consultants whether in attendance or not and all other present.

1.3 SUPERVISION

- .1 An experienced and qualified supervisor (construction superintendent) shall be full time present on the construction site. A working foreperson will not be acceptable. The supervisor shall not be changed without the Owner's/Consultant's approval.
- .2 Arrange for sufficient number of qualified assistants to the supervisor as required for the proper and efficient execution of the Work.

1.4 PROJECT DOCUMENTATION

- .1 Nomenclature: With reference to CCDC 2 – the following shall be used by JPTA and the Contractor in numerical sequence for Documentation Nomenclature and Numbering and tracking purposes (abbreviation and sequential number assigned):

RFI-001 means Request for Information #1

SI-001	means Supplementary Instruction # 1
RFC-001	means Request for Change #1 (as response to any PC or CD or other claim issued by either the Owner or the Contractor)
PC-001	means Proposed Change #1
CD-001	means Change Directive #1
CADA-001	means Cash Allowance Disbursement Authorization #1
CO-001	means Change Order #1

- .2 The General Contractor shall issue inquiries on behalf of all trades to the Consultant in writing as a Request for Information (RFI).
- .3 The Consultant will review, respond and distribute as necessary to the sub consultants. All responses will be in the form of a Supplemental Instruction or Proposed Change or Change Directive in accordance with CCDC 2.
- .4 The General Contractor shall issue a Request for Cash Allowance accompanied by invoices or receipts for those identified items within the Cash Allowance. The Consultant shall issue a Cash Allowance Disbursement Authorization (CADA) signed by the General Contractor, Consultant and Owner. Only a fully executed CADA's will be approved for payment.

END OF SECTION

01 32 10-Project Progress

1.1 CONSTRUCTION SCHEDULE

- .1 Submit in a format acceptable to the Consultant, a minimum of four (4) copies of Contractor's construction schedule prior to issuance of the first application for payment.
- .2 Set up format to permit plotting of actual construction progress against scheduled progress.
- .3 The Schedule shall show:
 - .1 Commencement and completion dates of Contract.
 - .2 Commencement and completion dates of construction stages/phases, if any.
 - .3 Commencement and completion dates of each trade. Major trades shall be further broken down as directed by Consultant; generally, follow Specification format.
 - .4 Order and delivery dates for major or critical equipment.
 - .5 Critical dates for shop drawing/sample submissions.
 - .6 Inspection dates.
 - .7 Any other information relating to orderly progress of Contract, considered by Contractor or Consultant to be pertinent.
- .4 The schedule shall be updated and issued prior to or with each monthly application for payment. Failure to issue an updated schedule will delay approval of the monthly application for payment.
- .5 To address potential schedule delays attributed to weather conditions, the Contractor shall utilize historical weather data from the National Oceanic and Atmospheric Administration (NOAA) or local almanacs to substantiate claims for weather-related delays. This data should reflect month-by-month averages and patterns specific to the project location. The Architect reserves the right to request documented evidence of weather-related events that impact the project schedule which exceed historical norms. Routine seasonal variations, as indicated by the historical data, shall not be accepted as justifiable reasons for project delays. The Contractor is expected to plan and execute the work with due consideration of these conditions.

1.2 PROGRESS RECORD

- .1 Maintain on site, permanent written record of progress of work. Record shall be open to inspection by Consultant at all times and copy shall be furnished to Consultant upon request.

- .2 Record weather conditions, dates of commencement, progress etc. Particulars pertaining to erection and removal of forms, pouring of concrete, installation of roofing and other critical or major components as well as number of employees of various trades and type and quantity of equipment employed daily, shall be noted.
- .3 Display a copy of the construction schedule in the site office from start of construction to completion. Superimpose actual progress of work on schedule at least once a week.

1.3 RECORD DRAWINGS

- .1 Obtain and keep on site a complete and separate set of black line white prints.
- .2 Note clearly, neatly, accurately and promptly as the work progresses all architectural, structural, mechanical and electrical field changes, revisions and additions to the work and deviations from the Contract Documents.
- .3 Note accurate location, depth, position, size and type of concealed and underground services, both inside and outside, on record drawings.
- .4 Record drawings shall be available for review at each site meeting.
- .5 Refer to Section 01 77 00 for requirements on submission of As-Built drawings.

1.4 PRODUCT DELIVERY CONTROL

- .1 The Contractor shall issue a shop drawing schedule to the consultants that is all inclusive of Divisions of the specifications and required within the drawings. The dates of submittals shall correspond the time sensitive products required in order to maintain the schedule.
- .2 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which is intended for use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.
- .3 Provide equipment delivery schedule, co-ordinated with construction and submittals' schedule, showing delivery dates for major and/or critical equipment.
- .4 The Contractor shall contact the Consultant immediately upon receipt of information indicating that any material, item, will not be available on time, in accordance with the original schedule and similarly it shall be the responsibility of all sub-contractors and suppliers to so inform the Contractor.

END OF SECTION

01 33 00-Submittals

1.1 GENERAL

- .1 Unless specified or directed otherwise, make all submissions to the Consultant.
- .2 Make all submissions required by the Contract Documents with reasonable promptness and in orderly sequence so as to cause no delay in the work.

1.2 RELATED REQUIREMENTS

- .1 Make the following submissions in accordance with requirements specified elsewhere:
 - .1 Applications for Progress Payment Section 00 81 00
 - .2 WSIB Certificates of Clearance Section 00 81 00
 - .3 Insurance Certificates Section 00 81 00
 - .4 Bonds Section 00 81 00
 - .5 Construction Schedule Section 01 32 10
 - .6 Equipment Delivery Schedule Section 01 32 10
 - .7 Purchase Order Documentation Section 01 32 10
 - .8 Waste Audit and Reduction Plans Section 01 41 00
 - .9 Maintenance and Operations Data Section 01 77 00
 - .10 Record Drawings Section 01 77 00
 - .11 Maintenance Materials Section 01 77 00

1.3 SCHEDULE OF VALUES

- .1 Submit schedule of values in accordance with requirements of GC 5.2, as amended, APPLICATIONS FOR PROGRESS PAYMENT.
- .2 Follow specifications table of contents as basis for degree of breakdown required. Show a further breakdown for work related to each specification as necessary to provide the Consultant adequate ability to relate the progress billing to the field work. Show breakdown for different construction phases/stages if required by Consultant.
- .3 Break down the cost of large items of work as directed by Consultant.
- .4 Provide additional cost breakdown information as requested by Consultant with no exception.
- .5 Provide within the breakdown line items as follows:
 - .1 As-built drawings Architectural / Structural / Civil
 - .2 As-built drawings Mechanical
 - .3 As-built drawings Electrical
 - .4 Maintenance Manuals Architectural / Structural / Civil
 - .5 Maintenance Manuals Mechanical
 - .6 Maintenance Manuals Electrical
 - .7 Final cleaning

- .6 The Schedule of Values shall indicate line items for close-out procedures, manuals, warranties and as-built drawings. Refer to Section 01 77 00 Project Close-Out for information to adequately value these line items.

1.4 SCHEDULE OF SUBMITTALS

- .1 Within 15 days of submission of construction schedule submit a schedule of submittals for shop drawings, samples, lists of materials and other documentation requiring Consultant's review.
- .2 For each item requiring submission and review show anticipated date of submission and critical date for return of reviewed submission.
- .3 Design sequence of submissions to reflect requirements of construction schedule.
- .4 Stagger submissions to permit adequate review time for each item submitted. If several submissions are made at the time or within a short time of each other, indicate order of priority in which submissions should be reviewed. Multiple submissions may result in delays to processing of submissions.
- .5 Include sufficient time to permit corrections and re-submission, if necessary, without affecting construction schedule.
- .6 The Consultant will review and return shop drawings in accordance with a Shop Drawings Schedule prepared by the Contractor and agreed upon at the commencement of the Work. The Contractor shall allow the Consultant a minimum of 10 Working Days to review shop drawings from the date of receipt, to the date of issuance, for return by post or courier, based upon a regular and reasonable flow of shop drawings. If the Consultant requires resubmission of the shop drawings, allow for an additional 10 Working Days review. If, at any time, the Contractor submits an unusually large number of shop drawings, such that the Consultant, within 3 Working Days of receipt of such shop drawings, will provide the Contractor with an estimate of the time necessary for processing. The Contractor shall periodically re-submit the Shop Drawings Schedule to correspond to changes in the construction schedule. The schedule re-submissions shall maintain the minimum 10 Working Days period for the Consultant's review.

1.5 SHOP DRAWINGS and SUBMITTALS

- .1 Submittals - All digital submissions shall bear Project Name, JPTA Job Number and date. All submissions shall be in the form indicated below, meeting the requirements of the Specifications. Multiple submissions shall be accompanied by a transmittal identifying which documents belong to which Submittal Code:
- .1 The following is an example only of the method of codification required to identify each submittal:

Example:

03 30 00-01

Concrete Mix Design

Specification Section	First Submittal / Product Number	

03 30 00-01-**R1**

Concrete Mix Design

Specification Section	First Submittal / Product Number	First Revision - Revised Version of Original

03 30 00-01-**R2**

Concrete Mix Design

Specification Section	First Submittal / Product Number	Second Revision - Revised Version of R1

03 30 00-**02**

Expansion Joint Strips

Specification Section	Second Submittal / Product Number	

(And so on. Bold text not required.)

End of Example.

- .2 Submit shop drawings required by Contract Documents, in accordance with requirements of GC 3.8 SHOP DRAWINGS the Amended General Conditions and the following:
- .3 Stamps and Review:
 - .1 Shop drawings received without review stamps by the subtrade submitting and the General Contractor will be returned for resubmission.
 - .2 Shop drawings requiring stamped, dated and signed certification of a professional engineer received without such certification will be rejected and returned.
- .4 Prepare shop drawings in imperial or metric measurements to match that of the contract documents.
- .5 Unless otherwise directed by the Consultant, submit all shop drawing electronically in PDF format and one hard copy if so requested by the Consultant and/or Sub-Consultants. The Consultant reserves the right, at the Consultant's unfettered discretion, to request a complete and full-size hardcopy version of any submittal or shop drawing.
- .6 After review Consultant will return to the Contractor an electronic version of the reviewed shop drawings. The Contractor shall distribute the reviewed shop drawing to the appropriate subtrade(s) and supplier(s).
- .7 Shop drawings which require the approval of a legally constituted authority having jurisdiction shall be submitted by Contractor to such authority for approval. Such

shop drawings shall receive final approval of authority having jurisdiction before Consultant's final review.

- .8 No work requiring a shop drawing submission shall be commenced until the submission has received Consultant's final review. Do not use any shop drawing, erection drawing or setting drawing which does not bear the stamp and signature of the Consultant.
- .9 The Consultant's review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same. This review shall not relieve the Contractor of his responsibility for meeting the requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.
- .10 Only shop drawings bearing the Consultant's shop drawing review stamp, date and initials, shall be used at the Place of Work or for the manufacture or fabrication of Products.
- .11 The review of shop drawings, by the Consultant, does not authorize a change in the Contract Price or Contract Time.
- .12 The Consultant will not approve payment for materials, equipment etc. that have yet to have reviewed shop drawings (not rejected and/or required re-submittal) that arrive, stored and/or are installed within the Place of the Work.

1.6 SAMPLES

- .1 Submit samples required by Contract Documents and as directed by the Consultant.
- .2 Unless indicated otherwise submit samples in duplicate.
- .3 Where colour selection is required, submit manufacturer's full colour range for specified product line. Photo copy or electronic colour samples are not acceptable.
- .4 Submit samples with identifying labels bearing material or component description, manufacturer's name and brand name, Contractor's name, project name, location in which material or component is to be used, and dated.

1.7 REQUESTS FOR SUBSTITUTIONS

- .1 A substitution, also known as an "alternate" or "equal" by a nontechnical party, is a product which the Contractor proposes to replace that which is specified within these contract documents.
- .2 No requests for substitutions, "alternates" or "equals" will be accepted on this project without the Consultant's express written approval prior to the tender close

date. The Consultant is under NO obligation to review requests for substitution prior to the tender close date.

- .3 No requests for substitutions, alternates or “equals” will be accepted on this project without the Consultant’s express written approval after the tender close date except as follows:

- .1 Where a specified product has been removed from the market or has been altered significantly or renamed by the product manufacturer after the tender close date, a substituted product may be proposed by the Contractor provided it is accompanied by the following information for review by the Consultant:

- .1 Cover Letter – written by the supplier/manufacturer identifying the reason for the request for substitution or providing explanatory narrative for same.
- .2 Side-by-Side Comparison – showing how the requested substitution or alternate product compares to the original product. This comparison is meant to be an exact side-by-side comparison for ease of review by the Consultant and is to include all testing reports and documentation as was specified herein. Company brochures, data sheets, etc may be appended to the Side-by-Side Comparison but are not considered to be the comparison itself. Comparison will include compliance with the Building Code and other Codes and Regulations governing the use and application of the product.
- .3 Cost Adjustment Proposal – all requests must be accompanied by a cost adjustment (ie credit, extra or cost neutral) value in dollars. The value is to include all work related to the substitution or alternate to complete the intent of the work of the original specified product.
- .4 Depending on the request, additional information, including testing or engineering (licenced in the Province of Ontario) may be required as follows:
- .1 Re-Design and Documentation – provide documentation which clearly identifies how the work impacts the overall design intent, adjacent building systems, materials or other component(s). Engineering to facilitate the request for substitution may be required and the requirement for such information is to the sole discretion of the Consultant.

- .2 Where the Contractor is requesting a review of a substitution or alternate, which is not the result of the above exemption (item 1.7.3.1), the follow applies:

- .1 The Consultant will reject the request in its entirety.

- .2 Or, if the Consultant decides to undertake, at its sole and unfettered discretion, a review of the request, the Contractor will reimburse the Consultant for time required to conduct such review. Terms of reimbursement will be identified by the Consultant prior to any review and will include time, material and all resources required for the review. Undertaking a review is NO guarantee of acceptance of a requested substitution. The Consultant has full authority to reject, deny or otherwise not review any or all requests for substitution. Due to the amount of time required for building component and building analysis review, any delay caused by the review itself is the full responsibility of the Contractor. The Consultant makes no guarantee of timelines for review which depends on numerous factors outside of the Consultant's control.

END OF SECTION

01 41 00-Regulatory Requirements

1.1 PERMITS, LICENCES, FEES

- .1 Comply with requirements of GC 10.2 and the Amended General Conditions.
- .2 Where permits, licences and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by the particular sub-trade responsible for that work.
- .3 Review building permit set with Consultant immediately following receipt of building permit and jointly determine whether or not changes to Contract are required.
- .4 Be responsible for ensuring that no work is undertaken which is conditional on permits, approvals, reviews, licences, fees, until all applicable conditions are met. No time extension will be allowed for delay in obtaining necessary permits.
- .5 Report to the Consultant in writing any condition which would prohibit granting of any permit or approval before work affecting such items is commenced.
- .6 Give notice of completion of project prior to occupancy, as required by applicable legislation.

1.2 BUILDING CODE, BY-LAWS, REGULATIONS

- .1 Carry out work in accordance with requirements of the Ontario Building Code, latest edition and issuances, including all amendments and revisions.
- .2 Comply with requirements, regulations and ordinances of other jurisdictional authorities.
- .3 Where it is necessary to carry out work outside property lines, such as sidewalks, paving or concrete curbs, comply with applicable municipal requirements.
- .4 Submit written notice to Consultant, of observed variance of Contract Documents from requirements of Building Code and authorities having jurisdiction. Assume responsibility for work known to be contrary to such requirements and performed without notifying Consultant.

1.3 CONSTRUCTION SAFETY

- .1 Be governed by pertinent safety requirements of Federal or Provincial Governments and of municipal bodies having authority, particularly the Ontario Construction Safety Act, and regulations of Ontario Ministry of Labour, and work in conjunction with proper safety associations operating under the authority of Ontario Worker's Compensation Act.
- .2 Do not, in the performance of the work, in any manner endanger the safety or unlawfully interfere with the convenience of the public.

- .3 Notify the Ontario Ministry of Labour of intended work of this Contract as required by the Occupational Health and Safety Act. A copy of the "Notice of Project" shall be submitted to Consultant and Owner.

1.4 FIRE PROTECTION

- .1 Refer to technical sections of Specifications and Drawings for fire protection requirements.
- .2 Test methods used to determine fire hazard classification and fire endurance rating shall be as required by Ontario Building Code.
- .3 Upon request, furnish to Consultant with evidence of compliance with project fire protection requirements.
- .4 Materials and components used to construct fire rated assemblies and materials requiring fire hazard classification shall be listed and labelled, or otherwise approved, by fire rating authority. Labelled materials and their packaging shall bear fire rating authorities label showing product classification.
- .5 Fire rated door assemblies shall include doors, frame, anchors and hardware and shall bear label of fire rating authority showing opening classification and rating.
- .6 Materials having a fire hazard classification shall be applied or installed in accordance with fire rating authority's printed instructions.
- .7 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.
- .8 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.
- .9 Fill and patch voids and gaps around openings and penetrations in and at perimeter of assemblies so as to maintain continuity and to produce a fire-resistant smoke tight seal, acceptable to jurisdictional authorities and Consultant.

1.5 HAZARDOUS MATERIALS

- .1 Comply with provisions of the Occupational Health and Safety Act as amended to include WHMIS (Workplace Hazardous Materials Information System).
- .2 Ensure that Material Safety Data Sheets (MSDS) are available on site prior to first delivery to site of any controlled material or substance.
- .3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS.
- .4 Log shall be open for inspection for Owner, Consultant and all personnel on site.

- .5 Ensure that workers are instructed in the purpose and content of MSDS.

1.6 DESIGNATED SUBSTANCES

- .1 Upon discovery of an unknown substance or a substance known to be asbestos containing, it shall be handled in accordance with Ontario Regulation 278/05 - Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
- .2 The word "handled" means that the General Contractor upon suspecting or discovering substance / asbestos, will stop work immediately and contact the Owner. No work shall be conducted in the area until the substance / asbestos has been identified and removed to the satisfaction of the Owner's and/or the Owner's Environmental Consultant.
- .3 Any abatement work performed must possess an Asbestos Abatement Worker 253W Certificate, in accordance with Section 20 of Ontario Regulations 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations. There will be no additional charge to the Contractor.
- .4 Following compliance to the Asbestos Regulations and/or Designated Substances regulations, work shall resume in "affected area".

END OF SECTION

01 45 00-Quality Control

1.1 INDEPENDENT INSPECTION AND TESTING

- .1 Requirements specified herein apply to independent inspection and testing specified under technical Specification Sections, Divisions 2 to 33. Costs for independent inspection and testing services shall be paid by Contractor out of cash allowance carried in the contract.
- .2 Requirements specified herein do not apply to the following:
 - .1 Inspection and testing required by law, ordinances, rules, regulations and orders of public authorities.
 - .2 Testing, adjustment and balancing of mechanical and electrical systems and equipment.
 - .3 Inspection and testing performed exclusively for Contractor's convenience.
 - .4 Tests specified in Division 2 to 16 inclusive, to be included in Contract such as mill tests, certificates of compliance and testing to be carried out by Contractor under direction of Consultant.
- .3 Failures by independent inspection and testing agency to detect defective work or materials shall not in any way prevent later rejection, when a defect is discovered or shall it obligate Consultant for final acceptance.
- .4 Independent inspection and testing agency (hereinafter referred to as testing agency) is expected to do the following:
 - .1 Carry out inspection and testing functions to establish compliance with requirements of Contract Documents.
 - .2 Check work as it progresses and prepare reports stating results of tests and conditions. Work and state in each report whether specimens tested conform to requirements of Contract Documents, specifically noting deviations.
 - .3 Distribute PDF reports to the following parties:
 - .1 Owner
 - .2 Consultant
 - .3 Sub-consultants affected
 - .4 Contractor
 - .5 Building Department
- .5 The testing agency is not authorized to amend or release any requirements of Contract Documents, nor to approve or accept any portion of work.
- .6 The Contractor shall do the following:

- .1 Notify testing agency a minimum 48 hours in advance of operations to allow for assignment of personnel and scheduling of tests without causing delay in work.
- .2 Provide testing agency with access to work at all times.
- .3 Supply material samples for testing.
- .4 Supply casual labour and other incidental services required by testing agency.
- .5 Provide facilities for site storage of samples.
- .6 Make good work disturbed by testing agency.
- .7 When initial inspection and testing indicates non-compliance with Contract Documents, any subsequent re-inspection and retesting occasioned by non-compliance shall be performed by same testing agency and cost thereof borne by Contractor.

1.2 MOCK- UPS

- .1 Where required by Contract Documents construct mock-ups of work on site, in size and at location directed by Consultant.
- .2 Construct mock-ups prior to start of affected work. Work affected by mock-ups may not commence prior to acceptance of mock-up.
- .3 Construct mock-ups to include all related specified materials and workmanship. Make revisions as directed by Consultant, in accordance with intent of Contract Documents, until mock-ups are acceptable.
- .4 Mock-ups, reviewed and accepted by Consultant, shall become the standard of quality.
- .5 Mock-ups, by prior arrangement, may be incorporated into finished work if approved by Consultant.

1.3 TOLERANCES

- .1 Unless more stringent tolerances are required by a Section of the Specifications or a referenced standard, meet the following non-cumulative tolerances for installed work:
 - .1 "plumb" shall mean plumb within ¼" in 10'-0" (6 mm in 3 m).
 - .2 "level" shall mean level within ¼" in 10'-0" (6 mm in 3 m).
 - .3 "square" shall mean not in excess of 30 seconds less or more than 90E.

- .4 "straight" shall mean within 1/4" in 10'-0" (6 mm in 3 m) under a 10'-0" (3 m) straightedge.

1.4 BUILDING ENVELOPE

- .1 Requirements specified herein apply to all elements of the exterior building envelope.
- .2 The continuity of air barrier/vapour retarder and insulation components is critical and must be maintained at all locations. Where different systems meet, ensure proper interface and continuity between adjacent components by implementing suitable construction sequences and by using compatible materials only.
- .3 Provide control joints in exterior building components of design and spacing which will permit expansion and contraction of components without causing distortion, failure of joint seals, undue stress, cracking, bowing or other defects detrimental to appearance and performance. Review design and location of control joints with Consultant prior to start of work and follow directions given by Consultant.
- .4 Anchor exterior cladding and glazing components to structure in manner suitable to accommodate structural deflection and creep. Design anchorage to withstand expected wind loads, positive and negative, in accordance with applicable regulations.
- .5 Ensure that air spaces within exterior building components are fire stopped in accordance with applicable regulations.
- .6 Ensure that air spaces on the outside of vertical air barrier/vapour retarder (walls) are constructed with adequate drainage provisions to the exterior.

1.5 DRAINAGE

- .1 Layout and construct work to ensure that positive drainage is provided to roof drains, floor drains, site drains and catch basins, as set in their final position to prevent un-drained areas and ponding.
- .2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.
- .3 Issue a written report to the Consultant prior to executing work affected, for areas that adequate drainage cannot be provided.

END OF SECTION

01 51 00-Temporary Facilities

1.1 GENERAL

- .1 Provide all temporary facilities and controls required for the proper execution of the work.
- .2 Provide and maintain temporary systems in accordance with applicable regulations and requirements. Arrange for, obtain and pay for any permits required.

1.2 TEMPORARY ELECTRICITY AND LIGHTING

- .1 Provide temporary power, electrical lighting and sub-power system for use by all Sections.
- .2 Arrange, obtain and pay for service, including meter, of sufficient size to allow use of required tools and equipment and to ensure adequate lighting levels for the proper execution work.
- .3 Install and maintain temporary electrical systems in accord with Construction Safety Association's "Temporary Wiring Standards on Construction Sites", the Ontario Electrical Code and other authorities having jurisdiction.
- .4 The cost of electrical usage to be paid by the Owner.

1.3 TEMPORARY HEATING

- .1 The General Contractor shall provide all necessary heating, dehumidification etc. to areas as required to permit the installations of all materials and as required to maintain schedule and mandatory completion dates.
- .2 Furnish equipment, labour and hook-up to provide temporary heat as required for proper execution of work should the existing temporary heat not suffice.
- .3 Heat the enclosed building to minimum 15 degrees C at all times until taken over by Owner.
- .4 Provide all humidity control devices to achieve moisture levels in associated materials to permit installation in accordance with manufacturer's recommendations.
- .5 The use of propane or natural gas heaters of a type where the flame is not exposed is permitted. Open flame heaters are not permitted.
- .6 Uniformly distributes heat to avoid hot and cold areas and to prevent excessive drying.
- .7 The General Contractor shall pay for all charges for fuel.

1.4 TEMPORARY VENTILATION

- .1 Provide minimum 1 air change per hour for enclosed areas receiving architectural finishes.
- .2 Install adequate mechanical ventilation prior to commencement of work where hazardous or volatile adhesives, coatings or substances are used.
- .3 Do not allow excessive build-up of moisture inside building.

1.5 TEMPORARY COMMUNICATION, TELEPHONE AND MEETINGS

- .1 Provide and maintain site telephone and data/internet service for the duration of the contract to effectively communicate from the site to all parties.
- .2 Provide and maintain Virtual Meeting capability within the Contractor's site office/trailer for the duration of the project. The following shall be provided:
 - .1 Provide a computer or dedicated device with functioning camera, microphone, and speakers suitable for group participation.
 - .2 Provide a stable high-speed internet connection capable of supporting video conferencing.
 - .3 Provide a monitor or display screen of adequate size for viewing shared documents and participants.
 - .4 Provide access to commonly used video-conference platforms (e.g., Microsoft Teams, Zoom) as required by the Consultant and Owner.
 - .5 Ensure the remote meeting setup is operational for all scheduled construction / job meetings and available on request for unscheduled meetings.
 - .6 Maintain equipment in good working order. Promptly repair or replace components that impede remote communication.

1.6 TEMPORARY WATER

- .1 Provide temporary clean and potable water supply, for use by all Sections.
- .2 General Contractor to pay for related charges.

1.7 TEMPORARY SANITARY FACILITIES

- .1 Provide toilet facilities, including hand wash facilities, for all personnel on site.
- .2 Keep facilities clean, sanitary and provided with required supplies at all times.
- .3 Comply with requirements of Ministry of Labour and Board of Health.
- .4 The use of the Owner washroom facilities is not permitted.

1.8 TEMPORARY FIRST-AID FACILITIES

- .1 Provide equipment and medical facilities as necessary to supply first-aid service to injured personnel in accordance with regulations of the Workmen's Compensation Act. Maintain facilities for duration of Contract.

1.9 TEMPORARY FIRE PROTECTION

- .1 Provide and maintain in proper working order fire extinguishers on each floor, prominently placed, until completion of work.
- .2 Fire extinguishers shall be minimum 9 kg 4A 60BC type or other as deemed necessary.
- .3 Where gas welding or cutting is to be done within 3 m or above combustible material, or above space that may be occupied by persons, interpose shields of non-combustible material. Tanks supplying gases for welding or cutting shall be placed at no greater distance from the work than is necessary and shall be securely fastened in an upright position. Such tanks shall be free from exposure to the sun or high temperature.
- .4 Coordinate welding and torch, etc. permits with the Owner.

1.10 TEMPORARY USE OF NEW PERMANENT SERVICE & EQUIPMENT

- .1 Do not use any new permanent service or equipment without Consultant's written approval.
- .2 Where permission is granted to use permanent services and equipment provide competent persons to operate services and equipment; inspect frequently and maintain facilities in proper operating condition at all times.
- .3 Permanent services and equipment shall be turned over to Owner in "as new" and perfect operating condition.
- .4 Use of permanent systems and equipment as temporary facilities shall not affect the warranty conditions and warranty period for such systems and equipment. Make due allowance to ensure that Owner will receive full benefits of equipment manufacturers warranty after project takeover.
- .5 The equipment manufacturer/warrantor shall inspect equipment and provide a written report of review.

1.11 CONSTRUCTION AIDS

- .1 Provide temporary stairs, railing guards, ladders, ramps etc. required for movement and placing of materials, equipment and personnel.
- .2 Provide mechanical hoisting equipment and fully qualified operators as required during construction.

- .3 Erect required scaffolding independent of walls, arranged to avoid interference with work of other Sections as much as possible.
- .4 Provide and maintain required shoring and bracing in accordance with Construction Safety Act and other applicable regulations.
- .5 Shoring and all false work over one tier in height shall be designed and shall bear the stamp of a registered professional engineer, having experience in this field.
- .6 The use of explosive power tools will not be permitted under any circumstances unless equipped with a device which positively prevents free flight of the stud.

1.12 BARRIERS

- .1 Protect public and workmen from injury.
- .2 Provide and maintain required hoardings, barricades, guardrails, and lights in accordance with applicable regulations.
- .3 Construction site fencing to be a pre-manufactured 6'-0" high metal fencing and/or 6'-0" high chain link fencing. **NOTE:** Construction fence to protect the Place of the Work complete with traffic gates for equipment/vehicle access.
- .4 Provide temporary covered hoarding as required.

1.13 TEMPORARY CONTROLS

- .1 Provide protective coverings to protect work against damage caused by weather, including but not necessarily limited to rain, snow, ice, wind, frost and excessive heat.
- .2 Provide wind breaks and sun shades to allow proper setting and curing of cement type materials.
- .3 Protect building materials from freezing.
- .4 Prevent sprayed materials from contaminating air beyond application area, by providing temporary enclosures.
- .5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .6 Prevent tracking of mud and dirt from site onto paved roads. Provide stabilized vehicle access/egress points, constructed of coarse granular material. Place additional granular materials as required to maintain access/egress points in proper working order. Clean mud and dirt from paved roads at end of each day by shovelling or sweeping and subsequent washing. Dispose of mud and dirt in a controlled disposal area.
- .7 Provide temporary vestibule/door enclosures as required to ensure the building security.

1.14 PEST CONTROL

- .1 Provide rodent control and other pest control programs during construction, in accordance with requirements of jurisdictional authorities.

1.15 SIGNS

- .1 Except as specified herein, do not erect any signs unless approved by Consultant.
- .2 Supply and erect signage related to safety for the place of the work or mandatory regulations notices.
- .3 Prior to commencement of work wherein hazardous or volatile cements, coatings, or substances are used, barricade entire area and post adequate number of warning signs.

1.16 PROJECT SIGNAGE

- .1 Construction Project Sign to be supplied and installed by this Contract as detailed on the drawings. Locate as directed by Owner. All costs for the installation of the sign to be included in the base bid and are NOT part of any allowance. The Owner and Architect to supply images, text and approve sign layout (proof) prior to sign production.
- .2 Erect no other sign(s), except those signs necessary to give direction or are made for health and safety purposes

1.17 FIELD OFFICE AND SHEDS

- .1 Except as specified herein, do not erect any signs unless approved by Consultant.
- .2 Provide a temporary office as required for work, large enough to accommodate site administrative activities and site meetings, complete with light, heating and cooling equipment to maintain 21C, ventilation, table and chairs. Do not store materials, tools, equipment in meeting areas; keep clean and tidy.
- .3 Provide temporary covers, sheds, and platforms of weatherproof construction as may be required for protection and preservation of materials, small tools, equipment etc.

1.18 TEMPORARY SEDIMENT, DUST AND DRAINAGE CONTROL

- .1 Provide and maintain adequate temporary pumping and drainage systems to keep excavations and structures free of water. Prevent flow of surface water into excavations. Locate sumps away from foundations. Prevent pumped water from carrying soil in suspension in sufficient quantity to cause settlement of adjacent earth. Provide sufficient standby equipment to ensure continuity of pumping systems.

1.19 EROSION AND SEDIMENTATION CONTROL

- .1 Control the drainage on the site to prevent flooding, erosion and run-off onto adjacent properties and road ways.
- .2 Dispose of water containing silt in suspension in accordance with requirements of jurisdictional authorities.
- .3 Determine and conform to sedimentation and erosion control requirements of jurisdictional authorities. Provide and maintain until completion of work or until directed by Consultant to be removed, sediment control devices at catch basins, drainage courses and at other locations on site as directed.
- .4 Provide storm drain inlet protection consisting of a sediment control barrier or an excavated ponding area around storm drain inlet or curb inlet; add bracing where necessary to withstand high flow volumes and depth. Inspect inlet protection after each rainfall and repair damage.
- .5 Sweep up accumulated sediment and dispose of in a controlled area. Remove inlet protection after area has been stabilized with permanent vegetation.
- .6 Sweep and wash adjacent roads daily of accumulated sediment from the activities of the Place of the Work.

END OF SECTION

01 61 50-Project Requirements

1.1 PROJECT QUALITY

- .1 Products supplied for work shall be new and as far as possible and unless otherwise specified, of Canadian manufacture.
- .2 Materials used for temporary facilities are not required to be new, provided they are structurally sound and in suitable and safe operating condition.

1.2 STANDARDS AND TERMINOLOGY

- .1 Where a standard has been adopted by these Specifications, incorporate minimum requirements of such standard into the work. Where requirements of Specifications are more stringent than those of the standard, follow more stringent requirements.
- .2 References to standards, specifications, handbooks and manufacturer's catalogues refer to latest edition thereof and all amendments or revisions applicable at bid closing date, unless date suffix is included with document number.
- .3 Wherever words "acceptable", "approved", "satisfactory", "selected", "directed", "designated", "permitted", "inspected", "instructed", "required", "submit", or similar words or phrases are used in standards or elsewhere in Contract Documents, it shall be understood, that "by (to) the Consultant" follow, unless context provides otherwise.
- .4 Where the word "provide" is used in these Contract Documents, it shall be taken to mean "supply and install" unless specifically noted otherwise.

1.3 CERTIFICATION

- .1 Building materials, components and elements specified without the use of trade or proprietary names shall meet requirements specified.
- .2 If requested by Consultant, submit evidence of meeting requirements specified. Evidence shall consist of certification based on tests carried out by an independent testing agency.
- .3 Certifications based on previous tests for same materials, components or elements are acceptable. Certification shall be in form of written test reports prepared by testing agency.

1.4 AVAILABILITY AND SUBSTITUTIONS

- .1 Refer to Section 01 33 00 - Submittals.
- .2 Products which are specified by their proprietary names or by part or catalogue number form the basis of the Contract. No substitutes for these may be used without Consultant's approval in writing.

- .3 Where it is found that specified materials have become unavailable for incorporating into work, notify Consultant immediately of proposed substitution.
- .4 In order to substantiate equivalency of proposed materials, products or processes submit samples, printed product descriptions, test data, installations, standards, certification, sample, guarantee/warranty forms, list of successful projects incorporating such proposals, and similar information requested by Consultant in accordance with Section 01 33 00 - Submittals.
- .5 Whenever a substitute is proposed, any change to contract price as a result of acceptance of proposed product shall include Consultant's costs for review and any adjustments to adjacent structure or space in order to accept minor differences in size or weight between proposed items and corresponding specified items in accordance with Section 01 33 00 - Submittals.
- .6 Prevent any substitution or request for substitution from delaying construction progress in any way.
- .7 Requests for substitution resulting from failure to place orders in time will not be entertained. Be responsible for ordering products in time to ensure their required delivery; bearing all costs for failure to comply with these requirements.

1.5 PRODUCT HANDLING AND STORAGE

- .1 Package, crate and protect products during transportation to site to preserve their quality and fitness for the purpose intended.
- .2 Store products in original, undamaged condition with manufacturer's labels and seals intact until they are being incorporated into completed work.
- .3 Handle and store materials in accordance with manufacturer's and supplier's recommendations and so as to ensure preservation of their quality, appearance and fitness for work.
- .4 Arrange materials so as to facilitate prompt inspection, and remove faulty, damaged or rejected materials immediately from site.

END OF SECTION

01 73 03-Execution Requirements

1.1 EXAMINATION

- .1 Examine the site, existing premises and surrounding areas and be fully informed as to the conditions and limitations under which the work has to be executed. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to bid closing.
- .2 Prior to commencement of work the contractor shall make careful examination of previously executed work, existing conditions, levels, dimensions and clearances. Promptly advise Consultant of unsatisfactory preparatory work and substrate conditions; commencement of work implies acceptance of conditions.

1.2 PROTECTION

- .1 Ensure no damage is caused to existing adjacent structures, buildings, foundations, pavement, fences, curbs, grounds, plant, property, utilities, services, etc. finishes during the progress of Work. Repair and make good any damage caused at no extra cost to Owner to the complete satisfaction of the respective property owners and authorities having jurisdiction. Only trades specifically capable of performing the work will be allowed to make remedial or repair work.
- .2 Keep surfaces to receive finished flooring dry and free from oil and grease. Stockpiling of damp or wet building materials and use of mixing boxes or water buckets without protecting floors from moisture gain by approved means, is prohibited.
- .3 Keep municipal roads clean of mud and debris resulting from construction traffic.
- .4 Prevent soiling of pavement due to spillage, mixing of material or any other cause. Make good any damage caused.
- .5 Protect new work from damage with suitable protective coverings.
- .6 Protect the place of the work during periods of down time.

1.3 SERVICES AND UTILITY SYSTEMS

- .1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.
- .2 The location of the existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.
- .3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.
- .4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.

- .5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.
- .6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.

1.4 SLEEVES, SUPPORTS AND FASTENERS

- .1 Unless specified in other Sections, furnish set and secure inserts, hangers, sleeves, fasteners, adhesives, anchors and other supports and fittings required for proper installation of work.
- .2 Use exposed metal fastenings and accessories of same texture, colour and finish as base metal on which they occur.
- .3 Select appropriate type of anchoring and fastening devices in sufficient quantity and in such a manner as to provide positive permanent anchorage of unit to be anchored in position. Keep exposed fasteners to a minimum, evenly spaced and neatly laid out.
- .4 Fasteners shall be of permanent type. Do not use wood plugs.
- .5 Fasteners which cause spalling or cracking of material to which anchorage is being made shall not be used.

1.5 CONCEALMENT

- .1 Conceal ductwork, piping, conduit and wiring located in finished areas, in ceiling spaces and furred construction unless specifically noted to be exposed.
- .2 If any doubt arises as to means of concealment, or intent of Contract Documents in this connection, request clarification from Consultant before proceeding with portion of work in question.

1.6 WORKMANSHIP

- .1 All work shall be carried out in accordance with the best trade practice, by mechanics skilled in the type of work concerned.
- .2 Products, materials, systems and equipment shall be applied, installed, connected, erected, used cleaned and conditioned in accordance with the applicable manufacturer's printed directions.
- .3 Where specified requirements are in conflict with manufacturer's written directions, follow manufacturer's directions, but inform Consultant in writing prior to proceeding with affected work. Where specified requirements are more stringent than manufacturer's directions, comply with specified requirements.

1.7 LINES AND LEVELS

- .1 Verify all elevations, lines, levels and dimensions as indicated and report errors, any conflicts, or inconsistencies to the Consultant before commencing work or as soon as discovered.
- .2 Arrange to have building base lines laid out by an Ontario Land Surveyor.
- .3 Accurately layout work and establish lines and levels in accord with requirements of Contract Documents.
- .4 Set up, maintain and protect permanent reference points and provide general dimensions and elevations for all Sections of Work.

1.8 DIMENSIONS

- .1 Check and verify dimensions wherever referring to work. Dimensions, when pertaining to work of another Section, shall be verified with Section concerned. Details and measurements of work which is to fit or conform with work installed, shall be taken at site.
- .2 Do not scale Drawings. If there is ambiguity, lack of information or inconsistency, immediately consult Consultant for directions. Be responsible for extra costs involved through the disregarding to this notice.
- .3 Walls, partitions and screens shall be considered as extending from floor to underside of structural deck unless specifically indicated otherwise on Drawings.

1.9 LOCATION OF FIXTURES

- .1 Locations of fixtures, apparatus, equipment, fittings, outlets, conduits, pipes and ducts shown or specified, but not dimensioned, shall be considered approximate.
- .2 Request from the Consultant to establish exact locations. Any re-locations caused by Contractor's failure to request direction from Consultant shall be done by Contractor at no extra cost. Where job conditions require reasonable changes in indicated locations and arrangements, make changes at no additional cost.
- .3 Conserve space and co-ordinate with work of other Sections to ensure that ducts, pipes, conduits and other items will fit into allocated wall and ceiling spaces, while ensuring adequate space for access and maintenance.

END OF SECTION

01 74 11-Cleaning

1.1 GENERAL

- .1 Be responsible for cleanliness of assigned work areas to satisfaction of Consultant. Maintain work area in neat and orderly conditions at all times.
- .2 Periodically, or when directed by the Consultant, remove from work areas rubbish and waste materials.
- .3 Use only cleaning materials as recommended by manufacturer of surface to be cleaned.
- .4 Deficiencies review will commence after final cleaning has been executed.

1.2 CLEANING DURING CONSTRUCTION

- .1 Remove all debris, packaging, waste materials etc. from the place of the work on a weekly basis.
- .2 Keep dust and dirt to an acceptable level as directed or requested by the Consultant and/or Owner.
- .3 Remove oily rags, waste and other hazardous substances from premises at close of each day, or more often if required.

1.3 FINAL CLEANING

- .1 Upon completion of work, or, where work is phased, upon completion of each phase, thoroughly clean all interior and exterior surfaces and components. Provide professional cleaning by a recognized, established cleaning company, to allow Owner to occupy without further cleaning except where specifically indicated otherwise. In the event cleaning is not done on timely basis, the Owner reserves the right to bring own forces to clean surfaces and components and back charge the Contractor for the costs.
- .2 Remove stains, dirt and smudges from interior and exterior finished surfaces.
- .3 Clean exposed finished surfaces in accordance with respective material manufacturer's recommendations.
- .4 Clean mechanical and electrical fixtures and other fittings of labels, wrappings, paper and other foreign material.
- .5 Replace heating, ventilation and air conditioning filters if units were operated during the late stages of construction, testing and balancing procedures etc. Clean inside of ducts, blowers and coils.

1.4 CLEANING OF ALUMINUM

- .1 The Contractor immediately before turning over the building to the Owner shall clean all aluminum members, sash, sills, trim, doors, etc. both interior and exterior exposed surfaces. Check and confirm with the various aluminum suppliers as to the correct procedures and solutions to be used.

1.5 CLEANING OF GLASS

- .1 The Contractor immediately before turning over building to Owner shall clean all glass and mirrors inside and outside.

1.6 ROOF CLEAN-UP

- .1 During construction and again immediately before turning building over to the Owner, the General Contractor shall inspect the entire roof surface and remove all debris, dirt and dust which accumulated during the construction period.

1.7 SITE CLEAN-UP

- .1 The contractor prior to owner occupancy and/or substantial performance shall clean the site of all construction materials, temporary fencing, hoarding, trailers, etc. All landscaped shall be cleaned of construction debris, cut and/or pruned in accordance with the specifications.
- .2 Remove snow and ice from driveways, parking areas and walks.
- .3 Power wash all paved surfaces.

1.8 DISPOSAL OF WASTE MATERIALS

- .1 All waste materials resulting from demolition and construction activities belong to the Contractor and shall be removed and legally disposed unless clearly stated otherwise. Refer to Waste Management specification.
- .2 Separate & recycle reusable materials to maximum extent possible from general waste stream and transport to recycling/reuse facilities.
- .3 Fires and burning of waste or materials are not permitted on site.
- .4 Do not bury waste or materials on site.
- .5 Do not dispose of liquid waste or volatile materials into watercourses, storm or sanitary sewers.
- .6 Comply with Ontario Regulations 102/94, 103/94 and all current regulations under the Environmental Protection Act.

END OF SECTION

01 74 19-Construction Waste Management

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 Prepare and maintain a Construction Waste Management Plan (CWMP) to form the basis of waste management practices for this project.
- .2 The successful implementation of this Construction Waste Management Plan will contribute to sustainable construction practices, reduce environmental impact, and promote responsible resource use throughout the duration of the project. All team members are expected to actively participate in these efforts to achieve the project's waste management objectives.
- .3 This Section includes administrative and procedural requirements for the following:
 - .1 Salvaging non-hazardous demolition and construction waste.
 - .2 Recycling non-hazardous demolition and construction waste.
 - .3 Disposing of non-hazardous demolition and construction waste.

1.2 RELATED SECTIONS

- .1 All sections of this specification.

1.3 WASTE MANAGEMENT STRATEGIES

- .1 Waste Reduction: Pre-Construction Planning – Conduct a detailed assessment of materials needed and order only what is necessary to minimize excess.
- .2 Recycling: Implement waste segregation practices on-site to separate recyclable materials (e.g., metals, wood, drywall, plastics) from non-recyclable waste. Establish partnerships with local recycling facilities to ensure proper disposal of recyclable materials. Maintain records of the quantities and types of materials recycled, including receipts or certificates from recycling facilities.

1.4 WASTE MANAGEMENT PROCEDURES

- .1 Waste Identification: Identify types of waste expected from the project, including:
 - .1 Construction debris (wood, concrete, metal, etc.)
 - .2 Packaging materials (plastic, cardboard, etc.)
 - .3 Hazardous waste (paints, solvents, etc.)
- .2 Waste Collection: Provide labeled waste containers for different waste types to facilitate segregation. Coordinate with waste management service providers for regular pick-up and disposal of waste.

- .3 Hazardous Waste Management: Identify any hazardous materials and follow proper handling, storage, and disposal procedures according to applicable regulations. Ensure workers are properly trained on the handling and disposal of hazardous waste.
- .4 Monitoring and Reporting: Conduct weekly audits to assess waste management practices and compliance with the CWMP. Maintain a log of all waste generated, recycled, reused, and disposed of, and report efforts to the Owner and Architect monthly.
- .5 Communication and Implementation: Conduct initial training for all project staff on waste management practices and the importance of the CWMP. Provide refresher training and updates as necessary throughout the project lifecycle.
- .6 Compliance and Review: Ensure all waste management practices comply with local, provincial, and federal regulations as required by project type and location. Review and update the CWMP regularly to reflect changes in project scope or waste management strategies.

END OF SECTION

01 77 00-Project Close-Out

1.1 REFERENCE STANDARD

- .1 Comply with provisions of OAA/OGCA Document No. 100-2018 "Take-Over Procedures" except as modified within the Specifications and as augmented by these Specifications.

1.2 OPERATING AND MAINTENANCE MANUALS

- .1 Provide Operation and Maintenance Manuals in accordance with Section 00 71 00.

1.3 EXTENDED WARRANTIES

- .1 Provide extended warranties in accordance with Section 00 71 00.

1.4 AS-BUILT DRAWINGS

- .1 Prior to Substantial Performance obtain a CAD file of all Contract Drawings from Consultant and transfer field changes, revisions, deletions and additions made throughout the execution of the Work, from the set of prints kept onsite to the CAD file. Consultant will incorporate modifications made to existing drawings and add new drawings issued during the course of construction into the CAD file prior to issuing CAD file to Contractor.
- .2 Clearly and prominently mark each drawing 'AS-BUILT DRAWING" prepared by name of Contractor.
- .3 Submit CAD file of these drawings on CD's and two (2) complete sets of Colour Prints of updated CAD file to the Consultant prior to application for Final Payment.

1.5 MAINTENANCE MATERIALS

- .1 Deliver to the location directed by the Consultant maintenance materials as required elsewhere in these Specifications. Obtain receipt for delivered materials and submit copy of receipt to the Consultant.
- .2 Package materials so that they are protected from damage and loss of essential properties.
- .3 Label packaged materials for proper identification of contents and project name.

1.6 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Prior to requesting Substantial Performance, at a time acceptable to Owner and Consultant, but not before operating and maintenance data has been reviewed and accepted by the Consultant, instruct designated Owner's representatives in the operation and maintenance of all systems and equipment.

- .2 Arrange training sessions for each type of operating system and equipment. Sessions shall be conducted by qualified instructors and shall be of sufficient duration and depth to adequately instruct participants.
- .3 Throughout the training sessions, make reference to reviewed operation and maintenance manuals to familiarize participants with the data provided.
- .4 Prepare an attendance record for each training session, to be signed by each participant upon conclusion of session. Show date and time of session, subject of session and name, title and organization of each participant. Submit a copy of each record to the Consultant.
- .5 Subcontractor whose work is subject of training session and Contractor shall be represented during training session by qualified personnel.

1.7 INSPECTION AND ACCEPTANCE OF WORK

- .1 Prior to requesting Substantial Performance submit the following:
 - .1 Operating and maintenance manuals (manuals must be submitted minimum 2 weeks prior to requesting Substantial Performance).
 - .2 Inspection and acceptance certificates required from regulatory agencies.
- .2 Advise the Consultant in writing, when work has been substantially completed. If Consultant agrees that this stage has been reached, prepare a complete list of deficiencies and submit this list to the Consultant.
- .3 On receipt of the above deficiency list in a satisfactory form, the Consultant, accompanied by Sub-consultants, the Contractor and the Owner will carry out a review of the contractor issued deficiency list. The consultants will add to the list should additional items be encountered. The review will be issued to contractor and owner.
- .4 Add to the deficiency list, in accordance with Consultant's directions, any additional deficiencies which are identified during inspection and reissue updated deficiency list. A 'Deficiency' dollar value will therein be established as per Section 00 71 00, item 1.4.
- .5 Upon completion, inspection and acceptance of work, Owner will take over and occupy completed work. Refer to Supplementary Conditions for procedures relating to certification of Substantial Performance and release of holdback.

END OF SECTION

01 79 00-Demonstration and Training

1.1 GENERAL

- .1 The Contractor shall co-ordinate and participate in all aspects of the Demonstration and Training.
- .2 The Contractor shall issue to the Consultant a schedule of all Demonstration and Train activities that has been established in consultation with the Owner representative to insure attendance.
- .3 The Contractor shall submit to the Consultant a copy of a sign-in sheet of all attendee's, Owner, Contractor, Subtrades, material/equipment representatives etc. having name, title and organization of each participant. The sign-in sheet shall have the project name, address and the specification section(s)/session being addressed.
- .4 The Contractor, Subtrades, material/equipment representatives etc. shall include for two (2) Demonstration and Training sessions for each/all aspects of the work.

1.2 DEMONSTRATION AND TRAINING

- .1 The Demonstration and Training sessions shall provide to the owner all necessary instructions as to the operation and maintenance of all materials and equipment provided within the execution of the contract.
- .2 The sessions shall be a classroom seminar environment complete with material manuals, operating manuals, product and system drawings etc.
- .3 Provide audio/visual aids. As requested by the owner provide a recorded version of each session.
- .4 The sessions shall demonstrate the operating procedure for each service/equipment.
- .5 The sessions shall train in the maintenance procedure for each material or piece of equipment.
- .6 Inform the owner of all required safe and proper access to equipment for operation and maintenance.

END OF SECTION

PART 1 - GENERAL

1.1. GENERAL INSTRUCTIONS

- 1.1.1 Comply with Section 22 “Plumbing General Requirements”, Section 23 “HVAC General Requirements” & Section 26 “Electrical Contract General Requirements”.
- 1.1.2 Contractor shall be responsible for proper performance of Work.
- 1.1.3 Provide all labor, materials, products, equipment and services for commissioning all building systems to ensure building is operating according to requirements of Contract Documents.
- 1.1.4 Refer to the Commissioning Team Responsibilities for more details.
- 1.1.5 The Commissioning Authority (CxA) shall develop a Commissioning Plan.

1.2. RELATED SECTIONS

- 1.2.1 Refer to the following sections:
 - Section 22 Mechanical Specifications
 - Section 23 Mechanical Specifications
 - Section 26 Electrical Specifications

1.3. REFERENCES

- 1.3.1 CSA Z320-11: Building Commissioning
- 1.3.2 ASHRAE Standard 202-2024: Commissioning Process for Buildings & Systems
- 1.3.3 ASHRAE Guideline 0-2019: The Commissioning Process
- 1.3.4 ASHRAE Guideline 1: Guidelines for Commissioning of HVAC Systems
- 1.3.5 ASHRAE Guideline 1.1-2007: HVAC&R Technical Requirements for the Commissioning Process
- 1.3.6 ASHRAE Guideline 4-2019: Preparation of O&M Documentation for Building Systems

1.4. DEFINITIONS and ACRONYMS

- 1.4.1. Commissioning (Cx): Is a systematic process of ensuring that all building systems designed, installed, functionally tested, performs and capable of being operated and maintained according to the design intent & owner's operational needs.
- 1.4.2. Commissioning Authority (Cx A): Owner's appointed commissioning professional.
- 1.4.3. Commissioning Consultant: (See Commissioning authority).
- 1.4.4. Consultant (Design Team): Member of the professional design team.
- 1.4.5. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources and documentation requirements of the commissioning process.
- 1.4.6. ME Contractor: refers to mechanical and /or electrical contractor.
- 1.4.7. Commissioning team: consist of various participants involved in the commissioning process. The commissioning documentation and tasks of each team member will be coordinated through the Commissioning Authority
- 1.4.8. Contractor Start-up: Contractor start-up and verification activities are conducted by the contractors and/or their sub-trades and equipment vendors. Contractor / vendor checking of the physical installation of the work and equipment and reviewing the completion of system installation and readiness, is completed prior to the CxA functional performance testing and verification activities.
- 1.4.9. TAB: Testing, Adjusting and Balancing.
- 1.4.10. BAS: Building Automation System.
- 1.4.11. FPT: Functional Performance Test
- 1.4.12. PFT: Pre-functional test
- 1.4.13. Pre-Functional & Functional Performance Testing (PF / FPT): Pre-Functional & Functional Performance Tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through its respective level of automation. This testing also confirms each systems capability of operating to the requirements of the facility and the Owner's Project Requirements.
- 1.4.14. Sampling: Performing observation, review, testing or other verification on only a fraction of the total number of identical or near identical pieces of equipment, drawings, events, etc. Sampling techniques include random statistical sampling and less formal professional judgment methods
- 1.4.15. Seasonal testing: Performance tests that are deferred until the system(s) will experience conditions closer to their design criteria based on weather conditions.

1.5. **CONSULTANT TEAM**

- 1.5.1. The Consultant Team for the Project is responsible for developing a set of performance objectives and providing a design that meets those objectives. The Consultant Team will be required to assist with developing and witnessing the system tests and integrated systems tests. Consultants are to advise the Contractor as to which tests require witnessing.

1.6. **COMMISSIONING TEAM**

- 1.6.1. Members of the team should include the followings:

- Owner Representative(s)
- CxA
- Mechanical Engineer
- Electrical Engineer
- General Contractor
- BAS Contractor/Vendor
- Mechanical Contractor
- Electrical Contractor
- TAB Contractor
- Manufacturer's Representatives

1.7. **COMMISSIONING TEAM RESPONSIBILITIES**

- 1.7.1. Owner Representatives:

- Attending commissioning meetings (as required).
- Receive commissioning reports and final commissioning report.
- Engaging a Commissioning Authority that does not include individuals directly responsible for project design or construction management.
- CxA reports directly and receive directions from the Owner representatives.
- Supporting the commissioning process.

- 1.7.2. Design Team:

- Prepare the contractors' M & E drawings and specifications.
- Reviewing shop drawings.
- Reviewing test reports from the contractors and verifying testing results.
- Inspecting the installations for general conformance with the contract documents, Codes and Standards.
- Review operating and maintenance manuals.
- Witnessing selected contractor's acceptance/demonstration tests.
- Review as-built documentation.
- Review performance testing results for general conformance with the contract documents.

1.7.3. CxA:

- Prepare the commissioning specification section.
- Review of the mechanical and electrical drawings and specifications.
- Develop and implement the commissioning plan
- Review equipment shop drawing submittals
- Chairs the commissioning meetings and records/ distributes meeting minutes.
- Assisting with the commissioning schedule.
- Conducting selected installation reviews as they pertain to commissioning and issuing deficiency reports.
- Review and monitor equipment start-up process.
- Receiving and evaluating the contractors' test forms.
- Preparing FPT forms for contractor (s) use.
- Issuing commissioning progress reports.
- Witness and verify contractor's performance verification tests (sampling technique)
- Co-ordinating with the TAB, BAS contractors and M&E Contractors.
- Reviewing O&M manuals.
- Review training schedule and agenda.
- Final commissioning reporting.
- Verifying seasonal performance during the opposite season of original performance testing.

1.7.4. General Contractor:

- Cooperate fully with CxA in execution of the Commissioning Process and Commissioning Plan.
- Incorporate all commissioning related activities and milestones in the construction schedule.
- Schedule all related commissioning activities in coordination with the CxA, subcontractors and vendors.
- Participating in commissioning meetings.
- Distribute contractors issued shop drawings.
- Include the CxA in all correspondences that affect the commissioning process and activities (e.g. schedules, site instructions, change orders, meeting minutes, etc.)
- Provide CxA with a copy of the ME O&M manuals for their review.
- Coordinates owner training with subcontractors and CxA.
- Ensure that sub-contractors and OEMs (Original Equipment Manufacturers) have completed all system start-ups and documentation as required by individual specification sections.
- Ensures the subcontractors perform their commissioning responsibilities.
- Collects, assembles and manages commissioning documentation from subcontractors.

-
- Works with subcontractors to correct commissioning deficiencies as quickly as possible.
 - Provides support and participate in the functional testing as needed.

1.7.5. ME Contractors:

- Cooperate fully with CxA in execution of the Commissioning process
- Coordinates with the GC to confirm commissioning responsibilities at bid time.
- Review the commissioning plan and provided comments.
- Coordinates with GC on scheduling of commissioning tasks.
- Demonstrates proper system installation and operation.
- Corrects system deficiencies in a timely fashion.
- Preparing equipment start-up and testing schedules.
- Conducting all tests as identified in the mechanical and electrical specifications.
- Notifying all parties of scheduled test dates.
- Completing and sign off all PFT (Pre-Functional Test) forms and make it ready for CxA review and approval.
- Arranging for the CxA and the consultants to attend and witness tests.
- Support CxA with the necessary resources (individuals and equipment) for completing all commissioning testing activities.
- Issuing test forms and progress reports to the CxA on a regular basis.
- Coordinates with vendors for the proper equipment start-up, documentations and report issuing.
- Provide declaration in writing to the CxA that installation is complete and ready for the CxA pre- functional check review and Functional Performance Testing as per the Commissioning Plan.
- ME contractor (s) and vendor(s) shall perform a complete 100% functional performance test for all equipment and systems and provide completed and signed off FPT sheets.
- Cooperate with CxA to assist with implementing all seasonal and deferred commissioning activities.
- Contractor (s) to submit valid calibration certificate for all instruments to be used;
- Preparing operating and maintenance (O&M) manuals.
- Preparing training schedules in coordination with the General Contractor.
- Preparing as-built drawings.
- Conducting acceptance/demonstration tests.

1.7.6. Building Automation System Vendor:

- The BAS Contractor will install, commission, and demonstrate their system to the requirements of the specification.
- BAS contractor to submit valid calibration certificate for all testing instruments to be used
- Provide BAS point to point and other verifications report for CxA and consultants' review.
- The BAS Contractor will coordinate closely with the mechanical contractor, electrical contractor, the TAB Contractor, and the CxA.
- The BAS contractor to provide work progress to the commissioning team.
- Completing and sign off all FPT (Functional Performance Test) forms and make it ready for CxA review and approval.
- Provides detailed operations & maintenance manuals for all aspects related to the Building Automation system.
- Provide list of all schedules and set points
- Coordinates control system functional checks with the CxA and demonstrates the sequences of operation to the CxA as required in the functional check sheets.
- The BAS vendor in cooperation with other contractors and vendors shall perform a complete 100% functional performance test for all equipment and systems related to the BAS and provide completed and signed off FPT sheets.
- Prepare training materials as defined in section 1.4 for operational staff training.
- The BAS Contractor will participate in the CxA performance tests and the seasonal performance tests.
- The BAS will attend selected commissioning /construction meetings.

1.7.7. TAB Contractor:

- Complete an initial project review prior to start any TAB activity to attempt to identify any construction issues preventing proper balancing of the systems.
- Performs a job walk prior to start balancing to identify any construction issues preventing proper balancing.
- The TAB contractor will test and balance the mechanical systems to the requirements of the project specification and in line with TAB standards.
- TAB contractor will prepare a schedule for their work and coordinate with the construction manager to include these activities with in the construction schedule.
- Provides all TAB documentation and associated reports.
- Reports on operation and programming issues discovered in the field while balancing.
- Issue report for the initial project review to the construction manager /mechanical contractor and copied CxA and mechanical engineer.
- The TAB contractor will attend selected commissioning /construction meetings.

- TAB contractor to submit valid calibration certificate for all instruments to be used;
- Coordinate with the CxA to witness selective percentage of the water and air balancing process.

1.7.8. Equipment Vendors

- Provides all documentation on furnished equipment, including complete submittals, equipment data, installation manuals, O&M manuals, start-up procedures, and warranties.
- Performs factory start-up when required.
- Provides support for troubleshooting systems issues.
- Provides technical training services for equipment as supplied, based on outline training program prepared by CxA.
- Conducting acceptance/demonstration tests.
- Contractor will submit completed test forms and attend selected construction meetings when required.

1.8. **PRODUCTS**

- 1.8.1. The contractor shall provide all material, equipment and instrumentation to complete the contractors' commissioning process identified in this section and the mechanical and electrical specification sections.

1.9. **SUBMITTALS**

- 1.9.1. Submittal Drawings and Equipment Data - to be submitted by contractor – refer to related specification section (s). The Commissioning Authority will review submittals to ensure the systems and equipment being supplied is consistent with the required commissioning test procedures, and if not, that the variances are acceptable to the Team, and that commissioning checklists are revised accordingly.
- 1.9.2. As- Built Record Drawings- related specification section (s) the various trades shall mark-up the consultants' drawings to clearly indicate the approved changes in the design or layout that took place during construction.
- 1.9.3. O&M Manuals - related specification section (s). The contractor shall compile as specified in the contract documents. O & M manuals shall be reviewed by the commissioning Authority (CxA).
- 1.9.4. Training Agenda and training materials, Contractor, through the manufacturers, will provide training agenda and training materials for each system.

1.10. **MANUFACTURER'S INSTRUCTIONS**

- 1.10.1. Unless otherwise indicated in the specifications, operate Products in accordance with manufacturer's instructions. Obtain written instructions directly from manufacturers.
- 1.10.2. Notify the Consultant in writing, of conflicts between the specifications and manufacturer's instructions, so that the Consultant may establish the course of action.
- 1.10.3. Improper operation of Products, due to failure in complying with these requirements, authorizes the Consultant to require removal and re-installation at no change in Contract Price or Contract Time.

1.11. **REPORTS**

- 1.11.1. Submit field test reports for the Project's electrical and mechanical equipment /systems, including but not limited to; boilers, chemical treatment, Rooftop Units, pumps, Switchboards, Panel boards, Transformers, BAS point to point verification, BAS field panels and devices. Also, system's megger test, piping flushing, piping cleaning and piping pressurization test reports.
- 1.11.2. The Commissioning Authority (CxA) will issue commissioning reports following all commissioning activities on site. The Contractor is responsible for completion of deficiencies as listed in the Commissioning Reports and shall return signed- off copies of issued commissioning reports noting action taken on items.
- 1.11.3. All commissioning deficiencies will be tracked to resolve and final sign-off by the Commissioning Consultant.
- 1.11.4. Contractors to feedback on items listed in the commissioning issue log developed by the Commissioning Consultant.

1.12. **QUALITY ASSURANCE**

- 1.12.1. Contractors to feedback on items listed in the commissioning issue log developed by the Commissioning Consultant.
- 1.12.2. Use personnel for starting, equipment and starting procedures who have experience in electrical and mechanical equipment and systems commissioning and are able to interpret results of readings and tests and report state of systems in a clear and concise manner.
- 1.12.3. Major electrical and mechanical equipment to be started and checked by OEM as defined in section 1.4 certified personnel.
- 1.12.4. Maintain a file for all PFT and FPT sheets and make it ready for CxA review and approval.
- 1.12.5. Contractors to submit valid calibration certificate for all testing instruments to be used.

1.13. OPERATION AND MAINTENANCE MANUALS

- 1.13.1. Provide additional requested documentation, prior to normal O&M manual submittals, to the Commissioning Authority for development of start-up and functional testing procedures. Typically, this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority. These documents will also be included in the O&M manuals.
- 1.13.2. The Commissioning Authority may request further documentation necessary for the commissioning process. This data request may be made prior to normal submittals.

PART 2 - EXECUTION

2.1. OVERVIEW

- 2.1.1. In general terms, commissioning (Cx) is the process of assuring and verifying that all building systems designed, installed, functionally tested, performs and capable of being operated and maintained according to the design intent & owner's operational needs
- 2.1.2. Contractor shall be responsible for proper performance of work.
- 2.1.3. The Commissioning Authority (CxA) shall plan, organize and implement the commissioning process.

2.2. COMMISSIONING PROCESS

- 2.2.1. Commissioning process can be defined as a series of actions and activities by the project participants at various times over the complete life cycle of the project. These actions and activities can be regarded as fundamental to a sound commissioning program and are included in the following phases of the commissioning process shall be responsible for proper performance of work.
- 2.2.2. Pre-Construction /Design Phase:
 - Developing initial outline for the commissioning plan
 - Developing Commissioning –Focused design review.
 - Review ME drawings and specifications.
 - Develop Commissioning Requirements for the Specifications.
- 2.2.3. Construction Phase:
 - Update and implement the commissioning plan.
 - Conducting commissioning meetings.
 - Commissioning schedule incorporated into the project master schedule
 - Reviewing shop drawing submittals for the commissioning related equipment
 - Conducting installation inspections
 - Reviewing equipment start-up reports
 - Reviewing operation and maintenance manuals
 - Complete verification checklists
 - Issuing site commissioning reports
 - Conduct sample functional /performance testing on BAS and mechanical system(s).

- Assist with the coordination and delivery of the training activities. Receive completed attendance sheets and report on the completion of the training requirements.

2.2.4. Occupancy and Operation Phase

- Cx A Develop final commissioning report
- Help resolve outstanding commissioning issues
- Perform seasonal testing in the opposite season of the original performance testing.

2.3. **STARTUP AND TESTING COST**

- 2.3.1. Contractors (s) pay costs associated with starting, testing/ re testing, adjusting, preparation for balancing and cleaning, including supply of calibrated instruments, equipment, supplies and consumable materials.

2.4. **MANUFACTURER'S RECOMMENDATIONS**

- 2.4.1. Prior to starting equipment or systems, obtain and review manufacturer's installation, starting and operating instructions. Read in conjunction with procedures specified herein.
- 2.4.2. Use manufacturers' and supplier's trained personnel where necessary to maintain validity of manufacturer's warranty.
- 2.4.3. Compare actual installation with manufacturer's recommended installation. Record discrepancies. Correct deviations detrimental to equipment performance prior to starting equipment.

2.5. **TESTING INSTRUMENTS AND EQUIPMENT**

- 2.5.1. Provide calibrated testing instruments and equipment, and ancillary equipment such as two-way radios and ladders required to perform starting of mechanical equipment and systems.
- 2.5.2. Instruments used in equipment start-up must be calibrated and accurate. Provide valid calibration certificates if requested by the Commissioning Authority.

2.6. **TOLERANCE**

- 2.6.1. As specified by the mechanical engineer, otherwise refer to the below table of acceptable variations from the design value that will be acceptable for the performance verification.

Sensor	Tolerances (±)
Cooling coil, chilled and condenser water temperature	0.4 F
AHU wet bulb or dew point	2F
Hot water coil and boiler water temperature	1.5F
Outside air, space air, duct air temperature	0.4 F
Watt hour, voltage and amperage	1% of design
Pressure (air water and gas)	3% of design
Flow rate. Air	10% of design
Flow rate, water	4% of design
Relative humidity	4% of design
CO sensor	0.01 % pts
Natural gas and oil flow rate	1% of design
Steam flow rate	3% of design

2.7. BUILT-IN CONTROLS

- 2.7.1. The built-in controls of all equipment will be tested by the respective Supplier/Contractor to prove its intended sequence of operation in presence of the CxA/Consultant. This testing will be carried out in appropriate weather condition as specified access to all system equipment being commissioned.

2.8. BAS CONTROLS TESTING

- 2.8.1. The Controls Contractor will submit a point-to-point checklist and calibration verification to CxA for review. CxA may suggest addition/changes to the checklists and the reviewed checklist will be utilized by the Contractor to complete the control's testing.
- 2.8.2. Contractor will test and record results for each equipment and component of the building automation system. On completion of the test, Contractor will submit a detailed test and calibration report to the Consultant and CxA for verification. CxA will physically verify the test report for at least one of each type of system/equipment commissioned. The non-conformities will be corrected by the Contractor and the test and verification procedure will be repeated for that system.
- 2.8.3. The controls contractor will test the sequence of operation for all HVAC equipment and devices and submit test reports accordingly. Complete sequence of operation shall be submitted as part of the complete controls shop drawings for engineer's approval and the review of the commissioning authority.

- 2.8.4. BAS contractor shall submit complete system shop drawings including graphics, system structure, sequence of operation, point list for each equipment/device, controls valves, sensors, etc.

2.9. COMMISSIONING REVIEW

- 2.9.1. Provide access to all system equipment being commissioned.
- 2.9.2. Do not conceal or cover equipment or systems prior to scheduling commissioning reviews.

2.10. PRE-FUNCTIONAL AND FUNCTIONAL CHECK SHEETS

- 2.10.1. Record all data gathered on site on a PFT sheets (start-up report forms) and commissioning check sheets.
- 2.10.2. Make copies of all starting and testing data before equipment and system start-up personnel leave site. Maintain one copy of all data taken during starting on site.
- 2.10.3. Maintain one copy of all final starting, testing, adjusting and balancing reports on site up to Substantial Completion of the Work for reference purposes.
- 2.10.4. Make copies of all red-line record drawings available for Commissioning Agents to review.
- 2.10.5. Complete and Sign off all PFT and FPT sheets and make it ready for CxA review and approval.

2.11. COMMISSIONING SCHEDULE

- 2.11.1. The Commissioning Authority will prepare commissioning schedule milestones to be incorporated in the approved project construction schedule by the general contractor.
- 2.11.2. General contractor will ensure all commissioning related activities and milestones are inserted in the project schedule, including all critical path activities.
- 2.11.3. The Contractor shall provide schedule for equipment start-up in coordination with the general contractor.
- 2.11.4. During construction phase, commissioning meetings will be scheduled by the Commissioning Authority on site for coordination of commissioning activities and schedule.
- 2.11.5. Prior to commencement of each particular testing procedure, coordinate all sub-trades, manufacturers, suppliers and other specialties to ensure all phases of work are properly completed. Establish necessary manpower requirements.

2.12. START-UP

- 2.12.1. The installing contractor shall under their own direction, plan, execute and document the installation verification and perform start up and checkout (Major systems /equipment start-up by OEM personnel). The contractor needs to verify that other building systems being installed will not compromise the operation and functional performance of the commissioned systems. Notify the Cx A minimum of 5 days in advance of equipment and system start up and/or installation verification testing. The CxA verifies the completed checklists and the startup checks.
- 2.12.2. Complete and sign off all start up test sheets and make it ready for Cx A review and approval.

2.13. PERFORMANCE VERIFICATION

- 2.13.1. The contractor(s) and vendor(s) shall be fully responsible for 100% actual system(s) functional performance tests and documentation of this testing. Changes to approved test procedures must be approved by the Cx A. The Cx A will conduct sample verification on tested systems after the Contractor and Controls Vendor have completed their complete Functional Performance Test (FPT).
- 2.13.2. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests.
- 2.13.3. Contractor's testing shall include all system and equipment.
- 2.13.4. Contractor's testing shall include 100% BAS point to point verification, programming, sequence of operation, calibration, scheduling, trending, graphics, commands and any other required test deemed necessary to complete the FPT process.
- 2.13.5. Contractor(s) and BAS vendor(s) to provide completed and signed off FPT sheets and make it ready for CxA review and approval.

2.14. RE TEST

- 2.14.1. Deficiency Resolution & Warranty Review: Items of non-compliance in material, installation or setup are corrected at the contractor's expense and the system retested. Failed tests will be repeated as required. Deficiencies, once identified are to be corrected expeditiously. Warranty issues will be identified and resolved by the contractor with the Owner.
- 2.14.2. Contractor (s) and vendor (s) shall bear all required costs for deficiency correction and retesting.

2.15. TRAINING OF OWNER STAFF

- 2.15.1. Training is to be led by an OEM factory trained technician directly involved and familiar with the site. Training materials, agenda and O+M manuals are to be provided at least 5 business days prior to training. Training sessions are to occur prior to substantial. Time to be used at owner's discretion.

- 2.15.2. Provide on-site training sessions including classroom and terminal hands on, half day each, for personnel designated by the owner/owner's service provider prior to and at substantial completion or when system starts affecting conditions in tenant spaces that owner/owners service provider must respond to.
- 2.15.3. Train the designated staff of owner's representative and owner to enable them to do the following:
 - a. Day-to-day Operators
 - b. Proficiently operate the system
 - c. Understand control system architecture and configuration
 - d. Operate the BAS workstation, peripherals and other interface terminals
 - e. System troubleshooting
 - f. Conduct routine maintenance
 - g. Understand system drawings and Operation and Maintenance manual
 - h. Now start-up, normal operation, shut down, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting and alarms

2.16. **TESTING, ADJUSTING AND BALANCING**

- 2.16.1. Comply with the TAB Specification and related sections in the contract document.
- 2.16.2. Contractor will submit a TAB process schedule.
- 2.16.3. Contractor will submit a preliminary TAB report and correct all deficiencies prior to start the balancing process.
- 2.16.4. Contractor to submit a final balancing report for all water and air systems.

2.17. **COMPLETION OF COMMISSIONING REQUIREMENTS**

- 2.17.1. Upon completion of commissioning, the Independent Commissioning Authority shall ensure the contractor leaves all systems in normal operating mode.
- 2.17.2. Except for identified seasonal commissioning activities to be conducted during the first year of operation, all commissioning shall be complete prior to Substantial performance of the work.
- 2.17.3. Commissioning shall be considered complete only when the final Commissioning Report has been received and approved by the client.

2.18. SYSTEMS TO BE COMMISSIONINED

2.18.1. Mechanical

- Rooftop Units
- VVT Terminal Units
- Heat Pump
- Exhaust Fans
- Unit Ventilators

2.18.2. Testing, Adjusting & Balancing work

- Air and Water Balancing

2.18.3. Building Automation System (BAS)

- Controllers
- Field devices
- Networking
- Sequence of operation
- System Graphics
- Hardware systems
- Operator Interface

2.18.4. Electrical

- Lighting Control

END OF SECTION

02 41 13-Selective Site Demolition

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 Selective Site Demolition shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and as follows:
 - .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
 - .2 Removal of existing trees, stumps, root systems complete within the new building foot print, asphalt paving areas, sidewalk areas, etc.
 - .3 Remove existing trees, plants, stumps and other landscaping elements at all new landscape areas indicated on the drawings.
 - .4 Removal of all existing concrete curbs, asphalt paving, concrete walks, pavers and associated granular base material from the site.
 - .5 Removal of concrete drop curbs that are no longer required. Refer to site plan.
 - .6 Stripping, loading and disposal of granular materials, asphalt, concrete, etc. from the site.
 - .7 Removal of all existing obstructions within the Place of the Work not indicated to be required on the final project site.
 - .8 Excavating, loading and disposal of all materials as required by the work.
 - .9 All demolition and removals as required for water connections, storm/sanitary sewer connections and all other services requiring demolition to access the said service.
 - .10 Refer to all other discipline drawings and specifications for the entire scope of work.

1.1 RELATED WORK

- .1 Refer to Section 31 23 15: Site Grading and Topsoil.
- .2 Refer to Section 31 23 10: Excavating, Trenching and Backfilling.
- .3 Refer to Section 01 51 00: Protecting the Place of the Work.

1.2 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to “Instructions to Bidders”, “Examination of Site”.

1.3 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.4 SOIL INVESTIGATION

- .1 A soil report of the site was conducted. Refer to Section 01 22 00.
- .2 This information is made available solely as a guide and no responsibility is accepted by the Consultant or Owner for its contents. The accuracy or otherwise of the report shall not affect the provisions of the contract.

1.5 EXCESS SOIL MANAGEMENT

- .1 Refer to Civil drawings for information on excess soil.

1.6 CO-OPERATION

- .1 This Contractor shall make himself familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.7 LINES

- .1 All lines and levels for excavation will be furnished by the General Contractor.

END OF SECTION

02 41 19-Selective Building Demolition

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 Selective Building Demolition shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and as follows:
 - .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
 - .2 Protect all interior fixtures and equipment adjacent to work.
 - .3 Do all necessary cutting and removal of concrete floor slabs, walls or portions thereof required to execute the work. Cut all roof and wall openings to install new components into existing structure.
 - .4 Do all necessary removal of masonry, windows, removal of flooring and base materials, ceiling, suspension systems, bulkheads etc. noted and required for the complete and proper execution of the work.
 - .5 Remove existing roof systems, (as required) and associated flashings etc. to allow for completion of the work as required.
 - .6 Saw-cutting of existing floors on grade and/or suspended as required for all work.
 - .7 Coordinate with mechanical and electrical divisions to have all required services properly and adequately cut, capped, removed or otherwise terminated in the work area.
 - .8 All waste materials and debris resulting from the work shall be disposed of from the premises in accordance with authority jurisdiction.
 - .9 Refer to Demolition Plan Drawings and Floor Plans Drawings and all related drawing details for full scope of work for this section.

1.2 RELATED WORK

- .1 Refer to Section 02 41 23: Selective Site Demolition

1.3 GENERAL CONTRACTOR'S RESPONSIBILITY

- .1 It shall be the General Contractor's responsibility to assign all Alterations and Patching Work to the various sub-trades concerned with such work and the tender

price shall include a sum sufficient to perform all work contemplated by the drawings and specifications.

- .2 Where alteration work occurs and where new work joins old work, it shall match existing surrounding work, texture and finish unless otherwise noted or specified.
- .3 Hidden pipes and conduit not indicated on drawings shall be relocated as required.
- .4 At conclusion of job, all renovated areas shall be left spotlessly clean.

1.4 EXAMINATION OF PREMISES

- .1 This Contractor shall be deemed to have examined the premises and to have satisfied himself/herself as to the condition and suitability of the work and the means of access to perform the work and to have carefully examined all the drawings and specifications pertaining to his and other trades involving the reuse of certain dismantled materials. No allowance shall subsequently be made by reason of any error or misjudgment on his/her part in this connection.

1.5 PROTECTION, DAMAGES AND WATCHMEN

- .1 The Contractor shall provide adequate interior dust barriers and exterior barricades or fences with danger signals as required around work.
- .2 The Contractor shall provide red lights at night as required or directed.
- .3 The Contractor shall protect any paving and sidewalks also adjoining properties, and shall make good all damage caused without cost to the Owner.
- .4 The Contractor shall provide adequate protection for workmen, residents and the public at all times as directed and as required by Municipal, Provincial or Federal regulations or laws.
- .5 The Contractor, at own expense, shall maintain watchmen as required to keep the public out at all times and shall see that no fires occur at any time.

2.0 PRODUCTS

2.1 GENERAL:

- .1 Provide all necessary equipment and resources to competently perform the work. During the whole time of construction work, the Contractor shall employ a competent foreman for the execution of all work.

3.0 EXECUTION

3.1 GENERAL DEMOLITION

- .1 The sequence of demolition or removal work shall be such that at no time will a wall or portion of a wall be left standing unsupported in an unstable condition or in danger of accidental collapse.

- .2 Where the need for shoring, is established provided, adequately designed and constructed system and place in position at the appropriate time. Periodic checks shall be made for effectiveness as demolition proceeds.
- .3 During systematic demolition or removal work, strength and stability of individual structural members may be dependent on the support of other members.
- .4 During the removal of any element of the existing building, caution shall be exercised to prevent damage to the remainder due to impact. Provide plywood or other material as protection to other elements.
- .5 All combustible debris shall be removed from the site as promptly as possible.
- .6 All work shall be in accordance with CSA Standard S350-M1980, latest edition.
- .7 The selective demolition work shall be conducted in such a way as to ensure that so far as is reasonably practicable, worker and other persons are not exposed to risks to their safety or health in connection with selective demolition work.

3.2 CUTTING AND PATCHING OF EXISTING FLOORS, WALLS AND CEILINGS

- .1 The General Contractor shall do all necessary cutting of slab floors which may be required for the installation of mechanical and electrical work. General Contractor to provide scanning and other similar procedures of all floor and/or wall systems where services are unknown to ensure the location of hidden or underground services/systems or reinforcing or other element are not cut or damaged.
- .2 On other than the ground floor, the Mechanical Contractor shall cut all holes not exceeding 6" in diameter. Beyond 6" in diameter, the General Contractor shall do all necessary cutting.
 - .1 All holes through walls not exceeding 8" in square shall be cut by the Mechanical Contractor. Beyond 8", the General Contractor shall do all necessary cutting. All chases required in walls shall be cut out by the Mechanical or Electrical Contractor after consultation and under the supervision of the General Contractor.
 - .2 All holes through ceilings not exceeding 8" in diameter shall be cut out by the Mechanical Contractor - beyond 8" the General Contractor shall do all necessary cutting.
 - .3 All holes through the roof shall be cut out by the General Contractor.
 - .4 All patching of floors, walls, ceilings and roofs left by removed, existing or new mechanical and electrical work shall be done by the General Contractor to the satisfaction of the Architect.
 - .5 All new services to existing finished areas shall be run concealed. Do any necessary chasing of plaster walls or ceilings as required to conceal work and patch to match adjoining surface finish and texture. Fish walls where existing construction allows.

- .6 Do all patching of existing masonry, concrete and gypsum board finishes damaged in the execution of the work.

3.3 EXISTING DISMANTLED MATERIALS

- .1 All dismantled materials including mechanical and electrical items not re-used shall remain the property of the Owner unless he decides otherwise. Materials retained by the Owner will be placed in an area of the existing building as designated by the Owner.
- .2 All other dismantled materials not required by Owner (including mechanical and electrical items) shall be deemed debris and promptly removed from site by the General Contractor.
- .3 Items to be removed and relocated shall be protected and stored on site by the General Contractor until such time as they are placed in their new locations.

END OF SECTION

03 10 00-Concrete Forming Accessories

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 All formwork for cast-in-place concrete including false work.
- .2 Re-shoring of concrete slabs and beams.
- .3 Shoring existing construction to support construction loads.
- .4 Pull-out Testing.
- .5 All embedments, water stops, anchor accessories etc.
- .6 Refer to General Notes on the Structural drawings.

1.2 RELATED SECTIONS:

- .1 Section 03 20 00: Concrete Reinforcing
- .2 Section 03 30 00: Cast-in-Place Concrete

1.3 FORMWORK DESIGN AND CODE REQUIREMENTS

- .1 Design all formwork including shores, bracing, false work, etc. for all loads and lateral pressures as recommended in the Ontario Building Code and the National Building Code of Canada, latest edition, CAN/CSA A23.1-94 and CAN/CSA-S269.2-M92, ACI Standard 347. False work to CSA Standard S269.1-1975 for supported work. The design and erection of formwork and related supporting works shall comply with the Construction Safety legislation and regulations. This Contractor must assume full responsibility for the design and adequacy of all formwork and false work.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittals.
- .2 Submit shop drawings for formwork, falsework and reshoring. Illustrate method, materials, cambers etc. Illustrate sequence of erection and removal of falsework, formwork and reshoring.
- .3 Provide shop drawing for all forming accessories, forms, liners, ties, tie plugs, etc.

- .4 Provide shop drawings sealed and signed by a Professional engineer in the Province of Ontario.

1.5 TOLERANCES

- .1 Conform to CSA A23.1, Clause 6.

1.6 FORMING FOR ARCHITECTURAL CONCRETE

- .1 Architectural concrete is exposed to view concrete. The concrete can be exposed on the exterior and/or interior of the building. Refer to architectural drawings for locations of walls, columns, ceilings (underside of floor slab) and other formed surfaces.
- .2 The quality of the forming materials and accessories will contribute to the final finish of the concrete. The consultant has the right to reject forming materials that are not applicable to the intended finish concrete expectations.
- .3 The final appearance of the concrete will determine acceptance or rejection.

1.7 SAMPLES AND MOCK-UPS

- .1 Submit sample of formwork, circular forms, form liner, form tie, tie hole plug, etc.
- .2 Construct a mock-up field sample of wall and column for review of the finish architectural concrete surface. The accepted sample will be the minimum standard of quality of work. Repeat the sample until the consultants have accepted the samples.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Falsework materials to meet CSA S269.1.
- .2 Formwork materials to meet CAN/CSA S269.3 as follows:
 - .1 For concrete not exposed to view, plywood and wood formwork materials to CSA O121 and CAN/CSA O141.
 - .2 For Architectural concrete (exposed to view) high density overlay plywood to CSA O121.
 - .3 Circular forms for architectural concrete (exposed to view) having no spiral pattern, Redline Poli-Permaform with poli-liner by Perma Tubes Ltd. or approved equal.
- .3 Form ties as follows:

- .1 For concrete not exposed to view, removable or snap ties, fixed or adjustable length, free of devices leaving a hole larger than 25mm (1") in concrete surface.
- .2 For Architectural concrete (exposed to view) galvanized ties complete with temporary plastic cones and permanent grey concrete plugs recessed 6mm (0.25").
- .3 Form ties to be metal designed as ties and spreaders having a minimum strength of 13 kN (3,000 pounds).
- .4 Snap ties to snap at minimum of 25mm (1") from the concrete surface.
- .5 Cone ties to internal disconnecting snapping 38mm (1 ½") from concrete surface without damage to the concrete.
- .4 Form liner to be high density plywood to CSA O121 or equal to maintain exposed concrete finish.
- .5 Form releasing agents designed for application and resist staining of concrete.
- .6 Grooves, reglets and chamfers using select pine shall be straight and accurately dressed to the sizes indicated on the drawings.

2.2 ACCESSORIES

- .1 PVC Waterstops:
 - .1 CDP PVC Waterstop
 - .2 W.R. Meadows of Canada Sealtight PVC Waterstop.
- .2 Bentonite Waterstops:
 - .1 Waterstop RX 101 by CETCO
 - .2 Waterstop EC by W.R. Meadows

3.0 EXECUTION

3.1 FABRICATION AND ERECTION

- .1 All work to conform to CSA A23.1.
- .2 Fabricate and erect falsework in accordance with CSA-S269.1.
- .3 Fabricate and erect falsework in accordance with CAN/CSA-S269.3 to provide finished concrete to shapes, dimensions etc. as per the drawings.
- .4 Fabricate formwork tight and flush to prevent leakage and panel outlines.

- .5 Form sides of footings unless noted otherwise on structural drawings.
- .6 Refer to drawings and schedules for required cambers in set concrete members.
- .7 Obtain Consultant's review of required form openings not indicated on the structural drawings.
- .8 Build in sleeves, anchors etc. required to accommodate the Work of other trades.
- .9 Use internal form ties:
 - .1 Do not permit loads from forms to be transmitted to existing structural elements.
 - .2 Apply a form coating and releasing agent to contact surfaces.
- .10 Construction joints:
 - .1 Provide construction joints where shown on drawings or as indicated in the general notes. Locate all other joints in consultation with the Consultant.
- .11 PVC Waterstops:
 - .1 Install waterstops in expansion joints, construction joints, control joints etc. of exterior walls, basement walls, retaining walls and other locations as indicated on the drawings.
 - .2 Heat splice all sections of waterstops for continuity over the length of the run. Use prefabricated splice sections at intersecting runs.
- .12 Bentonite Waterstops:
 - .1 Install bentonite waterstops in all construction joints of exterior walls, pit walls, basement walls etc.
 - .2 Install bentonite waterstops 75 mm (3") from outside face of concrete.
 - .3 Butt strips together and fasten at 600 mm (24") maximum.
- .13 Architectural Concrete:
 - .1 Conform to CSA-A23.1. Minimize formwork joints. Locate joints and ties in a repetitive symmetrical grid commencing at the center point of the wall or element.
 - .2 No ties to be located within 300 mm (12") of an edge or joint.
 - .3 Locate the lowest horizontal joint for exposed columns 2400 mm (8'-0") above finish floor.
 - .4 Refer to drawings for all corner bevels, reglets, grooves, etc.

- .5 Do not reuse forms that have surface damage, holes, etc that will compromise the quality of the concrete finish. Clean forms and fill holes and insure the tie pattern is correct.

3.2 FORM STRIPPING AND RESHORING

- .1 Conform to CSA A23.1.
- .2 Refer to the structural general notes for all stripping and reshoring requirements.
- .3 Obtain a field review and issue a report of all falsework and reshoring by a professional engineer registered in the province of Ontario prior to each pour.

3.3 MISCELLANEOUS FORMWORK

- .1 Construct all concrete sumps, pits, trenches, housekeeping pads, curbs, etc.
- .2 Co-ordinate the work with all trades so as to accommodate the requirements of other sections of the specifications and drawings.

3.4 CLEANING

- .1 Upon completion of the work, remove all containers, surplus materials, and installation equipment, excess material, and debris. Project area must be left in a clean and orderly condition.

END OF SECTION

03 20 00-Concrete Reinforcing

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED:

- .1 All reinforcing for cast-in-place concrete.
- .2 Supply of reinforcing bars for masonry.

1.2 RELATED SECTIONS:

- .1 Section 03 10 00: Concrete Forming and Accessories
- .2 Section 03 30 00: Cast-in-Place Concrete
- .3 Section 04 80 00: Masonry Assemblies

1.3 QUALITY CONTROL OF MATERIAL

- .1 Provide a certified copy of the material mill test report, source of supply, plant certification for epoxy coating and patching procedures for factory applied epoxy coating.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittals.
- .2 Submit shop drawings, plans, elevations, sections and bar lists to facilitate review and placing.
- .3 Indicate bar bending details, lists, quantities, sizes, spacing, location and splices with identifying code marks to permit placement and inspection without referencing the structural drawings.
- .4 Provide all accessories as required by the standard.
- .5 Design and detail lap lengths and bar development lengths to CSA-A23.3.
- .6 A copy of the reviewed shop drawings shall be on the construction site and made available to consultants, inspectors, installers, etc.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Reinforcing steel: billet steel, grade 400R, deformed bars to CSA-G30.18 unless otherwise indicated.
- .2 Cold-drawn annealed steel wire ties to meet ASTM A82.
- .3 Epoxy coated reinforcement to be fusion bonded epoxy coating conforming to ASTM D3963/D3963M. All bars to be supplied by plants certified by the Concrete Reinforcing Steel Institute for epoxy-coated steel.
- .4 All Bar supports to be Class B – pre-galvanized bar supports or Class C – plastic protected bar supports, solid plastic or precast concrete block bar supports.
- .5 Welded Wire Mesh (WWM) (Fabric) to meet ASTM A185, flat sheets only.
 - .1 Welded Wire Mesh Supports: Lotel “Mesh-Ups” plastic chairs in sizes appropriate for slab except all 125mm (5”) slabs to use 3 inch Mesh-Ups. Install to manufacturer’s recommended layout and as need to support WWM. www.meshup.com or www.lotel.com.
 - .2 No Alternates.

3.0 EXECUTION

3.1 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Ship bundles of bar reinforcing clearly identified in accordance with the shop drawing bar list.

3.2 INSTALLING REINFORCING

- .1 Install reinforcing to CSA A23.1.
- .2 Handle epoxy coated bars in accordance with CSA S413.
- .3 Place reinforcing to maintain the concrete coverage as indicated on the structural drawings and/or as required by the fire rating.
- .4 Before placing reinforcing remove all scale, dirt, oil or other contaminate that would reduce bond.
- .5 Install and space chairs, bolsters and other bar supports in accordance with the C.R.S.I. Manual of Standard Practice as a minimum, with additional supports as required to maintain reinforcing in its proper position during the pour. Maximum spacing is 1200mm (3’-11”). For slabs on grade, set wire mesh on 100 x 100 x 54mm (4”x4”x2”) concrete bricks spaced at 1200mm (3’-11”) o.c. each way.

3.3 PATCHING FACTORY APPLIED EPOXY COATING

- .1 At damaged epoxy coating locations patch in accordance with coating manufacturer written instructions and material.

3.4 INSPECTIONS

- .1 Provide the consultant and Independent Inspection and Testing Agency 24 hours notice of intent to pour concrete to permit review of installed reinforcing.
- .2 The cost of the inspection will be paid from the Cash Allowance.

3.5 MASONRY REINFORCING

- .1 Supply all reinforcing required for the construction of masonry walls, lintels, beams, columns, etc. Refer to Architectural and Structural drawings for scope of Work.

3.6 MISCELLANEOUS REINFORCING

- .1 Supply and install reinforcing at all concrete sumps, pits, trenches, housekeeping pads, curbs, exterior light standards, etc.
- .2 Co-ordinate the work with all trades so as to accommodate the requirements of other sections of the specifications and drawings.

3.7 CLEANING

- .1 Upon completion of the work, remove all containers, surplus materials, and installation equipment, excess material, and debris. Project area must be left in a clean and orderly condition.

END OF SECTION

03 30 00-Cast-In-Place Concrete

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 All plain and reinforced concrete footings, walls, column footings, piers, columns, floor slabs, thickened floor slabs, roof toppings, housekeeping pads.
- .2 Patch of existing floors to receive new terrazzo. Self Consolidating Concrete at locations indicated on the drawings and specified herein.
- .3 Installation of anchor bolts and steel bearing plates complete with grout.
- .4 Expansion strips, pre-molded expansion joints, saw cut control joints, slotted inserts, cast-in-place plates, sleeves, bonding agents, non-shrink grout, etc.
- .5 Below slab, on grade Vapour Barrier.
- .6 All thickened and depressed floor slabs, concrete formed platforms.
- .7 All concrete work called for on architectural, landscape, structural, mechanical and electrical drawings unless noted by others.
- .8 Filling of all boreholes with 10MPa lean concrete to meet final grades.
- .9 Finishing of all concrete surfaces.
- .10 All concrete sidewalks, pads and platforms, collars, bases, etc. shown on Site Plan.
- .11 Concrete testing.
- .12 For all sawcuts and joints, sealants and fillers for exterior and interior slabs.

1.2 RELATED SECTIONS:

- .1 Section 03 10 00: Concrete Forming and Accessories
- .2 Section 03 20 00: Concrete Reinforcing
- .3 Section 04 80 00: Masonry Assemblies - Grout fill in masonry walls
- .4 Section 07 26 16: Underslab Vapour Retarder

1.3 SUBMITTALS

- .1 The concrete supplier to provide a copy of Certificate of Ready Mixed Concrete Production Facilities as issued by the Ready Mixed Concrete Association of Ontario.
- .2 Submit all concrete mix designs, including pump mixes and indicate where the concrete mix is to be used.
- .3 Submit all admixtures intended to be used in the concrete mix design.
- .4 Each concrete mix design shall include the following:
 - .1 Aggregate type and size
 - .2 Concrete density range, wet and dry
 - .3 CSA exposure class
 - .4 Cement type
 - .5 Maximum water/cement ratio
 - .6 plastic air content range
 - .7 air-void system test data
 - .8 slump range
 - .9 percentage and type of supplemental cementing materials
 - .10 admixtures (all admixtures must be from the same supplier)
 - .11 assumed method of placement of the concrete.
- .5 Submit a drawing, indicating all slab on grade intended saw cut control joints and construction joints for review.

1.4 COLD WEATHER REQUIREMENTS

- .1 When air temperature is at or below 5 degrees Celsius or there is a probability of it falling to that limit during the placing or curing period, cold weather requirements shall be applicable and shall be governed by CAN/CSA A23.1-19 and ACI Standard 306, Recommended Practice for Cold Weather Concreting.
- .2 Provide heating equipment and enclosures to maintain humidified air within the enclosures to keep the concrete above freezing temperature for seven days. Heating equipment inducing carbon monoxide gas in the building is not acceptable. Also concrete shall be protected from alternately freezing and thawing for a period of 14 days after placement.
- .3 When placed, concrete shall have a temperature of not less than 5 degrees C. and not more than 27 degrees C. Accelerators or so called anti-freeze compounds shall not be permitted unless approved in writing by the Architect. All protective coverings shall be kept clear of the concrete and form surfaces to permit free circulation of air and shall be maintained intact for at least 24 hours after artificial heat is discontinued.
- .4 Forms must be clean of ice and snow. Use compressed air or other means to remove foreign matter.

1.5 HOT WEATHER REQUIREMENTS

- .1 Hot weather protection shall meet the requirements of CAN/CSA A23.1-19.
- .2 When the air temperature exceeds 27 degrees C. hot weather requirements shall be applicable. The time of initial mixing to complete discharge shall not exceed one hour and fifteen minutes. Temperature of concrete as placed shall not exceed 27 degrees C.
- .3 Concrete forming surfaces and reinforcing steel shall be sprinkled with cool water just prior to placing concrete but no standing water or puddles will be allowed.
- .4 Slabs shall be kept damp continuously for 24 hours followed by normal curing procedures.
- .5 Slabs may be cured by the application of a clear pigmented curing compound applied immediately after finishing of slab but before evaporation of surface moisture. The use of water reducing agents must be approved by the Architect when hot weather conditions prevail.

1.6 MIXING AND DELIVERY

- .1 Concrete shall be mixed in a mechanical batch mixer or a type approved by the Architect and meeting the requirements of CAN/CSA A23.1-19.
- .2 Mixing time shall conform to CAN/CSA A23.1-19. Mixers shall be rotated at the rate recommended by the manufacturer of the equipment.
- .3 Concrete from the mechanical batch mixer shall be transported to the project site in agitating or non-agitating equipment conforming to CAN/CSA A23.1-19.
- .4 Ready mixed or transit mixed concrete shall be batched, mixed and transported in accordance with CAN/CSA A23.1-19.
- .5 Each load of ready mixed or transit mixed concrete delivered to the project site shall be accompanied by duplicate delivery slips providing all information pertaining to each batch of concrete and/or as the Owner's Representative may require.

1.7 STRENGTH AND CONSISTENCY

- .1 Concrete materials shall be proportioned to provide a workable mix that can be handled, placed and worked into angles and corners of forms and around reinforcing steel and inserts. The mix proportion shall not be such that the concrete will easily segregate or cause excessive water to collect on the surface.
- .2 The strength of concrete shall be considered to be its strength at 28 days.

1.8 INSERTS FOR OTHER WORK

- .1 Install inserts, hangers, metal ties, plates, anchors, bolts, dowels, slots, nailing strips, dove tail anchors, blocking or other fastening devices required for the attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is poured.

1.9 INSPECTION AND TESTING

- .1 The Consultant will appoint and costs will be paid from cash allowance in contract for an independent testing agency to test average concrete of each days pouring. The independent testing agency shall perform the following:
 - .1 Supply cylinder moulds sample the concrete, make and cure test cylinders and perform compressive strength tests in accordance with current CSA-A23.2-19 Standards.
 - .2 Make slump tests and air content tests as required in accordance with current CSA-A23.2-19.
 - .3 A concrete test shall consist of four (4) cylinders properly labeled showing mix, location and date of pouring. Cylinders shall be cured under laboratory conditions. Contractor shall make provisions for initial curing of all cylinders a minimum of 24 hours.
 - .1 Provide facilities for storing specimens at the required temperature and in a location free from vibration or injury.
 - .2 Test one (1) cylinder at seven (7) days and two (2) cylinders at 28 days. Should the 7 or 28 day test fail to meet the design strength, test the fourth (4th) cylinder at 90 days to verify results.
- .2 Send two (2) certified copies of all test results direct to the Consultants with additional copies to the Contractor as directed.

2.0 PRODUCTS

2.1 EXPANSION JOINT STRIPS

- .1 Expansion joint strips shall be ½" (12.7mm) thick fiber expansion joint filler to ASTM D994.

2.2 NON-SHRINK GROUT

- .1 Non-shrink grout to be premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents of pouring consistency having a compressive strength of 40Mpa at 28 days.
- .2 Acceptable suppliers:
 - .1 Masterflow 713, BASF
 - .2 V-3 Grout, W.R. Meadows of Canada
 - .3 Sikagrout 212 by Sika Canada

2.3 BONDING AGENT

- .1 Concrete bonding agent shall be a high solids, acrylic polymer latex bonding agent and admixture that conforms to the ASTM C1059 Type I standard.

- .2 Approved product: Intralok Bonding agent by W.R. Meadows of Canada.

2.4 ADMIXTURES

- .1 Admixtures shall not be used unless prior written approval is obtained from the Consultant. All admixtures shall conform to the appropriate A.S.T.M. and CSA Standards. Air entraining admixtures and chemical admixtures shall conform to the requirements of the latest issue of CAN3-A266.1-M78.
- .2 For slabs on grade, mid-range water-reducing admixture, conforming to the requirements of the latest issue of CAN/266.6-M85 and ASTM-C494, Type A. Acceptable Product: Master Builders Technologies Limited, Polyheed at a mixing rate of 10 fl. oz. /cwt. cement.
- .3 No other admixture shall be used, without the permission of the consultant.

2.5 CURING COMPOUNDS

- .1 Curing compounds shall conform to the requirements of the latest issue of A.S.T.M. Standard C-309, Type 1, Class B, Vocomp - 20 by W.R. Meadows of Canada Ltd. or approved equal.
- .2 For exterior concrete slab work curing compound shall be W.R. Meadows Sealite white pigmented curing compound Conchem Promulsion 200, CPD White Cure (Water Emulsion) or Architect's approved equal. Concrete curing treatment must be applied in strict accordance to manufacturer's labeled instructions.

2.6 CURING AND SEALING FOR CONCRETE FLOORS

- .1 Curing and sealing for all interior concrete floors shall conform to A.S.T.M. C309, Type 1, Class B, Vocomp-20 by W. R. Meadows of Canada Ltd., Conchem Promulsion 100, or CPD Acrylic Floor Sealer (Water Emulsion). Apply in strict accordance with manufacturer's labeled instructions.

2.7 CONCRETE MIX DESIGNS

- .1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, for exposures specified. Use a water-reducing agent in all concrete. Obtain approval of the Consultant for the use of admixtures other than water-reducing and air entraining agents.

Supplementary cementing materials: Conform to the directions of the slag and fly ash manufacturers for the proportioning and mixing concrete. Except as otherwise required, limit supplementary cementing materials to no more than 25% of total cementitious content and limit the fly ash component to no more than 10% of total cementitious content. The limit on supplementary cementing materials may be increased for Class N exposure concrete provided that the effects of the resulting concrete properties, including finishing, rate of early age strength gain, curing and protection, are considered by the Contractor and a letter describing these effects

and any special construction procedures is submitted for the review with the mix design. Do not use supplementary cementing materials in architectural concrete.

Supplementary cementing materials for Class N exposure concrete: Conform to the directions of the slag and fly ash manufacturers for the proportioning and mixing concrete. Provide supplementary cementing materials equal to 50% of total cementitious content and limit water-to-cementing materials ratio to 0.45 maximum. Use no more than 15% fly ash of total cementitious material. Do not use supplementary cementing materials in architectural concrete. For columns less than 300mm in least dimension and for walls less than 200mm thick, reduce nominal size of coarse aggregate to 10mm.

- .2 Interior slabs (including slabs on steel deck), beams, walls and columns: Provide normal density concrete to give following properties unless otherwise noted:

- .1 Class of exposure: N
- .2 Cement: Type GU
- .3 Minimum compressive strength at 28 days: see Structural Drawings
- .4 Nominal size of coarse aggregate: 20mm
- .5 Slump at time and point of discharge: 50mm to 110mm

For interior slabs on steel deck with resilient floor finishes, reduce water/cement material ratio to 0.45 and provide minimum 25 MPa concrete. Protect finished and cured slabs from water.

- .3 Footings, piers, grade beams and foundation walls: Provide normal density, frost resistant concrete to give following properties:

- .1 Class of exposure: F-1
- .2 Cement: Type GU
- .3 Minimum compressive strength at 28 days: see Structural Drawings
- .4 Maximum water/cementing material ratio: 0.50
- .5 Nominal maximum size of coarse aggregate: 20mm.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 4 to 7%

- .4 Lean concrete and mud slabs: Provide normal density concrete to give following properties:

- .1 Class of exposure: N
- .2 Cement: Type GU
- .3 Minimum compressive strength at 28 days: 10 MPa
- .4 Nominal maximum size of coarse aggregate: 20mm
- .5 Slump at time and point of discharge: 50mm to 110mm

- .5 Exterior, exposed walls and columns exposed to freezing and thawing, but not exposed to chlorides: Provide normal density, frost resistant concrete to give following properties:

- .1 Class of exposure: F-2
- .2 Cement: Type GU
- .3 Minimum compressive strength at 28 days: see Structural Drawings

- .4 Maximum water/cementing material ratio: 0.55
 - .5 Nominal maximum size of coarse aggregate: 20mm
 - .6 Slump at time and point of discharge: 50mm to 110mm
 - .7 Air content: 4 to 7%
- .6 Structurally reinforced concrete exposed to chlorides, including grade beams and exterior reinforced slabs: Provide normal density concrete to give following properties:
- .1 Class of exposure: C-1
 - .2 Cement: Type GU
 - .3 Minimum compressive strength at 28 days: 35 MPa
 - .4 Maximum water/cementing material ratio: 0.40
 - .5 Nominal maximum size of coarse aggregate: 20mm
 - .6 Slump at time and point of discharge: 50mm to 110mm
 - .7 Air content: 5 to 8%
- .7 Interior slabs-on-grade: Provide normal density concrete to give following properties:
- .1 Class of exposure: N
 - .2 Cement: Type GU
 - .3 Minimum compressive strength at 28 days: see Structural Drawings
 - .4 Maximum water/cementing material ratio: 0.55
 - .5 Normal maximum size of coarse aggregate: 20mm. Increase to 40mm where slab-on-grade thickness exceeds 130mm
 - .6 Slump prior to addition of fibres: 50mm to 110mm
 - .7 Plastic fibre additive: apply at rate of 0.9 kg/m³. Add sufficient water reducing agent to restore slump loss.
 - .8 Slump at time and point of discharge, after addition of fibres and plasticizer: 50mm to 110mm
- .8 Interior and roof concrete toppings, curbs and bases: Provide normal density concrete to give following properties:
- .1 Class of exposure: N
 - .2 Cement: Type GU
 - .3 Minimum compressive strength at 28 days: 25 MPa
 - .4 Nominal size of coarse aggregate for:
 - Toppings between 25 and 35 mm thick: 10mm
 - Toppings between 35 and 50 mm thick: 14mm
 - Thicker toppings: 20mm
 - .5 Slump at time and point of discharge: 20mm to 60mm
- Where topping is less than 25mm thick, no coarse aggregate is allowed and a bonding agent shall be provided within the mix and to bond the topping to the substrate.
- .9 Exterior unreinforced slabs, driveways, sidewalks, curbs and gutters, parking slabs on grade: Provide normal density, chloride resistant concrete to give following properties:

- .1 Class of exposure: C-2
- .2 Cement: Type GU
- .3 Minimum compressive strength at 28 days: 32 MPa
- .4 Maximum water/cementing material ratio: 0.45
- .5 Nominal maximum size of coarse aggregate: 20mm
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

2.8 GROUT

- .1 Grout for base plates, bearing plates and other structural members requiring grouting shall be a non-shrink Meadows V-3 Construction Grout, Sika Grout 212, Embico Expansion Grout, Master Builders "Construction Grout" and shall be used in all cases where grouting is shown on drawings or otherwise scheduled. The material shall be used in the amounts specified by the manufacturer and explicitly in compliance with all directions for surface preparation, batching, mixing, placing and curing.

2.9 SAW CUT FILLER

- .1 Saw cut filler for all interior saw cut control joints shall be Sealtight Rezi-Weld Flex, Saw cut Filler or Consultant's approved equal applied in strict accordance with manufacturer's labeled instructions. Colour to be determined by architect.

2.10 SELF CONSOLIDATING CONCRETE

- .1 Self Consolidating Concrete shall be used at all exposed to view vertical elements of all stairs, exterior retaining walls, vertical elements of water feature, bench support concrete walls, etc.

2.11 ACCESSORIES

- .1 Waterstops and other accessories - refer to Concrete Forming and Accessories section.
- .2 Welded Wire Mesh Support: For concrete slabs on grade use Mesh-Ups by Lotel (www.meshup.com). Meshup height based on slab thickness. Use in accordance with manufacturer's written instructions.

3.0 EXECUTION

3.1 ERECTION OF FORMS

- .1 Construction formwork, shoring and bracing to produce finished concrete conforming to the shape, dimensions, locations and levels shown on the drawings and within the tolerances required by CAN/CSA A23.1-19.
- .2 Form chases, slots, openings, drips, recesses and control joints as detailed.
- .3 Formwork shall be so arranged and assembled as to permit easy dismantling and stripping so that the concrete will not be damaged during its removal. Make form

joints tight in order to prevent leakage of mortar. Clean all edges and contact surfaces before erection.

- .4 Verify lines, levels and column centre's before proceeding with formwork and ensure dimensions agree with drawings.
- .5 Formed chamfers and reglets at exterior retaining walls, benches and water feature shall be straight, level and precise. Waving and deviations in the finish product of these details will constitute a rejection of the work. Removal and reconstruction of the wall (walls) in its entirety will be at the expense of the contractor.

3.2 STRIPPING OF FORMS

- .1 Remove forms only in accordance with requirements of CAN/CSA A23.1-19 the Ontario Building Code and the National Building Code and not sooner than concrete will safely bear its own and intended superimposed loads. Forms shall not be removed without notifying Engineer intent to remove forms. The Contractor shall be fully responsible for safe removal of the forms.
- .2 Re-use of formwork and false work subject to requirements of CAN/CSA A23.1-19 and CAN/CSA-S269.3-M92, latest edition.

3.3 EMBEDDED PARTS AND OPENINGS

- .1 Provide formed openings where required for pipes, conduit, sleeves and other work to be embedded in and passing through concrete members.
- .2 Accurately locate and set in place items which are to be cast directly into the concrete.
- .3 Coordinate the work of other sections and cooperate with the trade involved in the forming and setting of openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.

3.4 PLACEMENT OF REINFORCEMENT

- .1 Reinforcement of the size and shapes shown on the drawings shall be accurately placed in accordance with the approved placement drawings, the structural drawings and the requirements of CAN/CSA A23.1-19.
- .2 Reinforcement including wire mesh shall be adequately supported by slab bolsters, chairs and spacers and secured against displacement within the tolerances permitted and in accordance with the latest A.C.I. Standard.
- .3 Mechanical splices subject to the approval of the Consultant.
- .4 Obtain Consultant's approval of reinforcing steel and placing before pouring concrete.

3.5 INSERTS

- .1 Set sleeves, ties, anchor bolts, pipe hangers, plates and other inserts, openings and sleeves in concrete floors as required by other trades.
- .2 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from Consultant before placing of concrete.
- .3 Place anchor bolts to layout and under supervision of trade supplying anchors prior to placing concrete.

3.6 PLACEMENT OF CONCRETE

- .1 Place concrete in accordance with CAN/CSA A23.1-19. Ensure reinforcement and inserts are not disturbed during concrete placement.
- .2 Notify the Consultant and the independent testing agency at least 24 hours before any concreting operation is to proceed.
- .3 Before beginning a run of concrete, hardened concrete and foreign materials shall be removed from the inner surface of the conveying equipment.
- .4 Before depositing concrete, debris shall be removed from the space to be occupied by the concrete, reinforcing steel and forms accurately placed and secured in position. Clean reinforcing before placing concrete.
- .5 When pouring concrete against previously poured work, the surface shall be thoroughly cleaned and roughened removing all latency and scum and coated with a paste of neat cement and water not more than 15 minutes in advance of depositing the new concrete.
- .6 Concrete shall be conveyed to the place of final deposit by methods that will prevent segregation or loss of material keeping concrete sufficiently plastic to ensure proper bonding of successive layers or panels. Free fall of concrete shall not exceed 3'-0" (900 mm).
- .7 During placement, concrete shall be consolidated thoroughly and uniformly by means of tamping, hand tools, vibrators or finishing machines to secure dense, homogeneous structure, close bond with reinforcement and smooth formed surfaces. Extreme care shall be taken to ensure that internal type vibrators do not disturb the reinforcing steel or the forms.
- .8 Maintain accurate records of concrete pours to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 Footings to be poured within the same day as exposure or a 2" lean concrete mud mat shall be provided.

3.7 TROWELLING

- .1 Concrete floor slabs requiring a concrete finish shall be screeded to the proper shape and elevation, machine floated and finished by skilled mechanics to produce

a smooth, dense surface, free from ridges, voids, or machine marks. Floor flatness to FF=40. Floor Levelness to FL=30.

- .2 Pitch slabs as noted on drawings or to floor drains.
- .3 Sprinkling of dry cement or dry cement and sand mixture over concrete surfaces is not acceptable.
- .4 Float surface with wood or metal floats or with power finishing machine and bring surface to true grade.
- .5 Steel trowel to smooth and even surface concrete slabs to be left exposed or to receive resilient tile or sheet flooring.

3.8 CURING AND PROTECTION

- .1 Freshly placed concrete shall be protected from the effects of direct sunshine, drying winds, cold, excessive heat and running water by the use of clear resin based curing compound or adequate tarpaulins or other suitable material until the end of the curing period.
- .2 All exposed non-formed surfaces shall be kept continuously moist for a minimum of seven consecutive days after placement of the concrete. Water shall be clean and free of any material that will cause staining or discoloration.
- .3 Apply curing and sealing compound to all interior concrete floors in strict accordance with manufacturer's labeled instructions where it will not jeopardize the bonding of future floor finishes. Co-ordinate with flooring divisions for compatibility.

3.9 CONSTRUCTION JOINTS

- .1 The location and detail of all construction joints not detailed on drawings shall be approved by the Architect. Where fresh concrete is to be placed against concrete which has set or partially set concrete shall be roughened, cleaned of all latency and thoroughly soaked with water prior to the placement of fresh concrete.
- .2 In general, the construction joints in floor systems shall be located as indicated on drawings. Proper key and dowels or extensions of reinforcing shall be provided at all constructions joints.

Note: Saw cut crack-control joints to CAN/CSA A23.1-19 as indicated on drawings. Fill all saw-cut joints in exposed concrete floors (which do not receive flooring) with saw-cut filler.

- .3 Saw-cuts at areas of exposed polished concrete are to be masked each side of the joint prior to applying approved saw-cut filler

3.10 DEFECTIVE CONCRETE

- .1 Concrete not meeting the requirements of the specifications and the drawings will be considered defective concrete and shall be modified or replaced at the Contractor's expense and to the satisfaction of the Engineer.
- .2 Excessive honeycombing or other defects in critical areas of stress shall be repaired or replaced at the Contractor's expense to the satisfaction of the Architect.
- .3 Concrete of insufficient strength or improper consistency shall be as required by the Architect subject to one or more of the following, all at the Contractor's expense and at no extra cost to the Owner.
 - .1 Changes in mix proportion for the remainder of the work.
 - .2 Cores drilled and tested from the areas in question as directed by the Engineer and in accordance with C.S.A. Standard CAN/CSA A23.1-19 test method A23.2-14C. The test results shall be indicative of the strength of the in-place concrete.
 - .3 Load testing of the structural elements in accordance with CAN3A-123.3-M84.
- .4 Concrete failing to meet the strength requirements of this specification shall be strengthened or replaced at the Contractor's expense to the satisfaction of the Architect.

3.11 FOOTINGS, WALLS, COLUMN PADS AND PIERS

- .1 Install all concrete footings, pads, canopy columns, piers and foundations as indicated on drawings of all sizes, forms and thickness indicated and reinforced as noted on drawings and schedules. Finish tops of footings, walls, columns and piers true and level at heights indicated providing all necessary keyways.
 - .1 Where pipes or sleeves pass through or under footings, consult the Engineer for direction.
 - .2 The excavation for the footings shall be clean and free of water and kept so until the concrete has set.
 - .3 All footings shall be placed upon firm approved soil the same day as exposure or a previously poured 2" lean concrete mud mat or a combination of both.
 - .4 Step footings in accordance with Building Code requirements and required by construction.
 - .5 Plumbness of walls and columns shall be within 1:400 measured at any one surface but total variation shall not be more than ¾" (20 mm) for the total height of the structure.
 - .6 Thickness variations for cross section for walls, columns and slabs other than slabs on grade shall not exceed the following:

- .1 12" (300 mm) and less $\pm .31"$ (8 mm).
- .2 Greater than 12" (300 mm) but less than 3'-3" (1 m) $\pm \frac{3}{8}"$ (12 mm).
- .3 3'-3" (1 m) and greater $\pm \frac{3}{4}"$ (20 mm).

3.12 REINFORCED SLABS

- .1 Make all floor slabs of thickness with reinforcing as noted on drawings.
- .2 Set all reinforcing steel as shown or directed. Pitch slabs as noted on drawings.
- .3 Build in all anchors, sleeves, inserts, floor drains and other items furnished by this Contractor or others.
- .4 Floor slabs on grade shall be poured over a continuous vapour barrier specified previously. Care must be taken not to puncture vapour barrier. Damaged portions of vapour barrier must be replaced before concrete is poured.
 - .1 Thickened and depressed floor slabs as indicated on drawings.
 - .2 Pitch slab to floor drains.

3.13 VAPOUR RETARDER & UNDERFLOOR INSULATION

- .1 Immediately prior to pouring all concrete floor slabs on grade, inside of building, Vapour Barrier shall be laid over granular fill, lapping 6" at joints. All seams and joints to be taped. The tape adhesion areas to be free of dust, dirt and moisture to allow maximum adhesion of pressure sensitive tape. Vapour barrier to be adhered to vertical intersections, walls where applicable.
- .2 Vapour retarder shall be continuous with all punctures and tears repaired before concrete is poured.
- .3 Install under floor insulation where detailed on the drawings. Refer to Site Plans for exterior slab locations having rigid insulation installed below the slab.

3.14 CURING AND SEALING INTERIOR FLOORS

- .1 Apply curing and sealing compound to all interior exposed concrete floors in strict accordance with manufacturer's labeled instructions.
- .2 A second and final application of sealer to be applied at all locations as per the room finish schedule just prior to owner occupancy

3.15 PREMOULDED EXPANSION STRIPS

- .1 Provide pre-molded expansion strips as specified under concrete materials in the following locations:
 - .1 between edges of all concrete floor slabs and all vertical surfaces.

- .2 between edges of sidewalks and vertical surfaces.
- .3 between edges of concrete platforms and concrete or masonry vertical surfaces.
- .4 in sidewalks as noted on drawings.
- .2 Expansion strips shall be $\frac{1}{2}$ " (12.7mm) thick and shall extend from bottom of slab to within $\frac{1}{2}$ " of top of slabs and platforms then insert raw oakum or polytape bond breaker and fill joint with polysulphide sealant as manufactured by Sternson "Load Flex" or approved equal where exposed. Alternatively provide saw cut exterior slabs, except joint between curb and walks and walks and building shall have expansion joints installed.

3.16 ANCHOR BOLTS & LEVELLING PLATES

- .1 This Contractor shall accurately set all anchor bolts and leveling plates furnished by other contractors.

3.17 SIDEWALKS & PLATFORMS

- .1 Provide 4"min thick (or larger as indicated on the drawings) sidewalks and platforms as shown on drawings reinforced with 152 x 152 MW11.1 x MW11.1 (6" x 6" #9/9) welded wire fabric for all sidewalks and platforms. Sidewalks and platforms shall be struck off and left with broom finish. Unless otherwise indicated, provide dummy joints as indicated on drawings. Walks and paving shall be pitched uniformly away from the building or crowned as directed.

3.18 MISCELLANEOUS CONCRETE

- .1 This Contractor to install the following miscellaneous reinforced concrete work:
 - .1 Grout under base plates and wall bearing steel members as indicated on drawings and required.
 - .2 Thickened and depressed floor slabs or addition rebar as detailed on the drawings.
 - .3 Concrete fill at Pipe Bumpers.
 - .4 House keeping pads as required for Mechanical/Electrical equipment.
 - .5 Exterior light standard foundations.

3.19 CONCRETE FINISH SCHEDULE

- .1 The following finishes shall be applied to concrete surfaces.
 - .1 Exterior walks and platforms. Float and broom finish.

- .2 Interior exposed concrete floors. Float and steel power trowel finish.
- .3 Rub exposed sharp edges from concrete to product 1/8" radius edge.

3.20 CLEANING

- .1 Contractor shall be responsible for good housekeeping during the work of this Section.
- .2 Remove all debris and inflammable rubbish from the site daily.
- .3 Do not bury any waste concrete on the project site.

END OF SECTION

03 41 50-Precast Hollowcore Slabs

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 RELATED SECTIONS:

- .1 Section 03 10 00: Concrete Forming and Accessories
- .2 Section 03 30 00: Cast-in-Place Concrete
- .3 Section 04 80 00: Masonry Assemblies
- .4 Section 03 20 00: Concrete Reinforcing

1.2 WORK INCLUDED:

- .1 Design and certification of Precast Hollowcore Slabs.
- .2 Supply and installation of Precast Hollowcore Slabs.
- .3 All associated accessories, insulation plugs, bearing pads, rebar reinforcing/anchoring devices, load transfer assemblies, grout at connections and joints etc.

1.3 REFERENCE STANDARDS

- .1 References below refer to the publications and where such reference is made it shall be to the latest edition and amendments of the standard:
 - .1 CAN/CSA A23.1 Concrete Materials and Methods of concrete Construction.
 - .2 CAN/CSA A23.3 Design of Concrete Structures
 - .3 CAN/CSA 23.4 Precast Concrete Material and Construction
 - .4 CAN/CSA W59 Welding Structural Steel
 - .5 CAN/CSA W186 Welding Reinforcing

1.4 QUALITY CONTROL OF MATERIAL

- .1 Provide a certified copy of the material mill test report, source of supply, plant certification for epoxy coating and patching procedures for factory applied epoxy coating.

1.5 QUALIFICATIONS

- .1 Fabricate precast/prestressed concrete elements certified by the Canadian Standards Association in the appropriate category(ies) according to CSA Standard A23.4 "Precast Concrete - Materials and Construction". The precast concrete manufacturer shall be certified in accordance with the CSA Certification program for Structural Precast/ Prestressed Concrete prior to submitting a tender and must specifically verify as part of his tender that he is currently certified in the appropriate category:
 - .1 (I) Non-Prestressed or (II) Prestressed
- .2 Only precast concrete elements fabricated by certified manufacturers are acceptable to the Owner. Certification must be maintained for the duration of the fabrication and erection for the project. Fabricate precast concrete elements in accordance with all applicable Building Code requirements.
- .3 The precast concrete manufacturer shall be a member in good standing with the Canadian Precast/Prestressed Concrete Institute (CPCI) and have a proven record and satisfactory experience in the design, manufacture and erection of precast concrete facing units of the type specified. The company shall have adequate financing, equipment, plant and skilled personnel to detail, fabricate and erect the work of this Section as required by the Specification and Drawings. The size of the plant shall be adequate to maintain the required delivery schedule.

1.6 DESIGN CRITERIA

- .1 Design precast/prestressed concrete units to CSA A23.3 and to carry handling stresses.
- .2 Design loads in accordance with applicable codes for use and occupancy, wind, temperature, and earthquake.
- .3 Consider vibration characteristics in accordance with NBC and provide calculations.
- .4 All design calculations and submissions shall bear the seal of a licensed professional engineer in the Province of Ontario.
- .5 The precast manufacturer shall provide a letter of conformance for all precast components based on a site visit by the Engineer within seven (7) days of completion of precast work.

1.7 SOURCE QUALITY CONTROL

- .1 Upon request, provide Engineer with certified copies of quality control tests and inspection related to project as specified in CSA A23.4 and CSA G279.
- .2 Inspection of prestressed concrete tendons is required in accordance with CSA G279.

- .3 Upon request, provide Engineer with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

1.8 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittals.
- .2 Submit shop drawings, plans, elevations, sections and bar lists to facilitate review and placing as follows:
 - .1 Design calculations for items designed by the Manufacturer
 - .2 Estimated camber
 - .3 Finishing schedules
 - .4 Methods of handling and erection
 - .5 Openings, inserts and related reinforcement
 - .6 Fire Resistance data for slabs.
- .3 Indicate bar bending details, lists, quantities, sizes, spacing, location and splices with identifying code marks to permit placement and inspection without referencing the structural drawings.
- .4 Provide all accessories as required by the standard.
- .5 Design and detail lap lengths and bar development lengths to CSA-A23.3.
- .6 Each drawing submitted shall be certified and stamped by a Professional Engineer registered in the Province of Ontario.
- .7 Openings larger than 150mm (6") diameter are to be located on the precast shop drawings and cut by the precast contractor.
- .8 A copy of the reviewed shop drawings shall be on the construction site and made available to consultants, inspectors, installers etc.

1.9 WARRANTY

- .1 The Precast Manufacturer warrants that the precast/prestressed elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with the General Conditions warranty clause, for a five (5) year period.

2.0 PRODUCTS

2.1 DESIGN

- .1 All slabs to be designed to maintain a minimum one (1) hour fire resistance rating.
- .2 All roof slabs to be designed as a floor system. Owner intends to use hollowcore roof system as future second floor school addition for classroom use (i.e. future second floor classroom addition over new addition).

2.2 MATERIALS

- .1 Cement, aggregates, water, admixtures: To CSA A23.4 and CSA A23.1.
- .2 Prestressing steel: Uncoated 7 wire cable conforming to CSA G279.
- .3 Reinforcing steel: To CSA G30.18.
- .4 Anchorage's and couplings: To CSA A23.1.
- .5 Embedded steel: To CSA G40.21 Type M300W or better.
- .6 Welding materials: To CSA W48.1-91.
- .7 Bearing pads: 3mm masonite smooth one side.
- .8 Insulation: Expanded polystyrene to CAN/CGSB-51-20.
- .9 Air entrainment admixtures: to CSA A266.1.
- .10 Chemical admixtures: to CSA A266.2.
- .11 Forms to CAN3/CSA-A23.ISZ.
- .12 Steel Primer to CGSB 1-40M79.
- .13 Topping and/or levelling coat over precast floor slabs shall be cementitious topping with 25 MPa minimum compressive strength. Thickness as noted on drawings. Provide data for Consultant's approval.

2.3 CONCRETE MIX

- .1 Use concrete mix designed to produce minimum 41 MPa (6000 psi) compressive strength at 28 days
- .2 Air entrainment of concrete mix: To CSA A266.4.
- .3 Admixtures: To CSA A266.4, CSA A266.5.
- .4 Do not use calcium chloride or products containing calcium chloride.

2.4 GROUT MIX

- .1 Cement grout: One-part type 10 Portland cement 2-1/2 parts sand, sufficient water for placement and hydration.

3.0 EXECUTION

3.1 FABRICATION

- .1 Manufacture units in accordance with CSA A23.4.
- .2 Mark each precast unit to correspond to the identification mark on shop drawings for location on a part of unit which will not be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Provide 50 mm (2") thick insulation plug at each cell end of hollow core at exterior where core is not filled solid.

3.2 ERECTION

- .1 Erect elements within the allowable tolerances indicated or specified.
- .2 Erection tolerances to be non-cumulative in accordance with CSA A23.4.
- .3 Install 3 mm (1/8") masonite bearing pads, smooth side up when bearing on concrete or masonry supports.
- .4 Set units in a tight, level position on true level bearing surface provided by others. Minimum bearing 90 mm (3-1/2") on concrete.
- .5 Fasten precast/prestressed units in place as indicated on reviewed shop drawings.
- .6 Level differential elevation of horizontal joints with grout to slope not more than 1:12.
- .7 Clean field welds with a wire brush and touch up with primer.
- .8 Field cut holes and openings up to 150 mm (6") diameter for mechanical trades. Openings larger than 150 mm (6") to be located on shop drawings at time of approval to be formed in the plant or cut in field. Do not cut reinforcing without prior approval of the precast hollow core slab manufacturer and the Engineer.

3.3 EXPOSED CEILING

- .1 Caulk exposed ceiling longitudinal joints, REFER TO Section 07 92 10 Sealants and Caulking.
- .2 The underside of precast shall be finished as per CSA A23.4 (clause 24.2.2) STANDARD FINISH.

3.4 INSPECTIONS

- .1 Provide the consultant and Independent Inspection and Testing Agency 24 hours of notice of intent to manufacture.

- .2 The cost of the inspection will be paid from the Cash Allowance.

3.5 CLEANING

- .1 Upon completion of the work, remove all containers, surplus materials, and installation equipment, excess material, and debris. Project area must be left in a clean and orderly condition.

END OF SECTION

04 80 00-Masonry Assemblies

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT LIMITED TO:

- .1 Masonry materials.
- .2 Storage and handling.
- .3 Weather precautions.
- .4 Laying all masonry.
- .5 Built-in items, accessories and miscellaneous masonry.
- .6 Cleaning masonry.
- .7 Grouting metal door frames in block masonry walls.
- .8 Grout and reinforcing within block masonry walls.
- .9 Weep hole ventilators, masonry anchors and reinforcing.
- .10 Control joints.
- .11 Precast concrete sills.
- .12 Coordination and installation of transition membranes at flashing locations.

1.2 RELATED SECTIONS:

- .1 Section 03 20 00: Concrete Reinforcing
- .2 Section 03 30 00: Cast-in-Place Concrete
- .3 Section 03 41 50: Precast Hollowcore Slabs
- .4 Section 05 12 00: Steel Lintels
- .5 Section 07 21 19: Foamed-in-Place Insulation and Air Barrier System
- .6 Section 07 26 16: Underslab Vapour Retarders
- .7 Section 07 27 10: Air Barriers

1.3 WORK TO BE INSTALLED BUT SUPPLIED BY OTHERS

- .1 Metal door frames (supplied and set in place by others) built into masonry walls by this Contractor.
- .2 Loose steel lintels.
- .3 Bearing plates for steel and joists.
- .4 Reinforcing steel to be grouted into engineered masonry walls.

1.4 SAMPLES & MOCK-UP

- .1 Before placing order for materials, submit samples of masonry units on carrying boards of all standard colour choices. Architect to review and make colour selection.
- .2 Produce in-situ mock-up of all masonry products where each product exhibits a minimum of 1200mm x 1200mm (4'-0" x 4'-0") panel size complete with all insulation transition membranes / thru-wall flashings and other masonry accessories as required by the wall type. Ensure adequate time for mortar to dry for review by consultant. The mock-up will not form part of the finished work if it is deemed acceptable.

1.5 PRODUCTION, DELIVERY, STORAGE AND HANDLING

- .1 Cementitious materials shall be stored in accordance with the requirements of CSA-A179-14. Storage of aggregates shall be in accordance with the requirements of CSA A23.1, latest edition. Masonry units shall be stacked to prevent chipping and shall be protected from weather and soil. All materials shall be kept clean and dry.
- .2 Deliver cement, lime and mortar ingredients with manufacturer's seals and labels intact.
- .3 Exposed units which become stained or chipped and materials which are affected by inadequate protection shall be replaced.
- .4 Masonry units and bricks to be stacked on timbers or platforms at least 3" above grade. Provide necessary means to prevent staining during storage. Place polyethylene or other plastic film between wood and other finished surfaces of units when stored for an extended period of time. Cover stored units exposed to weather for an extended period of time.

1.6 STANDARDS AND REFERENCES

- .1 Materials and workmanship shall conform to the requirements of CSA Standards for Masonry and the by-laws of the local municipality. Work shall be supervised by a competent foreman at all times and shall be performed by skilled and experienced workmen.

- .2 Wherever in these specifications methods of tests or standards are referred to or implied and not otherwise specified, the latest ASTM Standard dealing with such subjects shall be used.

1.7 JOB CONDITIONS & WEATHER PRECAUTIONS

- .1 The Contractor shall examine the existing conditions and report in writing to the Architect any deficiency or defect in the work of others. Installation of any part shall constitute acceptance of such surfaces as being satisfactory.
- .2 In warm, dry weather, wet all masonry units thoroughly before laying. Take all necessary precautions to prevent excessive suction of water from mortar into masonry units.
- .3 Lay no brick masonry units or concrete masonry units on which there is a film of water, ice, frost or snow.
- .4 When ambient temperature is 5° C. or lower, heat all brick, concrete masonry units and mortar ingredients. Salt or other chemicals for lowering freezing temperature or mortar shall not be used. During freezing weather, provide approved means of heating, protecting and enclosing masonry work. All membrane shall be waterproofed and flame proofed.
- .5 Enclosure and heating systems shall conform to the regulations of all governing agencies.
- .6 At the close of each day's work and/or at other work stoppages, cover tops of masonry work with waterproof, flame proof membrane secured firmly in place. When work resumes, clean top surface free of loose mortar.

1.8 INSPECTION AND TESTING

- .1 An independent testing agency appointed by the consultant, shall be paid from cash allowance in contract to test mortar and grout for masonry. The independent testing agency shall perform the following:
 - .1 Conduct slump tests for mortar and grout as outlined in CSA A179-14, latest edition, mortar and grout for unit masonry (follow Table B.1 for test frequency). Duplicate tests on two different portions of the same sample should not vary more than 3/8" (10 mm).
 - .2 Periodically determine the ratio of aggregate to cementitious material of mortar and grout mixed on site and based on the proportion specification method as outlined in CSA A179-14 (follow Table B.1 for test frequency).
 - .3 Test the compressive strength and the aggregate to cementitious material ratio of mortar and compressive strength of grout for mortar and grout mixed off site and based on the property specification method as outlined in CSA-A179-14 or latest edition (follow Table B.1 for test frequency).
- .2 Under this Section the Inspection Agency shall:

- .1 Sample the grout and the mortar, make and cure four (4) test specimens properly labeled showing mix, location and date of pouring. All specimens shall be cured under laboratory conditions. Contractor shall make provisions for initial curing of all specimens a minimum of 24 hours at the required temperature and in a location free from vibration and injury.
 - .2 Test one (1) grout specimen at seven (7) days and two (2) grout specimens at twenty-eight (28) days. Should the seven (7) or the twenty-eight (28) day tests fail to meet the design strength, test the fourth specimen at twenty-eight (28) days to verify results.
 - .3 If the grout fails to meet the 7-day compressive strength requirements, but meets the 28-day compressive strength requirement, it shall be acceptable. If the grout fails to meet the 7-day compressive strength requirement, but their strength at 7 days exceeds two-thirds of the value required for 7-day strength, the contractor may elect to continue the work at his own risk while awaiting the results of the 28-day tests, or to take down and remove the work affected.
 - .4 Send two (2) certified copies of all test results direct to the Architect with additional copies to the Contractor as directed.
- .3 Masonry Contractors shall cooperate with the inspection and testing company.

2.0 PRODUCTS

2.1 FACEBRICK

- .1 Canada Brick: Canada Architectural Series – Spring Hill Velour, Metric Modular size 57mm x 190mm x 90mm (2.25" x 7.5" x 3.5"). All brick shall be manufactured from one continuous run to ensure minimum colour and texture variations.
- .2 Compliance: CSA A82.1-14, Grade SW or latest equivalent.
- .3 Refer to drawings for brick type locations.

2.2 CONCRETE BLOCK

- .1 Concrete Masonry Units (CMU): Shall conform to CSA Standard A165.1 Series-14. Exterior and foundation block to be supplied per Table 1 of the standard as H, SS or SF/A/15/M. Interior Block per Table 1 as H, SS or SF/B/15/M where a normal weight concrete meets the required fire and load requirements as defined on the project documents. All other interior block to be supplied per Table 1 as H, SS or SF/C/15/M. Block size, shapes and thicknesses are as indicated on drawings or as required for the work.
- .2 Unless indicated otherwise, supply and install special shaped units where required on the drawings including corner returns, bond beams, sash blocks for control joints and lintel units as necessary over wall openings. All outside corners to be bullnose units.

- .3 Obtain each CMU type from the same Manufacturer. CMU units to be uniform in texture and colour and free from cracks, chips and blemishes.
- .4 Fire Resistance rating shall be of 1 hour unless otherwise indicated. Compliance of all fire ratings shall be determined in accordance to NCMA Tek 7-1C in compliance to Table D-2.1.1, NBCC-10. Provide units with fire resistive ratings not less than 1 hour for nominal 100mm thick units where structural framing fire resistive rating is provided by 100mm block masonry units.
- .5 Provide units to accommodate vertical and horizontal reinforcing as indicated on the drawings. Use of common lintel blocks (bond beams) at horizontal reinforcing locations will not be permitted.

2.3 MORTAR & GROUT

- .1 Mortar for all masonry to conform to CSA A179-14 or latest edition.
- .2 Aggregates for mortar to the requirements of CSA Standards as required.
- .3 Portland Cement: to CAN/CSA-A3000.
- .4 Water: clean and free of deleterious amounts of acids, alkalies or organic materials.
- .5 Mortar Types:
 - .1 Use natural grey for all brick and stone units.
 - .2 Follow manufacturer's mixing, application techniques and recommendations on all factory premix product. Mortar mixes may be bagged or bulk dry blended materials in enclosed containers.
 - .3 Mortar for all load bearing and non-load bearing interior and exterior masonry walls to be:
 - .1 For Job Site Mixed: To CSA A179-14 (R2019) or latest edition based on proportion specifications. Table 3 for course grout. Slump shall not exceed 10" (250 mm).
 - .2 For Plant Mixed: To CSA A179-14 (R2019) or latest edition based on property specifications Table 6 for coarse grout, 12.5 MPa at 28 days and 7.5 MPa at 7 days. Slump shall not exceed 10" (250 mm).
- .6 Grout Types – Refer to structural drawings.
- .7 Admixtures shall not be used in mortar and grout.

2.4 METAL JOINT REINFORCEMENT & TIES

- .1 Interior Concrete Block Walls:
 - .1 Reinforcing shall be truss type Hohmann & Barnard Inc. Truss-Mesh No. 120 or Blok-Lok Truss Reinforcing BL30 Standard Duty 3.7mm (0.144") side rod and 3.7mm (0.144") cross rod standard mill galvanized meeting ASTM A82 and CSA G30-3 specifications.
 - .1 Install at every second block course commence from the finish floor line.
- .2 Exterior Cavity Wall Tie at Poured Concrete Back-Up Walls:
 - .1 Provide Fero Heavy Duty Holed Rap Tie with 'V'-Tie. Hot-dipped galvanized to ASTM A-153 Class B2. Provide insulation where required. Refer to details and specifications for insulation thicknesses.
- .3 Exterior Cavity Wall Tie at Concrete Block Unit Back-Up Walls:
 - .1 Provide Fero Block Shear Connector with 'V'-Tie. Hot-dipped galvanized to ASTM A-153 Class B2. Provide insulation where required. Refer to details and specifications for insulation thicknesses.
- .4 Exterior Cavity Wall Tie at Steel Stud Back-Up Walls:
 - .1 Provide Fero Stud Shear Connector with 'V'-Tie. Hot-dipped galvanized to ASTM A-153 Class B2. Provide insulation where required. Refer to details and specifications for insulation thicknesses.
- .5 Install all ties 400mm (16") vertically commencing at the first block course and at 400 mm (16") o/c horizontally, to maintain a masonry tie to the brick not exceeding 1 tie per 2 square feet (1550 mm) in all exterior brick and block cavity walls.

2.5 VERTICAL CONTROL JOINTS

- .1 Control joints in masonry walls where indicated on the drawings shall be asphalt expansion joint filler or Rescor expansion joint filler as manufactured by W. R. Meadows of Canada Ltd. or Architect's approved equal to thicknesses as noted on the drawings.
- .2 At both interior and exterior face brick, stone or block masonry, provide one control joint at each steel column line location. Provide control joints at a of maximum 24" o.c. in addition to the column line locations and in addition to those specific locations indicated on the drawings. This criteria governs all control joint locations as joints may or may not be indicated on the drawings.

2.6 TRANSITION MEMBRANES & FLASHINGS

- .1 Supply all 20 gauge metal cavity wall flashings.
- .2 Refer to Section 07 27 10 air barrier system to be used for transition membranes and flashings.

2.7 WEEPHOLES & BREATHERS

- .1 Weep holes and breathers for face brick construction as shown on the drawings shall be BLOK-LOK Weephole No.343 sized to suit project brick height or an approved equivalent.

2.8 MASONRY CLEANER

- .1 Cleaner for brick masonry surfaces shall be Sure-Kleen Vana-Trol masonry cleaner as manufactured by Prosoco.

2.9 PRECAST CONCRETE DOOR SILLS & WINDOW SILLS

- .1 Precast concrete door sills, at all exterior door openings and window sills indicated on drawings, reinforced as manufactured by Unit Precast (Windsor) Ltd. or Architects approved equal. Provide shop drawings or manufacturer's cut sheets indicating dimensions, reinforcing and profiles.
 - .1 Outside corner of wall coping to be mitred 45 degrees.

2.10 BUILDING PAPER

- .1 Building paper, No. 15 Asphalt Felt to CSA A123.3-05 (R2015) or latest edition.

2.11 MORTOR STOP

- .1 BLOK-LOK Mortor-Trap. HDPE strands woven to a 90% open mesh partially filled grouting applications to ASTM D1668-73 Type 207.

3.0 EXECUTION

3.1 GENERAL

- .1 Workmanship
 - .1 Build masonry plumb, level and true to line with vertical joints in alignment.
 - .2 Lay coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
- .2 Tolerances
 - .1 Tolerances in notes to Clause 5.3 of CAN/CSA-A371-04 (R2014) or latest edition apply.
- .3 Exposed Masonry
 - .1 Remove chipped, cracked or otherwise damaged units in exposed masonry and replace with undamaged units.

- .4 Jointing
 - .1 Allow joints to set just enough to remove excess water, and then tool with round jointer to provide smooth, compressed, uniformly concave joints where concave joints are specified. For raked joints, rake to ¼" (6 mm) depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth where raked joints are specified.
 - .1 Exterior jointing concave.
 - .2 Interior brick joints raked.
- .5 Cutting
 - .1 Cut carefully for electrical switches, outlet boxes and other built-in items.
 - .2 Use masonry saw for cutting. Make cuts straight, clean and free from uneven edges. Do all cutting of exterior masonry to maintain continuity of appearance of exterior brick, renaissance masonry units and interior concrete masonry units.
- .6 Building-In
 - .1 Build-in all items required to be built into masonry.
 - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
- .7 Provision for Movement:
 - .1 Leave ½" space between top of non-load bearing walls and partitions and structural elements. Do not use wedges. Cut units as required to maintain clearances.
- .8 Loose Steel Lintels:
 - .1 Install loose steel lintels. Centre over opening width with 8" (200mm) bearing each end.
- .9 Control Joints:
 - .1 Provide continuous control joints with fillers as indicated on the drawings and required. Sealants and backing for sealant will be installed by Section 07 92 10.
- .10 Masonry Reinforcing and Connectors:
 - .1 Install masonry connectors and reinforcement in accordance with CSA-A370-14 and CSA-A371-14 unless indicated otherwise.
- .11 Weep holes & Breathers:

- .1 Install weep hole vents in vertical joints immediately over flashings in exterior wythes of cavity wall and masonry veneer construction, at a maximum horizontal spacing of 610mm o.c. (24").

3.2 ABOVE GRADE BLOCK WALLS

- .1 Masonry block walls shall be standard concrete block to thicknesses as indicated on drawings. All joints shall be concave tooled. All walls shall be reinforced with metal joint reinforcement every second block course.
- .2 Install reinforcing bars and grout fill voids at spacings and locations shown on the structural drawings.

3.3 NOTICE TO OTHER TRADES

- .1 The Contractor shall notify all other trades when materials to be set in masonry work will be required and also to notify all trades when and where the exact location of openings and chases will be necessary.

3.4 LAYING CONCRETE MASONRY UNITS

- .1 Build wall partitions, furring, backing, fireproofing, etc. of concrete masonry units of thickness shown.
- .2 Bed course solidly in full mortar and where not otherwise shown with vertical joints breaking halfway over course below. Butter vertical joints entire height of units and shove into place.
- .3 Bond each course at corners and intersections and bond into adjacent construction. Concave tool mortar joints in all block interior walls.
- .4 Where units occur against steel, place anchors in each course spaced 610mm (24") horizontally and secure anchors to steel.
- .5 Jamb units shall be shapes and sizes required to bond with wall units, build in where indicated or required. Leave no cells open in face surfaces. Incorporate sections of brick work in concealed hollow unit masonry where required to support plumbing or heating fixtures.
- .6 All exposed masonry jamb and outside corners shall be bullnosed units.
- .7 Lay masonry work plumb, true to line with level and accurately space courses. Cut where necessary to conform profiles where indicated.
- .8 Break each head joint with course below except where otherwise indicated. Keep bond plumb throughout.
- .9 Cut masonry units carefully for installation of electrical outlets, conduit, other built-in items indicated or required. Use only masonry saw for cutting blocks.

- .10 Use metal joint reinforcement of proper block width in every second bed joint commencing with second course above floor line. All masonry walls shall be carried up to and terminate against underside of roof deck unless detailed otherwise. Make provisions for movement in non-bearing walls. Provide 2440mm (8'-0") of metal joint reinforcing in every course not having block reinforcing above the heads of openings in all interior walls. In no case shall walls be terminated above ceiling lines unless otherwise noted or detailed.
- .11 Care shall be taken to ensure that the slots are kept free of mortar or debris above the mortar joints. Extend mortar joints across bottom of sound slots, evenly tooled to maintain continuity of jointing. The units will have 4 cells each and where grouted and reinforced masonry is indicated the cells without the fibrous fillers will be used for reinforcing and grout.

Note:

- .1 Control joints as indicated on drawings and required. Install at 7875mm (24'-0") o/c if not indicated on drawings.
- .2 Block walls reinforced filled with grout by this Contractor as noted on drawings.
- .3 Fill with grout - hollow metal door frames in block masonry walls.
- .4 Precast block lintels and loose steel lintels bearing plates for joists and steel to be installed by this trade.
- .5 Build in dampproofing, flashings weep holes and breathers in exterior walls as shown on the drawings.
- .6 Build in items required to be built into masonry for mechanical and electrical trades.
- .7 Build in duct sleeves provided by the Mechanical Division.

3.5 MISCELLANEOUS MASONRY & BUILT-IN ITEMS

- .1 Point around all sides of hollow metal window frames with mortar. Leave caulking grooves around outside perimeter of all exterior window and door frames for caulking. Also provide caulking grooves in all interior joints between masonry and steel framing.
- .2 Build in all frames, pipes, sleeves, anchors, nailing plugs and other required work furnished by others and co-operate with the various contractors in building in their work. Set loose angle lintels furnished under "Miscellaneous Metal" Division.
- .3 Grout fill all hollow metal door frames as shown on Door Schedule in masonry walls.
- .4 Form openings or holes in walls for drains, heating vents, access doors and other piping as indicated or required. Cut for such work where necessary and fill up to pipes after they are in place leaving space over pipes to allow for movement.

- .5 Leave temporary openings in walls where required by other Contractors for bringing in building or mechanical equipment as directed.
- .6 Provide and install masonry lintels above doors and openings, reinforced as indicated on drawings.

3.6 VERTICAL & HORIZONTAL REINFORCEMENT

- .1 Vertical and horizontal reinforcement shall be installed in accordance with CSA Standards A370 and A371 latest editions and in accordance with structural drawings.
- .2 Provide dowels from foundation wall to size and spacing of vertical reinforcing steel, with minimum 36 bar diameter embedment.
- .3 Vertical reinforcement shall be installed continuous in full grouted cores from properly lapped dowels at the foundation level to the upper block course, unless noted otherwise on drawings. Lap bars a minimum 36 bar diameters.
- .4 Provide one (1) 15M bar in full grouted core at each side of all wall openings, extending a minimum three (3) block courses above and below opening.
- .5 Vertical reinforcing shall be positioned in centre of masonry core and secured top and bottom.

3.7 GROUT FILL

- .1 Block walls and lintel blocks shown on the drawings to be filled with grout shall be executed by this Contractor in accordance with CSA Standard CSA-A371 latest edition. Insure installation of specified fill stop at proper level in walls to be filled with grout.
- .2 Note: Use only low lift grouting procedures as outlined in Clause 5.9.3.1 of CSA A371 latest edition.

3.8 CONTROL JOINTS

- .1 Build vertical control joints in block exterior and interior walls where indicated on drawings and required. Exterior vertical joints to have non-hardened sealants installed to produce weather tight construction for this purpose as specified in Section 07 92 10-Sealants and Caulking.

3.9 CLEANING MASONRY

- .1 Clean down all exposed masonry from top of building to bottom of same including all exterior and interior exposed masonry.
- .2 Conduct work in a clean manner as possible and remove excess materials, mortar droppings daily. Remove mortar droppings on connecting or adjoining work before its final set.

- .3 At completion of work, point holes in joints of exposed exterior masonry surfaces and completely fill with mortar and tool properly.
- .4 Stone locations: Cleaning shall be executed in strict accordance to manufacturer's labeled instructions.
- .5 Remove and replace defective materials with approved materials and correct defective workmanship. Leave all masonry clean and in an acceptable condition.
- .6 Do not use wire brushes for cleaning.

3.10 PROTECTION

- .1 Protect all finished masonry work from damage and replace all damaged or defective material.

3.11 CLEAN UP

- .1 Remove all debris and excess material not required in the performance of the work immediately from the site.

END OF SECTION

05 12 00-Structural Steel

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 The work under this section of the specifications comprises the furnishing of all labour, materials, tools, equipment and services to perform all operations in connection with Structural Steel & Miscellaneous Metal to the full intent of the drawings and specifications, (see General Notes).
- .2 All beams, columns, channels, plates, loose angles, clip angles, bent and stiffener plates, gusset plates, bearing plates, leveling plates anchor bolts and accessory steel members attached to steel joists, beams and columns.
- .3 All wide flange, hollow structural columns, stub columns, outriggers, base plates, bearing plates, cap plates, side plates, anchor bolts, leveling plates, specialty anchors, etc. as shown on the drawings.
- .4 All angles, plates, clip angles, stiffener plates, hangers, shelf angles and accessory steel members attached to beams, columns, metal deck and steel joists.
- .5 All seat angles throughout, all complete with bolts, etc.
- .6 Metal bearing plates for steel joists, beams, angles and anchors for metal deck and miscellaneous steel as required.
- .7 Shop painting.
- .8 Angle framing between structural steel framing and joists as noted on structural drawings for condenser unit supports, rooftop units, etc. required for mechanical, electrical and architectural items.
- .9 Roof access ladders, support framing, etc.
- .10 Plate, angle and beam lintels.
- .11 Accessory fasteners required in the proper installation and securing of work.

1.2 RELATED SECTIONS:

- .1 Section 03 20 00 Concrete Reinforcing
- .2 Section 03 30 00 Cast-in-Place Concrete – Grout under base plates
- .3 Section 04 80 00 Masonry Assemblies

- .4 Section 05 21 00 Steel Joist
- .5 Section 05 31 00 Metal Deck
- .6 Section 05 41 00 Structural Metal Stud Framing
- .7 Section 05 50 00 Metal Fabrications

1.3 DESIGN STANDARD

- .1 Conform with the Building Code under Ontario Regulations 403/97 as amended and any applicable acts of any authority having jurisdiction and the following, except as specifically varied herein:
 - .1 CSA-S16-14 – Design of Steel Steel Structures.
 - .2 CSA-S136-16 – Design of Cold Formed Steel Structural Members.
 - .3 CSA W47.1-09 & CSA-W59-13 - Certification of Companies for Fusion Welding of Steel Structures & Welded Steel Construction.
 - .4 Where there are differences between the specifications and the drawings and the standards, codes or acts, the most stringent shall govern.

1.4 TOLERANCES

- .1 Conform to erection tolerances specified in CSA-S16 except as otherwise specified.
- .2 Interfacing tolerances may not be compatible with the above. Review and co-ordinate interfacing tolerances so that the various elements come together properly.

1.5 GENERAL

- .1 All materials, articles and accessories incorporated in the work shall be of type and quality specified herein and subject to the approval of the Consultant. Methods of preparation, construction and installation of such materials, articles and accessories shall be in accordance with the accepted standard and as directed by the Consultant.
- .2 Structural Steel Contractor shall provide anchor bolt layout to the General Contractor. The General Contractor shall provide an as-built drawing of anchor bolt and pier location, elevation and trueness of top of concrete piers for review by the Consultant and Structural Steel Contractor. General Contractor shall make corrections as required by the Consultant and Structural Steel Contractor.

1.6 TESTING

- .1 The Consultant will appoint and all costs will be paid from allowance in contract for an independent testing laboratory to test 15% of all bolted and welded connections of all erected structural steel, shear connectors (to CSA W59 procedures), deck and joists.

- .2 All moment connections to have ultrasonic test. The test results shall be submitted as a written report to the Consultant before acceptance of the erection of the structural steel is accepted.
- .3 Non-destructive testing shall be used for testing of welds. Should any of the connections prove defective, the Consultant may order the testing of 100% of the connections with all costs beyond the 15% also being borne by this Contractor.

1.7 MILL TESTS

- .1 Provide copies of all mill test reports properly corrected to materials in order to verify quality of manufacture. All materials shall conform with requirements of specifications of the Canadian Standards Association or the American Society for Testing Materials for the particular designated grade.

1.8 QUALIFICATIONS AND QUALITY ASSURANCE

- .1 Proposed fabricators and erectors, if required by Consultant, shall show shop facilities, erection equipment and proposed methods of doing work to a satisfactory completion before they will be accepted as eligible to carry out this portion of the work.
- .2 The Fabricator and Erector assuming full responsibility for welded construction shall be certified by the Canadian Welding Bureau to the requirements of CSA Standard W47.1, for Division 1 or Division 2 or CSA Standard W55.3, or all as applicable.
- .3 For fusion welded structures, part of the work may be sublet to a Division 3 Fabricator or Erector; however, full responsibility shall remain with the Division 1 or Division 2.1 Fabricator or Erector.
- .4 Design details and connections in accordance with requirements of CSA-S16 and CSA Standard W59 to resist forces, moments and shears indicated.
- .5 Provide a letter from the Engineer responsible for the design, detailing and installation of all connections related to structural steel confirming engagement and responsibility of the above. If requested by the Consultant, the Engineer shall provide a copy of Engineer's Certificate of Authorization and proof of Liability Insurance.

1.9 SHOP DRAWINGS

- .1 This Contractor shall prepare shop and erection drawings for all work and submit to the Consultant for review, in accordance with Section 01 33 00, Submittals.
- .2 All connections shall be designed and certified by a Professional Engineer of the Province of Ontario. Upon request, submit to the Consultant design calculations of all connections (welded or bolted). Each drawing submitted shall bear the signature and stamp of a qualified Professional Engineer registered in Ontario.

- .3 Indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners, rivets and welds. Indicate welds by AWS Standard A2.4 Symbols for Welding.
- .4 Fabrication and delivery to the site of structural steel prior to the shop drawing review process including required certification will not be approved for payment in any given progress draw.
- .5 A copy of stamped and reviewed shop drawings shall be available at the site for review by Inspection Agencies and the Consultants.

1.10 PRODUCT HANDLING

- .1 Handle and store steel materials at the job site in such a manner as to cause no damage to other materials or existing buildings, to property or new structure. Handle structural steel so as to avoid permanent distortion.
- .2 An area for receiving and storage of fabricated steel on the site will be allotted by the General Contractor.
- .3 Steel materials shall be stored on site in such a manner as to prevent any permanent distortion (loss of pre-camber, warping, etc.).

1.11 JOB CONDITIONS

- .1 Verify all dimensions, conditions and obtain all necessary measurements at the job. Before commencing work, examine all spaces and surfaces in which and/or to which miscellaneous iron work will be attached. Report any necessary corrections immediately to the Consultant. Do not proceed until corrections (if any required) have been made. Commencing work implies this Contractor's acceptance of all said spaces, surfaces and job conditions.

1.12 SUBSTITUTIONS

- .1 The cost of substitutions of structural steel sections of equal or greater strength for those shown on drawings can only be done with written approval by the Consultant and shall be at this Contractor's expense.
- .2 Substitution of structural steel members are subject to the following characteristics:
 - .1 Flange width.
 - .2 Depth.
 - .3 Cross sectional area, section modulus, moment of inertia and lateral support conditions.
- .3 Should this Contractor elect to fabricate some of the structural steel members, written approval must be obtained from Consultant. All such members must be certified by a Professional Engineer and all details and analytical calculations submitted to the Consultant.

2.0 PRODUCTS

2.1 GENERAL

- .1 All material shall be rolled from new billets and no materials shall be rolled from rejected new billets nor from material previously rolled. All steel unless otherwise noted shall be made by the open hearth process and shall conform with the standard Specifications For Structural Steel for Building of the American Society for Testing Materials.
- .2 Steel materials generally shall conform to the requirements of the latest edition of Canadian Standards Association Specification S-16.1 Steel Structures for Buildings.

2.2 STRUCTURAL STEEL

- .1 Structural steel for this project except as specified otherwise shall conform to as follows:
 - .1 Wide flange sections: CSA G40.21, Grade 350W
 - .2 Hollow structural sections: ASTM A500, Grade C or CSA G40.21 Grade 350W, Class C
 - .3 Channels, angles and plates: CSA G40.21, Grade 300W
 - .4 Standard I beams: ASTM A36M, $F_y=248$ Mpa(35 ksi)
 - .5 Structural pipe: ASTM A53, Grade B, $F_y=241$ Mpa(35 ksi)
 - .6 Welded wide flange shapes: CSA G40.21, Grade 350W

2.3 WELDING

- .1 Welding shall be done by manual shielded metal arc processes and shall be carried out in strict accordance with the following C.S.A. Specifications:
 - .1 No. W47 - latest edition for Qualifications of Welders.
 - .2 No. W48 - latest edition - for Electrodes (only coated rods allowed).
 - .3 No. W59 - 13 Welded Steel Construction.

2.4 HIGH STRENGTH STEEL BOLTS

- .1 Bolts, nuts and washers to ASTM A325-10. Hi tensile steel bolts shall be 3/4" diameter for all joints unless noted otherwise on the drawings.

2.5 STANDARD THREADED FASTENERS

- .1 Standard bolts shall be 3/4" diameter in accordance to ASTM A307-76B Grade A where noted on drawings.

2.6 ANCHOR BOLTS

- .1 Anchor bolts shall be of sizes indicated on the drawings and in accordance with ASTM F1554. Minimum grade is 36. See structural drawings for grade required.

2.7 SHOP PAINT

- .1 Shop paint for steel receiving a finish coat of paint on site to be in accordance with CISC/CPMA 2-75.
- .2 Shop paint for steel without finish coat to be in accordance with CISC/CPMA 1-73a.
- .3 Touch-up paint to in accordance with CAN/CGSB 1.171 or CAN/CGSB 1.181.
- .4 No lead paints permitted.
- .5 Refer to drawing for columns and floor beams to receive spray-on fire proofing. No prime paint therein required.

2.8 FABRICATION

- .1 All steel fabrication shall be continuously inspected by the fabricator before shipment to ensure compliance of material and workmanship with the requirements of these specifications.

2.9 ACCESSORIES

- .1 Provide all accessories necessary to complete the work. Accessories include but are not limited to screws, bolts, nuts, rods, hangers, connection clip angles, washers, anchors (shackles, yokes, clevises, turn buckles, pins, etc. and similar items whether specifically mentioned herein or not).

2.10 FASTENERS

- .1 Anchorage devices are selected on typical application requirements for fastening miscellaneous devices to masonry and concrete walls and floors. In all cases, follow the manufacturer's recommendations.
- .2 Products specified are Powers. Acceptable manufacturers are:
 - .1 Hilti.
 - .2 ITW Construction Products
- .3 Types of Anchors
 - .1 For connections of steel to masonry, Powers Wedge Bolt, Blue Tip with Block-Plug, size as required, hex head, carbon steel, zinc plated.

- .2 For steel to concrete floors where exposed to public, use Wedge Bolt, Blue Tip, carbon steel, zinc plated.
- .3 For steel to concrete or precast where unexposed to public, use Power-Stud, carbon steel, zinc plated.

3.0 FABRICATION AND ERECTION

3.1 CONNECTIONS, FITTINGS & DETAILS

- .1 Fabricate structural steel as indicated in accordance with CSA-S16-14 and in accordance with shop drawings. All details and connections shall be carefully made and fitted with special care taken so that the finished work presents a neat and workmanlike appearance without the use of unnecessary fills.
- .2 Standard connections as detailed in the latest edition of the Handbook of Steel Construction published by C.I.S.C. shall be used where possible. Where detail does not permit the use of standard connections, the detail connection shall develop the full strength of the member.
- .3 Moment connections where indicated to be welded.
- .4 Details shall be designed so that field high strength bolting can be done properly.
- .5 Hi tensile bolts shall have two hardened steel washers per bolt. Bolt in finished work shall not project more than 4 mm beyond nut without the use of unnecessary washers.
- .6 Welding shall be solid, smooth and regular, free from pits or incorporated slag or scale. Welds shall be made in such a manner as to avoid distortion or damage to members.
- .7 Eccentric beam to column connections shall be fabricated as indicated on the drawings.
- .8 Shop connections shall be welded in accordance with this specification and accepted standard practices. All moment connections shall be shop welded.
- .9 Field connections shall be made by either high strength bolts and/or welding except as otherwise indicated on the drawings.
- .10 All finishes required on column ends shall be brought to true and normal surface by milling with a milling machine. Grinding will not be allowed. Splicing will not be allowed other than shown on the design drawings without the approval of the Consultant at the shop drawing stage.
- .11 Provide holes for attachment of other work (e.g., wood blocking). Where necessary, holes shall be slotted. Mark all "Miscellaneous Metal" items with paint and identify with identifications on setting diagram.

- .12 Provide wall anchors for wall bearing beams unless otherwise indicated.
- .13 Reinforce openings to maintain required design strength.

3.2 WORKMANSHIP

- .1 All workmanship must be first class in all respects and any members not presenting a finished and workmanlike appearance will be rejected. All finished members shall be free from twists, bends or open joints.
- .2 All members shall be true to length so that assembling may be done without fillers, except where same are required as detailed.
- .3 Joints in exposed interior work shall be concealed as far as possible and where not possible are to be hairline.

3.3 SHOP PAINTING

- .1 Unless otherwise noted, all structural steel shall be given one shop coat of paint. Steel to be embedded in concrete shall not be painted. All surfaces to be painted shall be thoroughly cleaned of all rust, scale, grease or oil and be dry immediately before paint is applied.
- .2 Repaint where surfaces are damaged during erection or where necessary to scrape off the shop coat. Also paint bolts after erection.
- .3 Refer to drawing for columns and floor beams to receive spray-on fire proofing. No prime paint therein required.

3.4 MARKINGS

- .1 Mark materials in accordance with CSA-G40.20-13. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark for fit and match.

3.5 ERECTION

- .1 All erection of structural steel shall be performed in a safe manner and in accordance with CSA-S16-14, the Construction Safety Act and Canadian Construction Safety Code (latest editions).
- .2 All steel shall be set accurately to the lines and elevations shown on the drawings.
- .3 All members shall be connected temporarily with sufficient bolts to insure the safety of the structure until permanent connections are made.
- .4 The Steel Contractor shall assume full responsibility for the correct plumbing and alignment and for setting of all members. He shall set all guys, braces, etc.

necessary to maintain the structure during erection until such time as the work of other trades is in place.

- .5 Drifting of unfair holes will not be permitted in field erection of structural members. The Structural Steel Contractor shall be solely responsible for accuracy and fit of all structural steel members. If members do not fit properly in the field, repairs and replacements must be made by suitable methods to the satisfaction of the Consultant.
- .6 Welding shall not be done until structure has been properly aligned.
- .7 There shall be no burning of holes in members in the shop or the field without permission of the Architect.

3.6 ANCHOR BOLTS

- .1 Structural Steel Contractor shall furnish and deliver to the project site, all anchor bolts complete with washers and bolts required for anchoring columns and beam wall bearing plates. Structural Steel Contractor shall check anchor bolt location, elevation and trueness of top of concrete pier, General Contractor shall make corrections as required by Structural Steel Contractor.

3.7 BEAMS

- .1 Beams shall be rolled sections and welded wide flange shapes, straight and without camber or more than 1/4" for each 10 ft. of span unless noted otherwise on drawings. Beam connections in general shall have standard double angle clips which in all cases must be sufficient to develop full strength of the member. Supply masonry anchors and welded bearing plates on ends of beam to sizes as shown on drawings and of sufficient size for bearing on masonry or concrete, where wall bearing beams are indicated.

Note:

- .1 Provide the indicated camber to beams in such a manner as to provide a uniform parabolic profile. Ensure that the method used to provide camber does not reduce the safe load carrying capacity of the members.
- .2 Diameter, length and spacing of studs as indicated on drawings.
- .3 Provide curved steel where indicated on drawings.

3.8 MISCELLANEOUS STRUCTURAL FRAMING

- .1 Provide and install all miscellaneous structural framing, loose angles and plates complete with bolts, strap anchors, etc. for attachment to structural steel, concrete, masonry, walls, etc. as indicated on drawings and required for complete job.

3.9 LOOSE ANGLE AND BEAM LINTELS

- .1 Furnish to Mason for setting, all angle and beam lintels required throughout the work as shown on drawings. Lintels shall have bearing lengths as indicated on the Lintel Schedule.

3.10 BEARING PLATES GENERALLY

- .1 Provide and install all bearing plates as indicated on drawings and as required for a complete job for all miscellaneous metal work, steel joist bearing plates, lintels, etc. resting on concrete and masonry walls.

3.11 ARCHITECTURAL EXPOSED STRUCTURAL STEEL

- .1 Make all mitres, cuts and coping in surfaces that are exposed to view with uniform gaps of 3 mm as shown as open gaps or in contact where indicated without gaps.
- .2 Remove all imperfections and markings.
- .3 Provide continuous welding at exposed joints without gaps.
- .4 Exposed welds shall be smooth. Grind flush all groove and plug welds ready for paint.
- .5 Erection tolerances to be half what is normally permitted.

3.12 MISCELLANEOUS FRAMING

- .1 Provide and install all miscellaneous structural framing (beams, channels, angles, tubes, plates, etc.) complete with bolts or strap anchors for attachment to concrete, masonry, structural framing, etc. as indicated on drawings and required for complete job. Connections to joists must receive joists manufacturer's approval and comply with their recommendations for attachments and/or reinforcing of joists to receive framing by this trade.
 - .1 Angle framing for exhaust fans, roof mounted mechanical equipment and ducts through roof in steel framed roof areas.
 - .2 Beam, angle and plate lintels noted on drawings and Lintel Schedule. Refer also to architectural details.
 - .3 Lintels for ducts over 16" in width passing through masonry walls not shown on Lintel Plan.
 - .4 Angle and wall anchors for joists and bridging.
 - .5 Angle clips for lateral wall bracing to underside of joists, beams and precast.

3.13 RELATION TO OTHER TRADES

- .1 This Contractor shall co-operate with the metal deck supplier, steel joist supplier, concrete contractor and all other contractors and sub-trades for co-ordination of common works.

3.14 INSPECTION

- .1 The fabricator shall allow the work to be inspected by the Architect/Engineer or other duly appointed agent at any stage of fabrication.
- .2 Acceptance of any material or finished member in the shop shall not prevent their subsequent rejection if found defective in the field.

3.15 CLEANING

- .1 This Contractor shall clean up and remove from the site all rubbish and surplus materials resulting from work under this section promptly as the work proceeds and upon completion.

END OF SECTION

05 31 00-Metal Deck

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 The work of this section shall include all labour, materials, equipment and services necessary for the design, fabrication and erection of the steel roof deck as indicated on the drawings.

1.2 RELATED SECTIONS:

- .1 Section 03 20 00: Concrete Reinforcing
- .2 Section 03 30 00: Cast-in-Place Concrete
- .3 Section 04 80 00 Masonry Assemblies
- .4 Section 05 12 00: Structural Steel
- .5 Section 05 21 00: Steel Joist
- .6 Section 05 50 00: Metal Fabrications
- .7 Section 07 55 00: Single-Ply Roofing - Installation of acoustic batt insulation

1.3 REFERENCE STANDARDS

- .1 Conform to the Ontario Building Code.
- .2 CSA-S136-12, North American Specification for the Design of Cold-Formed Steel Structural Members.
- .3 CSA-S16-14, Design of Steel Structures.
- .4 CSA-W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
- .5 CSA-W59-13, Welded Steel Construction (Metal Arc Welding).
- .6 Canadian Sheet Steel Building Institute Standards (CSSBI) for Steel Roof Deck, 10M and Composite Steel Deck, 12M except where specified otherwise.

1.4 QUALIFICATIONS

- .1 Any organization undertaking to weld under this Contract shall be certified by the Canadian Welding Bureau on the requirements of CSA W47.1.
- .2 Welders engaged in this work shall furnish proof that they have successfully carried out welding of gauge metal.

1.5 DESIGN CRITERIA

- .1 Design deck in accordance with the requirements of the Ontario Building Code to support loadings shown on the drawings.
- .2 Conform to all CSSBI requirements, CSSBI-10M Standard for Steel Roof Deck and CSSBI-12M Standard for Composite Steel Deck, all latest editions, where applicable unless otherwise required by drawings or specifications.
- .3 Compute structural capacity of steel deck using working stress design limit states design.
- .4 Deflection under specified live load to not exceed 1/360 the of span.
- .5 Design deck anchorage to the supporting framework or walls to safely resist net uplift forces shown.
- .6 Wherever possible, design units to span over three or more supports in order to obtain increased rigidity.
- .7 Where applicable, design and install deck units to safely sustain uplift forces due to wind during erection until the concrete slabs are placed.
- .8 Design framing for openings or holes through the deck up to 16" maximum width measured perpendicular to the span of the deck.

1.6 SHOP DRAWINGS

- .1 Prepare shop and erection drawings of all work to the Consultant for review in accordance with Section 01 33 00, Submittals.
- .2 Clearly indicate decking plan, types, profile, dimensions, core thickness, anchorages, connection to supports and spacing, projections, openings and reinforcement details and accessories.
- .3 Each drawing submitted to bear the signature and stamp of qualified Professional Engineer registered in the Province of Ontario.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Deck: Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy (Galvanealed) by the Hot-Dipped Process to ASTM A653M-17 SS Grade 230 with Z275 zinc

protection coating for interior surfaces not exposed to weather, unpainted finish, as indicated on the structural drawings.

- .2 Accessories: Cover plates, cell closures and flashings of galvanized sheet steel with minimum base steel thickness of .076 mm (22 gauge). Metallic coating same as deck material.
- .3 Primer: Zinc rich, ready mix to CGSB 1.181-99.

2.2 TYPES OF DECKING

- .1 Roof Deck: Base steel thickness 0.91mm (0.036" or 22 gauge), 38mm (1½") deep profile, non-cellular, with interlocking side laps.
 - .1 Acceptable Manufacturers
 - .1 Vic West Steel Inc., RD938.
 - .2 Canadian Metal Rolling Mills Ltd., S-15.
 - .3 Agway Metals Inc., RD36
 - .4 Canam Steel Works Inc., C-832.
 - .5 Ideal Roofing Company Ltd. IRD-150
 - .2 Acoustic Deck: Base steel thickness 0.91mm (0.036" or 22 gauge), 38mm (1½") deep profile, non-cellular, perforated on vertical face of flutes, interlocking side laps.
 - .1 Acceptable Manufacturers as listed for roof deck.
 - .2 Provide complete quantity of Flute Filler Insulation for acoustical deck to Roofing Trade for installation.
 - .3 Refer to Roof Framing Plan and Architectural Drawings.
- .2 Floor Deck: Fabricated from ASTM A653M SS Grade 230 galvanized steel, with zinc coating Z275 Galvanneal, as designated by ASTM A635M.
 - .1 Nominal steel core thickness of flute profile shall be 0.91 mm minimum.
 - .2 Composite Deck profile to have integral lugs on the vertical face of the flutes and interlocking side joints.
 - .3 Provide all closure plates, stiffeners edge strips etc.
 - .4 Acceptable products for 75mm (3") high-bond composite deck is Vic West Steel Inc. HB 30V and 38mm (1 ½") high bond composite deck is Vic West

Steel Inc. HB 93B. or approved equals of manufacturers listed for roof deck above.

3.0 EXECUTION

3.1 GENERAL

- .1 Design, detailing, fabrication and erection in accordance with CSA-S136.
- .2 Deck work in accordance with Canadian Sheet Steel Building Institute Standards (CSSBI) for Steel Roof Deck, 10M except where specified otherwise.
- .3 Welding in accordance with CSA W59 except where specified otherwise.
- .4 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel decks and/or CSA W55.3 for resistance welding.
- .5 Refer to General Notes on drawings regarding metal deck.

3.2 ERECTION

- .1 Erect steel deck in accordance with manufacturer's instructions and erection drawings.
- .2 The lower end of the first course sheets shall be welded to supports in the 1st, 3rd and 5th row corrugations. Roof deck shall be attached to supporting steel by means of electric arc welding, to the manufacturer's specification and minimum 20mm ($\frac{3}{4}$ ") diameter plug welds. Lap ends to 50mm (2") minimum and over supports.
- .3 Immediately after deck is permanently secured in place, touch up metallic coated top surface with primer where burned by welding.
- .4 Install cover plates over changes in deck direction, where deck is in same plane.

3.3 OPENINGS

- .1 No reinforcement is required for openings cut in deck which are smaller than 150mm (6") square.
- .2 Frame deck openings with any side 150mm to 300mm (6" to 12") as recommended by manufacturer, except as otherwise indicated.
- .3 For deck openings with any side greater than 300mm (12") and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.4 CONNECTIONS

- .1 Install connections in accordance with CSSBI Steel Roof Deck, 10M and in accordance with design requirements for diaphragm action.

END OF SECTION

05 41 00-Structural Metal Stud Framing

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 Wind Bearing Studs include:
 - .1 Wall studs subjected to lateral loads (no axial load other than self-weight and the weight of applied finishes).
 - .2 Steel bridging.
 - .3 Top and bottom track.
 - .4 Head and sill members.
 - .5 Stud, bridging and track connections.
 - .6 Top and bottom track connections to main structure.

1.2 RELATED SECTIONS:

- .1 Section 03 20 00: Concrete Reinforcing
- .2 Section 03 30 00: Cast-in-Place Concrete – Grout under base plates
- .3 Section 04 80 00: Masonry Assemblies
- .4 Section 05 12 00: Structural Steel
- .5 Section 05 31 00: Metal Deck
- .6 Section 05 50 00: Metal Fabrications
- .7 Section 09 21 16: Gypsum Board Assemblies

1.3 REFERENCED STANDARDS

- .1 Referenced standards, refer to the latest edition except where specified otherwise.
- .2 Where referenced standards conflict with this specification, this specification governs.
- .3 The following standards are referenced in this specification:

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A591/A591M-89 Specification for Steel Sheet, Electrolytic Zinc Coated, for Light Coating Mass Applications.
 - .2 ASTM A653/A653 M-00 Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Ion Alloy-Coated (Galvannealed) by the Hot Dip Process.
 - .3 ASTM A792/A792M-99 Specification for Steel Sheet, 55% aluminum-Zinc Alloy-Coated by the Hot Dip Process.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-G164-M92 (R1998) Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA W47.1.92 (R1998) Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W55.3-1965 (R1998) Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .4 CSA W59-M1989 (R1998) Welded Steel Construction (Metal Arc Welding) (Metric Version).
 - .5 CSA S136-94 (R2001) Cold Formed Steel Structural Members.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99 Ready-Mixed Organic Zinc Rich Coating
- .4 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 Canadian Sheet Steel Building Institute CSSBI 52M-91 Lightweight Steel Framing Binder.

1.4 DESIGN CRITERIA

- .1 Design shall be based on Limit States Design principles using factored loads and resistances.
- .2 Loads and load factors shall be in accordance with the National Building Code of Canada.
- .3 Resistances and resistance factors shall be determined in accordance with the National Building Code and CSA/CAN3-S136.
- .4 Conform to the requirements of specified fire rated assemblies.
- .5 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines

of bridging. Collateral sheathing is not to be used to help strain member rotation and translation perpendicular to the minor axis for wind bearing studs. Provide sufficient bridging to align members during erection and provide the necessary structural integrity during construction as well as in the completed structure.

.6 Maximum deflection shall conform to the following:

- .1 Exterior wall studs supporting materials susceptible to cracking (e.g. masonry veneer) L/720.
- .2 Top and bottom track deflection to be accounted for in the overall L/720 deflection criteria.

.7 Components to accommodate specified erection tolerances of the structure.

.8 The spacing of members shall not exceed the following:

Wall studs - 16" as indicated on drawings for straight walls.

.9 Allow for movement of the structure. Wind bearing stud end connections to accommodate roof and floor deflections such that the studs are not loaded axially.

.10 Connections between lightweight steel framing members shall be by bolts, welding or sheet metal screws.

.11 Resistances for sheet metal screws shall be based on the manufacturer's lower bound test values multiplied by the appropriate resistance factor, given in CAN3-S136.

.12 Exterior wall stud properties, Limit States Design for perforated Properties shall have a minimum stiffness as follows:

For 6" studs at 16" o.c:

I_x 2.38 (in⁴)

.13 Exterior wall track properties, top and bottom, Limit States Design of track shall be not less than 18 gauge for 6" tracks.

Refer to Materials, for minimum design thickness criteria.

.14 Unsheathed lateral support to be provided by bridging conforming to the following schedule:

Unsheathed Allowable Height (feet).	No. of Rows of Equally Spaced Bridging.
0.0 - 4.0	0
4.0 - 7.9	1
8.0 - 11.9	2
12.0 - 15.9	3
16.0 - 19.9	4

- .15 Track fastening to structural elements as specified by the Design Engineer for the Metal Stud System.
- .16 Clip angles used for steel bridging to be a minimum of 16 gauge and screwed or welded to studs and bridging.

1.5 SUBMITTALS

- .1 Submit mill reports covering chemical and mechanical properties, and coating designation of steel used in this work.
- .2 Submit one (1) representative piece of all framing component parts including mechanical fasteners if used. The length of pieces submitted need not exceed 12" (300mm). Tag pieces with the name of the part, the metal thickness exclusive of coating and the manufacturer.
- .3 Submit engineering calculations or data verifying the capacity of the members and the ability of the assemblies to meet the design requirements including brick connectors.
- .4 Submit shop drawings certified by a Professional Engineer in the Province of Ontario in accordance with Section 01 33 00 Submittals.
 - .1 Include all necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coating and materials. Include connection details for attaching framing to itself and for attachment to the structure. Indicate dimensions, openings, requirements of related work and critical installation procedures. Show temporary bracing required for erection purposes.
 - .2 Indicate design loads.
 - .3 Indicate type and spacing for fastenings of top and bottom stud runners to building structural components.
 - .4 Work in conjunction with project structural and mechanical drawings.
 - .5 Do not fabricate until all submittals in 1.5 are reviewed by the Consultant.
- .5 Submit two (2) copies of field review reports as required in Section 3.6.1.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Steel shall have metallic coatings that conform to one of the following ASTM Standards.
 - .1 A525M - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

- .2 A591 - Steel Sheet, Cold-Rolled, Electrolytic Zinc-Coated.
- .3 A792M - General Requirements for Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
- .2 Steel shall conform to the requirements of CAN3-S136 and shall be identified as to specification, type, grade and mechanical properties.
- .3 Wall members forming part of the exterior building envelope, including parapets, shall have a minimum coating of Z275 (G90) galvanizing in accordance with A525M. Other coatings (e.g. aluminum-zinc alloy) providing equal or better corrosion protection may be used.
- .4 Sheet metal screws shall have a minimum coating thickness of .008 mm of zinc or cadmium. Other coatings providing equal or better corrosion protection may be used.
- .5 Welding electrodes shall be of the 480 MPa minimum tensile strength series (eg. E480XXX, E480S-X).
- .6 Zinc rich paint for touching up welds and damaged metallic coatings shall conform to CGSB 1-GP-181M.
- .7 The design thickness, exclusive of coating shall not be less than 0.048" (1.2mm). Thicker material may be used to meet structural requirements. Material used to fabricate steel framing shall comply with the thickness tolerance requirements of CAN/CSA-S136.

2.2 STEEL STUD DESIGNATION

- .1 Colour Code steel studs in accordance with CSSBI 50M

Mils	Colour Code	Design Thickness	Gauge No.
33	White	0.0346	20
43	Yellow	0.0451	18
54	Green	0.0566	16
68	Orange	0.0713	14
97	Red	0.1017	12

2.3 MASONRY VENEER TIES

- .1 Coordinate all ties with Section 04 80 00 Masonry Assemblies.
- .2 Exterior Cavity Wall Reinforcement at Steel Stud Back-Up Walls:
 - .1 Provide Fero Stud Shear Connector with 'V'-Tie. Hot-dipped galvanized to ASTM A-153 Class B2. Provide insulation where required. Refer to details and specifications for insulation thicknesses.

- .3 Install all ties 400mm (16") vertically commencing at the first block course and at 400 mm (16") o/c horizontally, to maintain a masonry tie to the brick not exceeding 1 tie per 2 square feet (1550 mm) in all exterior brick and block cavity walls.

3.0 EXECUTION

3.1 GENERAL

- .1 Fabrication and erection shall conform to the approved shop drawings. Modifications required to accommodate as-built conditions (other than minor dimensional changes) shall be submitted for approval.
- .2 Be responsible for the co-ordination with mechanical and electrical trades and frame openings required.

3.2 WELDING

- .1 Companies engaged in welding shall be certified by the Canadian Welding Bureau to CSA Standard W47.1. Companies shall have welding procedures approved and welders qualified for the base material types and thicknesses that are to be welded.
- .2 Welds shall conform to CSA W59 and/or ANSI/AWS D1.3, whichever is applicable.
- .3 For materials less than 1/8" (3mm) thick, shop drawings may show nominal weld leg sizes. For such material, the effective throats of welds shall not be less than the thickness of the thinnest connected part.
- .4 Touch-up welds with zinc rich paint.

3.3 SCREWS

- .1 Steel screws shall equal or exceed the minimum diameter indicated on the shop drawings.
- .2 Penetration beyond joined materials shall be not less than 3 exposed threads.
- .3 Thread types and drilling capability shall conform to the manufacturer's recommendations.
- .4 Screws covered by sheathing materials shall have low profile heads.

3.4 FABRICATION

- .1 Where specified, provide cut-outs centered in the webs of members to accommodate services. Unreinforced cut-outs shall be limited to the dimensions in Table 1.
- .2 The effect of cut-outs on the strength and stiffness of the member shall be considered. Fabrication tolerances for members shall conform to Table 2.

- .3 The steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

3.5 ERECTION

- .1 Erection shall be by experienced qualified erectors, executing work in accordance with the Design Engineers approved Shop Drawings.
- .2 Methods of construction may be either piece by piece (stick-built) or by fabrication into panels (panellized) either on or off site.
- .3 Lightweight steel framing shall be erected true and plumb within the specified tolerances. Temporary bracing shall be employed wherever necessary to withstand all loads to which the system may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the stud system.
 - .1 The Erector shall ensure that during erection a margin of safety consistent with the requirements of the National Building Code and CAN3-S136 exists in the uncompleted structure.
- .4 Erection Tolerances
 - .1 For the purposes of this section, camber is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis, and sweep is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.
 - .2 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
 - .3 For track, camber shall not exceed 1/1000th of the member length.
 - .4 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 3/16" (4mm) for wind bearing studs.
 - .5 Spacing of studs shall not be more than +1/8" (3mm) from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.
- .5 Make all field measurements necessary to insure the proper fit of all members.
- .6 Cutting of members may be by saw or shear. Torch cutting is not permitted.
- .7 Holes that are field cut into lightweight steel framing members shall conform to the requirements of Section 3.4.1 and 3.6.6.
- .8 Insulation equal to that specified shall be placed in all jamb and header assemblies that will be inaccessible after their installation into the wall. Insure that insulation is kept dry and not compressed.

3.6 INSPECTION

- .1 The lightweight steel framing Design Engineer, responsible for the production of the shop drawings, shall provide periodic field review during construction and shall submit reports in accordance with Section 1.5.5.
 - .1 The cost of this field review shall be paid for by the Contractor.
- .2 Additional inspections and testing of materials and workmanship shall be carried out by a qualified Independent Inspection Agency appointed by the Architect.
 - .1 The cost of this additional inspection shall be paid for out of the Cash Allowances for Inspection and Testing.
 - .2 Any testing or inspection required by the Architect because of an error by the Contractor or due to departure from the contract documents by the Contractor, shall be paid for by the Contractor.
 - .3 Inspections shall include:
 - .1 Checking that mill test reports are properly correlated to materials.
 - .2 Sampling fabrication and erection procedures for general conformity to the requirements of the specification.
 - .3 Checking that the welding conforms to the requirements of Section 3.2.
 - .4 Checking fabrication members against specified member shapes.
 - .5 Visual inspections of all welded connections including sample checking of joint preparation and fit-up.
 - .6 Sample checking of screwed and bolted joints.
 - .7 Sample checking that tolerances are not exceeded during fit-up or erection.
 - .8 Additional inspections and testing of welded connections as required by CSA W59.
 - .9 General inspections of field cutting and alterations required by other trades.
 - .10 Submission of reports to the Architect, the Project Engineer, the Contractor and the authorities having jurisdiction covering the work inspected with details of deficiencies discovered.
 - .4 The Contractor shall provide the necessary cooperation to ensure that the inspection can be executed.

3.7 CLEAN UP

- .1 Remove all debris and excess material not required in the performance of the work immediately from the site.

END OF SECTION

05 50 00-Metal Fabrications

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 Fabrication, supply and installation of the miscellaneous metal fabrications work including metal work which is not specified elsewhere.

1.2 RELATED SECTIONS:

- .1 Section 05 12 00: Structural Steel
- .2 Section 05 31 00: Metal Deck

1.3 REFERENCES

- .1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- .2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
- .3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- .4 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer
- .5 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating
- .6 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel
- .7 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles
- .8 CAN/CSA-S16.1-01, Limit States Design of Steel Structures
- .9 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau)
- .10 CSA W59-1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Imperial Version)
- .11 CCD-047a-98, Paints, Surface Coatings

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading: Deliver, store, handle and protect materials in accordance with Div. 1 and Section 01 61 50 - Project Requirements.
- .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W 350W.

- .2 Steel pipe: to ASTM A53/A53M standard weight extra strong double extra strong, black galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Stainless steel tubing: to ASTM A269, Type 302 Commercial grade Seamless welded with AISI No. 4 finish.
- .7 Grout: non-shrink, non-metallic, flowable, 15 MPa at twenty four (24) hours.

2.2 FABRICATION

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

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2 to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: to CAN/CGSB-1.40.
- .4 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 ISOLATION COATING

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

2.5 SHOP PAINTING

- .1 Apply one (1) shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 70C.
- .3 Clean surfaces to be field welded; do not paint.

2.6 ANGLE LINTELS

- .1 Steel angles: galvanized prime painted, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted.

2.7 PIPE RAILINGS

- .1 Steel and Stainless Steel pipe: mm nominal outside diameter, formed to type, shapes and sizes as indicated.
- .2 Where steel, galvanize exterior pipe railings after fabrication. Shop coat prime interior railings after fabrication.

2.8 ELEVATOR PIT ACCESS LADDERS

- .1 Stringers: 51mm x 51mm x 6mm thick, steel angle
- .2 Steel Rungs: 20 mm diameter, welded to stringers at 305mm on centre
- .3 Brackets: sizes and shapes as indicated, weld to stringers at 1220 mm on centre, complete with fixing anchors
- .4 Galvanize finish for exterior, prime paint for interior
- .5 Galvanize exterior ladders after fabrication

2.9 CHANNEL FRAMES

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Weld 6mm thick steel strap anchors to channel jamb frame at mm on centre.
- .4 Finish: galvanized prime coat painted.

3.0 EXECUTION

3.1 ERECTION

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

3.2 PIPE RAILINGS

- .1 Install pipe railings to stairs.
- .2 Set railing standards in concrete. Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.3 ACCESS LADDERS

- .1 Install access ladders in locations as indicated.
- .2 Erect ladders clear of wall on bracket supports.

3.4 CLEAN UP

- .1 Remove all debris and excess material not required in the performance of the work immediately from the site.

END OF SECTION

05 51 29-Metal Stairs And Ladders

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 Fabrication, supply and installation of all stairs, railings, guards, landings at stairs as detailed on the drawings.

1.2 RELATED SECTIONS:

- .1 Section 05 12 00: Structural Steel
- .2 Section 05 31 00: Metal Deck
- .3 Section 05 21 00: Steel Joist

1.3 REFERENCES

- .1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- .2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
- .3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- .4 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer
- .5 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating
- .6 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel
- .7 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles
- .8 CAN/CSA-S16.1-01, Limit States Design of Steel Structures
- .9 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau)
- .10 CSA W59-1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Imperial Version)
- .11 CCD-047a-98, Paints, Surface Coatings

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading: Deliver, store, handle and protect materials in accordance with Section 01 33 50 - Project Requirements.
- .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W or W350 as applicable.
- .2 Steel pipe: to ASTM A53/A53M standard weight extra strong double extra strong, black galvanized finish.

- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Stainless steel tubing: to ASTM A269, Type 302 Commercial grade Seamless welded with AISI No. 4 finish.
- .7 Grout: non-shrink, non-metallic, flowable, 15 MPa at twenty four (24) hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured, to NAAMM, Metal stair Manual.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Shop coat primer: to CAN/CGSB-1.40. Final Paint by others.
- .2 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 ISOLATION COATING

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

2.5 SHOP PAINTING

- .1 Apply one (1) shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use primer as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease.
- .3 Clean surfaces to be field welded; do not paint.

2.6 PIPE RAILINGS AND GUARDS

- .1 Steel and Stainless Steel pipe: mm nominal outside diameter, formed to type, shapes and sizes as indicated.
- .2 Where steel, galvanize exterior pipe railings after fabrication. Shop coat prime interior railings after fabrication.

2.7 ROOF ACCESS LADDERS

- .1 Stringers: Channel or plate as indicated on the drawings.
- .2 Steel Rungs: Weld to top rail and stringers no greater than 100 mm on centre
- .3 Brackets: sizes and shapes as indicated.
- .4 Galvanize finish for exterior, prime paint for interior
- .5 Galvanize exterior ladders after fabrication

2.8 CHANNEL STRINGERS AND RISERS

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous stair stringer and landing perimeters.
- .3 Finish: galvanized prime coat painted.
- .4 Close all ends of stringers, rails and guards.

2.9 STEEL PAN

- .1 Fabricate stairs where detailed with closed steel pan treads and risers or tread only.
- .2 Steel pan shall be 10 gauge material bent to shapes indicated on the drawings.
- .3 Provide supporting angle framing as detailed.

2.10 GRATING LANDINGS AND STAIR TREADS

- .1 Refer to details for locations sizes and types of grating landing and stair treads.
- .2 Landing grating and stair treads as fabricated by Borden Metal Products (Canada) Ltd.

3.0 EXECUTION

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.

- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Consultant such as anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices are not acceptable. If required the devices to match finish and be compatible with material being attached or supported.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .8 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 STAIR AND PIPE RAILINGS

- .1 Install stairs and pipe railings in as large sections as feasible.
- .2 Grind smooth all field welds and prime accordingly.

3.3 ACCESS LADDERS

- .1 Install access ladders in locations as indicated.
- .2 Erect ladders clear of wall on bracket supports.
- .3 Co-ordinate the work with other trades (ie. Roofing Contractor).

3.4 CLEAN UP

- .1 Remove all debris and excess material not required in the performance of the work immediately from the site.

END OF SECTION

06 10 10-Rough Carpentry

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 All nailers, back-blocking, bucks, studs, furring, grounds, strapping, shims, etc.
- .2 Installations of doors, frames and hardware supplied under other sections of the specifications.
- .3 Coping blocking with plywood cover and plywood secured to masonry on roof vertical, sloped and horizontal surfaces.
- .4 Curbs, blocking and other openings through roof, etc.
- .5 All plywood exclusive of form work.
- .6 All nails, fasteners, bolts, washers, nuts, screws and rough hardware accessories.
- .7 Continuity membranes of Section 07 27 10 at roof parapet walls, up stands and tie ins to dissimilar materials of the building envelope.
- .8 Installations of various wood trim, frames, jambs, etc. supplied by millwork section and installed by this Section.
- .9 Supply and installation of all fire resistant $\frac{3}{4}$ " plywood backing for all electrical, communication, security panels etc.

1.2 RELATED SECTIONS:

- .1 Section 03 10 00: Concrete Forming and Accessories
- .2 Section 06 40 00: Architectural Woodwork
- .3 Section 07 21 13: Board Insulation
- .4 Section 07 21 19: Foamed-in-Place Insulation
- .5 Section 07 27 10: Air Barrier Systems
- .6 Section 08 11 14: Metal Doors and Frames
- .7 Section 08 14 10: Flush Wood Doors
- .8 Section 08 71 00: Door Hardware

- .9 Section 10 57 13: Hat and Coat Hooks

1.3 INSTALLATION BY THIS TRADE

- .1 This Contractor to familiarize himself with other sections of this specification to ascertain materials supplied by others but installed by Carpenter, including but not limited to the following items:
- .1 Doors and Hardware. Refer to Sections 08 11 14, 08 14 10 and 08 71 00.
 - .2 Various metal brackets supplied by Steel Contractor and others. Refer to Section 05 50 00 Metal Fabrications.
 - .3 Refer to 1.2 – WORK INCLUDED
 - .4 Refer to 1.3 - RELATED WORK

1.4 CO-OPERATION

- .1 Do all carpentry work and wood framing required by other trades. Refer to other sections of the specifications and to the drawings for pertinent information regarding such requirements.

1.5 DELIVERY, STORAGE AND PROTECTION

- .1 Protect materials from weather while in transit to the job site. Store materials on site in such a way as to prevent deterioration or loss of impairment of their structural and other essential properties.

1.6 MEASUREMENTS

- .1 Obtain measurements at the building for all items which are to be fabricated as required so that all parts of the work will fit together and will meet the conditions at the building.

1.7 BARRICADES

- .1 This Contractor shall provide all temporary protection, barricades, hoardings, etc. and miscellaneous items for building security, workmen and pedestrian traffic.

2.0 PRODUCTS

2.1 LUMBER GRADES AND QUALITY

- .1 All lumber shall be the grades specified in accordance with the standard grading rules of the National Lumber Grades Authority and C.S.A. Standard 0141 Softwood. Lumber shall be grade stamped by a grading organization or agency certified by the Canadian Lumber Standards Administrative Board.

- .2 All lumber shall be sound, thoroughly seasoned and free from warp that cannot be corrected in the process of bridging or nailing. Woodwork exposed to view shall be dressed four sides. Moisture content shall not exceed percentages allowed by the National Lumber Grades Authority.

2.2 FRAMING LUMBER

- .1 All framing lumber for joists, studs, plates, nailers, bucks, grounds, copings, blocking, roof platforms and curbs and furring and strapping shall be No. 2 S.P.F. to sizes and spacing shown on drawings. Pressure treated for roof copings, members in contact with masonry and curbs on roof.

2.3 ROUGH HARDWARE AND NAIL

- .1 Nails, spikes, screws, bolts, etc. shall be of sufficient size and type to rigidly secure all members in place.
- .2 Rough hardware and nails shall be in accordance with C.S.A. Specification B111-1974 and the National Building Code of Canada.
- .3 Galvanizing to CSA G164-M92. Use galvanized fasteners for exterior work and in all pressure treated lumber.

2.4 PRESSURE TREATED LUMBER

- .1 All pressure treated lumber to be in accordance with CSA Standards 080 Series-M89 and 080.1 M 1983.

2.5 PLYWOOD

- .1 All interior, non-painted plywood shall be G.I.S. Grade B fir plywood in accordance with CSA 0121-M78, $\frac{3}{4}$ " (19mm) thickness.
- .2 Interior painted poplar plywood G.I.S., Grade 'A' in accordance with CSA-0153-M1980.
- .3 Plywood for exterior use on roof. G.I.S. Exterior Grade B Fir Plywood in accordance with CSA 0121-M78 or CSA 0151. Thickness as per drawings.

2.6 FASTENERS

- .1 For anchorage of plywood and framing members to block masonry or concrete surfaces, Gripcon or Powers, Tapper mechanical fasteners, 1" embedment into the base material.
- .2 Bolts 12.7mm (1/2") diameter unless indicated otherwise, complete with nuts and washers.
- .3 Toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs recommended for purpose by manufacturer.

- .4 For anchorage of plywood and wood blocking to metal framing members, Powers, TEKS.
- .5 For metal to concrete, low velocity fasteners, Powers, Ramset or Hilti drive pins. Follow manufacturer's recommendations for spacing, edge distance and embedment.
- .6 For wood to metal deck, Powers Deck Screws, penetration through deck 12.7mm (1/2") minimum.
- .7 For wood framing members to structural steel, Powers, Drive Pins.
- .8 Other fastener types required performing the function intended and compatible to material being fastened and substrate to which it is fastened.

2.7 CONTINUITY MEMBRANE

- .1 Vapour retarder continuity strip on roof and parapet areas and up stand curbs to interface between vapour retarder installed by the roofing section and sheet applied air barrier as detailed on drawings and installed as a component of the roof carpentry.
- .2 Acceptable Product:
 - .1 Sopraseal Stick 1100 by Soprema.
 - .2 Bakor Blueskin SA.
 - .3 IKO Aquabarrier AVB.
 - .4 W.R. Meadows, Sealtight Air Shield.
 - .5 3M Air & Vapour Barrier 3015
- .3 Primers as recommended by membrane manufacturer.

3.0 EXECUTION

3.1 WORKMANSHIP

- .1 All work of this section shall be done by skilled and experienced mechanics in accordance with drawing details and manufacturers recommendations. This trade shall examine the work and materials installed by others insofar as it applies to this section and report to the Consultant any work improperly done or arranged to receive the work of this trade. Erection of materials to be carried out in a substantial manner to ensure a rigid, straight, square, plumb and horizontal lines level.

3.2 WOOD FRAMING IN GENERAL

- .1 Provide and install all items of wood framing, nailers, plywood, sheathing, blocking, etc. All wood members shall be anchored to masonry, steel and concrete construction as shown or required with anchor bolts, plates, washers, etc. of size sufficient to securely fasten all items and to the spacing as noted on the drawings.

- .2 Where bolt size and spacing is not shown or noted, members shall be secured with 1/2" bolts; not less than two in each member and for continuous nailers at 24" o/c. Lumber shall be bored for bolts and countersunk for heads. Provide washers under all bolt heads and nuts. All nails for exterior work shall be hot dip galvanize coated.
- .3 Fastening devices or adhesives shall be of appropriate type, used in sufficient quantity and in such manner to provide positive, permanent fastening which will not shift, work loose or fail due to vibration or other causes resulting from normal use of building. Install anchors or spacing to provide required load/stress carrying capacity. Do not use wood plugs.
- .4 Lay out neatly to keep exposed fastenings to minimum, evenly spaced and aligned. Do not use fastening which will cause spalling, cracking, or deformation or deterioration of material being fastened by or to. Follow manufacturer's recommended edge distances and embedment depths.
- .5 Do not use powder actuated fastening devices which are stressed in withdrawal without approval. Take stringent safety precautions when using powder actuated fastenings. Use only low velocity plunger-type devices.
- .6 Use screws, nails, staples and other similar driven fasteners suitable to materials to be joined and to conditions under which they are installed and used.
- .7 Ensure that in finished work fasteners are sized to take durable hold under stress to be encountered without damage to, or weakening of elements secured together, and that fastenings will not corrode or cause staining of exposed surfaces.
- .8 Treat all field cuts in lumber and plywood with special non-leachable field cut preservative by brush coating. Approved field-cut wood preservative is available from outlets distributing pressure treated wood products. Follow instructions and cautions on container.
- .9 Use exterior grade lumber in contact with masonry or concrete and on all roof areas.

3.3 WOOD ROOF COPING

- .1 Coping blocking and plywood covering shall be to thickness and profiles as detailed on the drawings, bolted or nailed with grip-con fasteners to masonry support and non-corrosive screws to metal stud framing members.
- .2 Stud framing to profiles and sizes indicated secured to deck with Red-Dek screws and structural steel with powder actuated drive pins.
- .3 Install rigid and batt insulation types indicated on the various details.

3.4 ROOF CURBS

- .1 Fabricate wood box curbs for exhaust fans and ducts through the roof as detailed on the drawings of pressure treated members and securely anchored to roof deck and angle sub-support frame. Exhaust fan and other curbs shall be verified with

manufacturers shop drawings for inside clear and outside dimensions before fabrication.

3.5 WOOD AND HOLLOW METAL FRAMES

- .1 Wood and hollow metal door and window frames shall be installed plumb, rigid and in true alignment. Securely brace all frames until built into walls. Secure base anchors on door and sidelight frames with a minimum of two (2) powder actuated drive pins at each vertical jamb or frame member to concrete floor slabs.

3.6 WOOD & HOLLOW METAL DOORS

- .1 Wood & hollow metal doors shall be installed in locations indicated on the drawings, complete with hardware listed in the Hardware Specification. Doors shall be prepared for glazing by the supplier. Wood and Hollow metal doors will be prepared to receive standard hardware items.

3.7 HARDWARE

- .1 Install all hardware as listed in the Hardware Specifications, Section 08 71 00. This Contractor shall include in the costs for adjusting, fitting of all hardware listed. Do all required drilling and tapping to install hardware.

3.8 FINISH WORK

- .1 Scribe and cut as required to fit abutting walls and surfaces to fit properly into recesses and to accommodate fixtures, outlets and other projecting, intersecting or penetrating objects.
- .2 Form joints to conceal shrinkage.
- .3 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .4 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .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.
- .6 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .7 Butt and cope internal joints of baseboards to make snug, tight joint. Cut right angle joints of trim members with metered joints.
- .8 Fit backs of finish trim members snugly to wall surfaces to eliminate cracks at junction of walls.

3.9 CONTINUITY MEMBRANE

- .1 Prime substrate to receive continuity strip membrane at rate recommended by the manufacturer.
- .2 Install peel and stick sheet membrane onto metal roof deck up face over top and down exterior face of exterior wall parapets to form a complete air/vapour barrier seal and interface to the roof vapour retarder and the exterior wall air/vapour barrier membrane.
- .3 Install peel and stick membrane to all dissimilar materials to ensure continuity of the air barrier at all locations.
- .4 Co-ordinate with materials and related sections comprised of the exterior building envelope to insure properly interface of the work required.

3.10 CLEAN UP

- .1 Remove all debris and excess material not required by the contractor promptly from the site in accordance with Section 01 74 11, Cleaning.

END OF SECTION

06 40 00-Architectural Woodwork

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 All cupboards, cabinets, open shelving, cabinet fillers, scribes, etc.
- .2 Supply and installation of all cabinet hardware.
- .3 Supply, installation and finishing of shelves.
- .4 All countertops.
- .5 Factory finish all millwork.
- .6 Supply and installation of custom millwork fabrications as shown on drawings.

1.2 RELATED SECTIONS:

- .1 Section 06 10 10: Rough Carpentry
- .2 Section 08 14 10: Flush Wood Doors
- .3 Section 08 71 10: Door Hardware
- .4 Section 09 21 16: Gypsum Board Assemblies
- .5 Section 09 30 13: Tile and Marble

1.3 CO-OPERATION

- .1 Schedule delivery and installation with the General Contractor. Ensure completion of finish work occurring in relation to the millwork has been completed and areas to receive millwork are ready and that the environmental conditions of the job site are conducive to the installation of the finished millwork.

1.4 SUBMITTALS / MOCK-UP

- .1 Provide Cover letter to submittals stating this trade is familiar with and will abide by best practices, standards and guidelines as set for the by the Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .2 Submit a cut away mock-up 16" wide upper and base cabinet with drawer complete with all hardware, showing construction of casework.

- .3 Submit manufacturer's data sheets and cut sheets for all wood and panel products and all cabinet hardware.
- .4 Provide samples of finish(es). Co-ordinate with Architect's colour schedule for stain and/or finish match and opaque finish colours.
- .5 Prepare shop and installation drawings for work of this Section and submit to the Architect for review before proceeding with millwork fabrication in accordance with Section 01 33 00, Submittals. Shop drawings to show all details required for the fabrication and installation of all work.
- .6 Provide Professional Engineer of Ontario stamped engineered drawings where panels are suspended from ceilings showing mounting details and hardware.

1.5 MEASUREMENTS & ENVIRONMENTAL CONDITIONS

- .1 Obtain field check measurements at the building site for all items to be fabricated.
- .2 Obtain sizes of Owner's equipment, fixtures and plumbing fixtures to be built into the work of this Section.
- .3 Confirm, maintain and keep logs that building site maintains 25 - 55% relative humidity at all times.

1.6 STANDARDS AND QUALIFICATIONS

- .1 The millwork contractor shall be a current member of the Architectural Woodwork Manufacturers Association of Canada (AWMAC). A copy of proof of membership shall be provided prior to issuance of shop drawings.
- .2 Do all millwork to Millwork Standards of Architectural Woodwork Manufacturers Association of Canada (AWMAC), latest edition, except where specified otherwise.

1.7 QUALITY ASSURANCE

- .1 Execute all work to Millwork Standards of Architectural Woodwork Manufacturers Association of Canada (AWMAC), latest edition.
- .2 All millwork shall be fabricated and finished where specified at the factory of this Contractor. The manufacturer must have at least ten (10) continuous years' experience in the fabrication of this type of woodwork.

1.8 SYSTEM DESCRIPTION

- .1 All casework shall be fabricated as individual cabinets. Each module shall be self-supporting and with gables finished to allow removal and relocation without any alteration to the basic unit.
- .2 All work shall be fabricated and finished at the factory of this contractor.

1.9 WORKMANSHIP AND MILLWORK

- .1 All millwork shall be of the highest quality of cabinet work to conform to design and details shown on the drawings.
- .2 Fabrication of all components shall be accomplished using competent labour, proper materials and equipment, and the workmanship shall conform to established standard practices, conditions, procedures and recommendations.
- .3 The temperature of panels and the area in which the actual fabrication is to take place should not be less than 18 Deg C. with a relative humidity of not less than 30% and not more than 80%.
- .4 All panels shall be clearly cut, sharply defined and mitres accurately made. Machining to be cleanly run, smoothly sanded and free of blemishes. All work shall be clean and free of adhesives, tool marks, scratches and surface blemishes.
- .5 Fastenings shall be concealed wherever possible. Face nails (where permitted) shall be as few as possible and as small as practical, neatly countersunk and filled.
- .6 All backing, dividers and gables shall be dado construction.
- .7 This Contractor has the option of using hardwood or veneer core plywood for nailers behind cabinet backing for securement of cabinets to walls.
- .8 Set all frames and interior wood finish of every kind plumb, level, straight and true with proper grounds and attached firmly to same.
- .9 Do not install any interior wood finish of any kind until all walls are thoroughly dry.
- .10 Provide matching scribes and fillers required to fit cabinets to abutting walls, columns and other projecting and intersecting objects. Corner L's shall have top enclosures.
- .11 All four (4) edges of adjustable shelving, doors, drawer fronts and face frames are to have edging type specified below. No exposed core.

1.10 GUARANTEE / WARRANTY

- .1 This Contractor shall guarantee his work for a period of one year from date of Substantial Performance of the work as certified by the Consultant and shall replace all defective work or equipment at no expense to the Owner.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Handle all materials and components carefully to prevent damage.
- .2 Do not deliver components to site until work of wet trades is complete and moisture readings of surfaces in proposed storage area is acceptable.
- .3 Protect components from moisture.

2.0 PRODUCTS

2.1 LUMBER GRADES AND QUALITY

- .1 All lumber shall be the grades specified in accordance with the standard grading rules of the National Lumber Grades Authority and C.S.A. Standard 0141 Softwood. Lumber shall be grade stamped by a grading organization or agency certified by the Canadian Lumber Standards Administrative Board.
- .2 All lumber shall be sound, thoroughly seasoned and free from warp that cannot be corrected in the process of bridging or nailing. Woodwork exposed to view shall be dressed four sides. Moisture content shall not exceed percentages allowed by the National Lumber Grades Authority.
- .3 Woodwork exposed to view shall be dressed four sides. Moisture content shall not exceed percentages allowed by the National Lumber Grades Authority.

2.2 HARDWOOD - GENERAL USE

- .1 Hardwoods for cabinet construction and miscellaneous locations shall be strength Group A conforming to the requirements of CSA CAN3-086-M84, kiln dried to a moisture content of 6%.

2.3 PLYWOOD (Veneer Core Panels)

- .1 Veneer Core panels for rough framing, misc. components and toekicks shall be 7-ply good-one-side veneer core plywood.

2.4 CABINET CONSTRUCTION

- .1 General:
 - .1 Gables and dividers to consist of 3/4" thick material core panels. Cabinet backs to be made from 3/8" thick material core panel.
 - .2 Cabinet backs to be dadoed into cabinet box on all four edges.
 - .2 Kicks: Unless as specifically noted/detailed, all cabinets to have separate framed bases of veneer core plywood. Note base type on drawings.
 - .3 Provide full panel sub-tops at all sink locations.
 - .4 Edging: All edges to match cabinets material and to be finished with 3mm (1/8") solid hardwood edge in species to match cabinet if Wood Veneer OR with laminated 3mm (1/8") PVC (poly-vinyl chloride) to match MCP selected if MCP.
- .2 Cabinet Drawer Boxes: Plywood for drawer box construction shall be Baltic Birch Plywood in accordance with CSA Standard 0153-M1980. Grade 'A' G.2.S. Thickness to be 12.7mm (1/2") or as detailed.

.3 Cabinet Exterior, Interior, Doors and Drawer Fronts and Shelves:

General:

- .1 All semi-exposed surfaces (interiors) to match exposed surfaces (exteriors) in all respects (i.e. material, species, grade, finish) unless noted otherwise specifically below.

MCP:

- .1 Locations / Rooms:
- .2 Product: Thermally Infused Melamine, particle core and melamine-impregnated decorative paper complying with ANSI/NEMA LD 3 performance.
- .3 No-Added Formaldehyde: Core material shall be Duraflake VESTA ULEF Particleboard by Arauco, Uniboard NU Green 2 Particleboard or Tafisa Tafipan Evolo.
- .4 Colours and textures including wood grain to be selected by the Architect.

2.5 PLASTIC LAMINATE

- .1 All plywood for substrate for plastic laminate counter tops and casework shall be poplar faced ply core in accordance with CSA Standard 0121-M78, Grade 'B' G.2.S. Plywood to be used at all counters. Thickness as indicated.
- .2 Plastic laminates shall be as manufactured by Cyanamid Canada Inc., Formica Products Division, Forbo/Arborite, Wilson Art, Nevamar or Pionite. Colour and finish will be as selected by the Architect from manufacturer's all patterns and solid colour ranges and finishes.
- .3 High-Pressure Laminate (HPL) Countertops – Water-Resistant Core:
- .1 Provide horizontal high-pressure decorative laminate (HPL) countertops fabricated with NEMA LD-3 Grade HGS (Horizontal, General-Purpose, Standard) laminate, minimum 0.048 in (1.2 mm) thick, factory bonded to a water-resistant composite wood core.
- .2 Core Material: Exterior-grade or moisture-resistant particleboard (MR PB) conforming to ANSI A208.1, Grade M-2, or Moisture-resistant MDF (MR MDF) conforming to ANSI A208.2
- .3 Backsplash of same material – Refer to drawings for cove, butt, etc.
- .4 Backing sheets to be Backer Grade used to balance sandwich construction. Use backer sheets of the same manufacturer as face sheets.
- .5 Provide typical mechanical tight joint fasteners at splines.

- .6 Seal all exposed edges and sink cut-outs with waterproof adhesive or sealer.
- .7 Confirm with Consultant type of post formed counter edges prior to shop drawing submittal.

2.6 TRIM & CASING

- .1 As indicated on drawings at miscellaneous areas, provide birch, maple or poplar for paint finish and birch for stain finish. All to be moulding grade, solid stock, sizes and profiles as shown on drawings.

2.7 ADHESIVES

- .1 Laminate: Adhesives shall be as recommended by the laminate manufacturer for the type of application and substrate.
- .2 Cabinet joint adhesive shall be in accordance with standard practice for the type of joint and location to obtain maximum strength of components.

2.8 CABINET HARDWARE

- .1 Equivalent hardware from other manufacturers may be acceptable subject to the approval of the Architect of samples and a list of items proposed.
- .2 Submit samples of all items in specified finish to the Architect to accompany any proposal for substitution.
- .3 Hardware shall not be ordered from the manufacturer until the samples have been approved by the Architect and the hardware and finishes supplied shall be identical to the approved samples.
- .4 Cabinet Hardware – the following shall be supplied where required by the drawings:

.1	Drawer and door pulls general	Stanley 44831/2	C26D
		CBH 220 3 1/2	C26D
		Richelieu 33204	195

- .2 Sliding door pulls Hafele # 152.00.727

- .3 Shelf standards and supports -Bain Bridge Manufacturing 5mm Supports. Mounting as per details. Locking Shelves System.

Note: Alternately the millwork contractor may provide adjustable shelving with 5 mm holes at 38 mm c/c using Richelieu 340.040-11 plastic support clips with steel pins.

- .4 Slides:

- .1 Drawer slides -Hettich #KA5632 full extension or Accu-Ride #3832 full extension. Maximize depth to suite drawer depth. Lengths as required.
- .2 Keyboard slides -Accu-Ride #2109 3/4" extension
- .3 Printer slides -Accu-Ride #9307 full extension
- .5 Cabinet Locks:
 - .1 Locks for 3/4" cabinet doors. Richelieu Series BP14000 Series or Hafele Cylinder Module System, polished nickel finish. Cam rotation and key removal position to suit installation location.
 - .2 Drawer locks, Hafele Cylinder Module System Locks for cabinets deadbolt type with interchangeable core or equal by Richelieu.
 - .3 Locker locks, Hafele cylinder deadbolt locking system 232.35.301 and 323.35.300 with strike plate, in polished nickel finish.
 - .4 Sliding door locks, Hafele push button lock 234.58.611.
 - .5 Provide locks for the cabinets as noted on the drawings.
 - .6 All cabinets are to be keyed alike within a given area with master key. Keyed alike areas will be determined during shop drawing review.
- .6 Elbow Catches - Ives 2A92.
- .7 Fully concealed hinges for 3/4" cabinet doors:
 - two hinges per leaf - for doors up to 36" in height.
 - three hinges per leaf - for doors over 36" to 48" in height.
 - four hinges per leaf - for doors over 48" in height.
- .1 Full overlay doors - Blum #75M55 clip-on - zinc die cast - self closing, 125 deg. opening with die cast mounting plates #173L810.
- .2 Screws for hinge and mounting plates - Blum System Screws No. 661.130 - 2G.
- .8 Bumpers for 3/4" cabinet doors - Richelieu-Martin BP 303-11, clear nylon, all doors.
- .9 Installation screws - Type suitable for substrate to which cabinet is installed and with chrome plated cup washers.
- .10 Tight joint fasteners - KV513 or KV 516.

- .11 Levellers - Richelieu 5390-30.
- .12 Grommets - 2 1/2" diameter - 2 piece set in black plastic.
- .13 Piano Hinges - Hafele 351.09.633 where noted on drawings.
- .14 Sliding door fittings - Top and bottom guide track -Hafele 404.14.904.
 - Top guide - Hafele 404.19.310.
 - Bottom guide - Hafele 404.20.330.
- .15 Ventilation grille - Grilles for air circulation at radiator cabinets to be supplied and installed by Millwork trade. Grilles to be clear anodized aluminum linear bar diffusers Model CT-580 by Titus Corp (titus-hvac.com). Ensure continuous grille installation with 6mm spacing for expansion contraction end-to-end. Grilles to cover entire top facing glazing and base, except where support is required. Rubber base infill at base as required by flooring trade. Kick height to be coordinated with grille width.
- .16 Standoff systems - CR Laurence - 1 1/2" diameter stainless steel standoff system with 1/2" base or 3/4" base as noted on drawings.
- .17 Installation Screws - Type suitable for substrate to which cabinet is installed and with chrome plated grommets.
- .18 Wood Filler - Plastic wood and C.G.C. drywall joint filler or approved equivalent.
- .19 Adhesives shall be Dual - 6 - 1875 (Industrial Grade) for laminate application. Cabinet joint adhesive shall be in accordance with standard practice for the type of joint and location to obtain maximum strength of components.

2.9 MAPLE BENCHES, SHELVES AND COAT HOOK STRIP

- .1 Maple bench seats, shelves and coat hook strips for Dressing Rooms finished thickness maple planking edges rounded as detailed.
- .1 Maple benches to be butcher block shelves and coat hook strips for Dressing Rooms finished thickness maple planking edges rounded as detailed.

2.10 ACCESSORIES

- .1 Rough hardware, wire nails, spikes and staples, etc. shall be in accordance with CSA Specification B111-1974 or latest. Screws to CSA B35.4-1972 or latest.

3.0 EXECUTION

3.1 INSPECTION

- .1 This Contractor shall inspect the site to assure that the work will interface with the work of other trades.

3.2 PREPARATION

- .1 Take all necessary measurements of spaces and conditions at the site to which the work must conform. Measurements shall be taken prior to the fabrication of the work to avoid delays in the project completion.
- .2 Confirm and log environmental humidity.
- .3 Orders for materials shall be placed with sufficient lead time so that material will be delivered to the fabricator within ample time to avoid delay of manufacturing of case work.

3.3 FABRICATION

- .1 Fabricate case work to AWMAC construction custom grade.
- .2 Work shall be finished and assembled at mill. All casework and trim shall be finished smooth and free from machine or tool marks that will show through the finish. All fastenings shall be countersunk to receive putty or blind nailed, glued or a combination of both.
- .3 Cabinets shall be fabricated plumb, level and square.
- .4 Assemble cases with properly machined and accurately cut panels to details and profiles as shown on the drawings. Provide construction with mortised and tenon or blind dado joints or dowelling.
- .5 Wood base, $\frac{3}{4}$ " fir plywood, 4" high to receive rubber base by others. Particleboard not acceptable.
- .6 Gables, bottoms, tops, doors and drawer fronts, $\frac{3}{4}$ " thickness material as per details, all exposed faces finished.
- .7 Backs, dado to gables, thickness as detailed.
- .8 Shelves, $\frac{3}{4}$ " or 1" thickness, material as detailed, banded all 4 sides.
- .9 Cabinet rails, $\frac{3}{4}$ " x 2" Birch face particle core plywood CW4 with 1/8" hardwood edging.
- .10 Cabinet mounting strips, $\frac{3}{4}$ " x 3½" hardwood or plywood.
- .11 Drawer boxes ½" thick solid Baltic birch plywood box construction, front, back and sides, top edged machined to radius, ¼" thick plywood bottoms.
- .12 Bottoms grooved into front and sides of box, glue and fix to sides and back.
- .13 Install and fit all cabinet hardware in the factory. Ensure all items properly operate for the function for which they were intended.

3.4 TRIM

- .1 Shape to profiles indicated.
- .2 Provide in lengths to minimize jointing at site.
- .3 Scribe and cut as required to fit abutting walls and fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

3.5 INSTALLATION

- .1 Set and secure materials and components in place, rigid, plumb and square.
- .2 Provide heavy duty fixture attachments for wall mounted and suspended cabinet work.
- .3 All securement fasteners shall have grommet plates (cup washers) to conceal and trim holes drilled for cabinet anchors.
- .4 Make allowances around perimeter where fixed objects pass through or project into casework to permit normal movement without restriction.
- .5 Provide cut-outs for appliances, outlet boxes, piping and other penetrations.
- .6 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .7 At junction of plastic laminate counter backsplash and adjacent wall finish apply small bead of sealant.
- .8 Site applied plastic laminate shall have joints offset from joints in core material. Adhere laminate over entire surface and install with hairline joints. Bevel all arises.
- .9 After installation fit and adjust all hardware. All hardware to function smoothly without binding.
- .10 The General Contractor shall be responsible for protection of installed casework.

3.6 CLEANING OF FINISHES

- .1 Remove all debris and excess material not required by the contract promptly from the site.
- .2 All finished woodwork shall be cleaned and touched up as required.

END OF SECTION

07 21 13-Board Insulation

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work of this section consists of furnishing all materials, labour and equipment necessary to complete the proper installation of all rigid insulation indicated on the drawings and specified herein, briefly described as follows:

- .1 All below grade perimeter foundation and under-slab insulation.
- .2 Cavity wall insulation at thru wall flashing conditions.

1.2 RELATED SECTIONS:

- .1 Section 03 30 00: Cast-in-Place Concrete
- .2 Section 06 10 10: Rough Carpentry
- .3 Section 07 21 16: Blanket Insulation
- .4 Section 07 26 13: Underslab Vapour Retarder
- .5 Section 07 21 19: Foamed-in Place Insulation
- .6 Section 07 27 10: Air Barrier
- .7 Section 09 21 16: Gypsum Board Assemblies

1.3 COORDINATION

- .1 Schedule delivery and installation with the General Contractor. Ensure that the work preceding installation is complete and areas are ready for the work of this section.

1.4 SHOP DRAWINGS

- .1 Prepare shop and installation drawings for work of this section to the Architect for review before proceeding with installation, in accordance with Section 01 33 00, Submittals.

2.0 PRODUCTS

2.1 FOUNDATION WALL RIGID INSULATION

- .1 At all in-wall Foundation Walls: HFC Compliant extruded polystyrene to CAN/ULC-S701-2017. Refer to drawings.
- .2 Thickness: 4" (100 mm)
RSI-Value: 0.88/25mm (R-5.0/inch) of thickness
Size: 1220 X 2440 MM (48" x 96") shiplapped.
Compressive Strength: 210 kPa (30 psi)
- .3 Acceptable Products:
 - .1 Dow Styrofoam, SM
 - .2 Celfortec, Celfort 300
- .4 Exposure: limit prolonged exposure to sunlight.

2.2 PERIMETER UNDERSLAB RIGID INSULATION - HORIZONTAL

- .1 Under slab insulation at building perimeter and porch areas as shown: HFC Compliant extruded polystyrene to CAN/ULC-S701-2017.
- .2 Thickness: 3" (76 mm)
RSI-Value: 0.88/25mm (R-5.0/inch) of thickness
Size: 1220 X 2440 MM (48" x 96") shiplapped.
Compressive Strength: 210 kPa (30 psi)
- .3 Acceptable Products:
 - .1 Dow Styrofoam, SM
 - .2 Celfortec, Celfort 300
- .4 Exposure: limit prolonged exposure to sunlight.

2.3 CAVITY WALL INSULATION AT FLASHINGS

- .1 Cavity wall insulation: HFC Compliant to ASTM C578 Type IV – Standard Specification for Rigid Cellular Polystyrene Insulation and to CAN/ULC S701-2017. Butt edge.
- .2 Thickness: Refer to Drawings
RSI Value: 0.97/25mm (R-5.6/inch) of thickness
Size: To suit details
Compressive Strength: 173 kPa (25 psi)
- .3 Acceptable Product:
 - .1 Dow Styrofoam Cavitymate
 - .2 Owens Corning, FORMULAR Codebord
- .4 Exposure: limit prolonged exposure to sunlight.

3.0 EXECUTION

3.1 WORKMANSHIP

- .1 Install insulation when building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Ensure that no gap is left between back side of insulation board and face of substrate/air barrier. Air gap will render insulation's thermal properties useless.
- .4 Fit insulation tight around exterior doors, windows and protrusions.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset joints with exterior gypsum board. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Insulation to be installed in cavity of exterior masonry/metal stud wall assemblies from foundations to top of parapet walls as shown on the drawings.
- .7 Important: Install insulation tight to air/vapour barrier so that there is no gap between back of insulation and face of substrate. Provide full and continuous contact with substrate.

3.2 PERIMETER FOUNDATION RIGID INSULATION

- .1 Install board on inner location of all exterior foundation walls. Extend vertically to depth as shown on drawings.

3.3 UNDER SLAB INSULATION & PERIMETER INSULATION

- .1 Do not proceed until the work of others is complete and surfaces are acceptable.
- .2 Install materials in accordance with manufacturer's printed directions, unless otherwise specified herein.
- .3 Install insulation horizontally and vertically below concrete slabs, to form a continuous thermal barrier. Refer to drawings for extent.
- .4 Install insulation in single layer with joints tightly butted ensuring that levels and grades are appropriate to final concrete pour for each location.
- .5 Cut and trim neatly to fit spaces and shapes.

3.4 CAVITY WALL INSULATION

- .1 Install cavity wall insulation using adhesive recommended by Air Barrier Manufacturer.

- .2 Cut and fit insulation to conform to thru wall flashings and masonry ties.
- .3 Apply approved foam insulation at open joints.
- .4 Install in conjunction with thru wall flashings, spray foam insulation at lintels etc. as detailed on the drawings.

END OF SECTION

07 21 16-Blanket Insulation

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work of this section consists of furnishing all materials, labour and equipment necessary to complete the proper installation of all spray applied insulation, rigid insulation and batt insulation as indicated on the drawings and specified herein, briefly described as follows:

- .1 Infill blanket/batt and semi-rigid batt insulation where detailed on the drawings.

1.2 RELATED SECTIONS:

- .1 Section 06 10 10: Rough Carpentry
- .2 Section 07 21 13: Board Insulation
- .3 Section 07 26 13: Underslab Vapour Retarder
- .4 Section 07 21 19: Foamed-in Place Insulation
- .5 Section 07 27 10: Air Barrier
- .6 Section 09 21 16: Gypsum Board Assemblies

1.3 COORDINATION

- .1 Schedule delivery and installation with the General Contractor. Ensure that the work preceding installation is complete and areas are ready for the work of this section.

1.4 SHOP DRAWINGS

- .1 Prepare shop and installation shop drawings for work of this Section to the Architect for review in accordance with Section 01 33 00, Submittals.

1.5 REFERENCES

- .1 CAN/ULC S702, Standard for Thermal Insulation Mineral Fibre for Buildings
- .2 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials

- .3 CAN/ULC S115, Standard Method of Test of Firestop Systems
- .4 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- .5 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

2.0 PRODUCTS

2.1 BATT INSULATION

- .1 Misc Framing at Parapets: Friction fit batts R-20 (R.S.I. 3.5), R-14 (R.S.I. 2.5) and R-12 (R.S.I. 2.1) complying with CAN/ULC-S702, Thermal Insulation Mineral Fiber for Buildings.
 - .1 Rockwool (Roxul) PLUS
 - .2 Alternate: by Johns Manville 'MinWool SAFB'.
- .2 Interior and Exterior Wall Partitions (encapsulated in steel stud): Friction fit batts R-20 (R.S.I. 3.5), R-14 (R.S.I. 2.5) and R-12 (R.S.I. 2.1) complying with CAN/ULC-S702, Thermal Insulation Mineral Fiber for Buildings. Sound attenuation batting for interior partitions:
 - .1 Rockwool (Roxul) AFB – fire resistant, water resistant and sound attenuating batt insulation with the following properties:
 - .1 Flamespread = 0
 - .2 Smoke-developed = 0
 - .3 To CAN/ULC S102, CAN/ULC S114, CAN/ULC C423
 - .2 Thickness to maximize stud size.
 - .3 Alternate: by Johns Manville 'MinWool SAFB'.
- .3 Safing and Fire stops: Friction fit batts complying with CAN/ULC-S702, Thermal Insulation Mineral Fiber for Buildings.
 - .1 Alternate: by Johns Manville 'MinWool Safing'.
 - .2 Or Equal by Rockwool.

3.0 EXECUTION

3.1 WORKMANSHIP

- .1 Install insulation in accordance with manufacturer's written recommendations.

- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Do not compress insulation to fit into spaces.

END OF SECTION

07 21 19-Foamed-In-Place Insulation And Air-Barrier System

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work of this section consists of furnishing all materials, labour and equipment necessary to complete the proper installation of all spray applied polyurethane foam insulation and air barrier system as indicated on the drawings and specified herein, briefly described as follows:

- .1 Spray applied polyurethane foam insulation applied to concrete block, exterior sheathing, transition membranes and metal surfaces within all exterior wall assemblies and other locations indicated. Products containing ozone-depleting substances including HFCs are not allowed.
- .2 Reinforced transition membranes at perimeter of all openings, back-up substrate material change joints and connection points.
- .3 Primers and sealants.
- .4 Bent gauge metal insulation stops around exterior wall openings where required.

1.2 RELATED SECTIONS:

- .1 Section 04 80 00: Masonry
- .2 Section 07 21 16: Blanket Insulation
- .3 Section 07 26 13: Underslab Vapour Retarder
- .4 Section 07 27 10: Air Barriers
- .5 Section 09 21 16: Gypsum Board Assemblies

1.3 REFERENCE STANDARDS

- .1 CAN/ULC - S705.1-Latest Edition Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material - Specification.
- .2 CAN/ULC-S705.2-Latest Edition Thermal Insulation- Spray Applied Rigid Polyurethane Foam, Medium Density - Application - Specification.
- .3 CAN/ULC-S770-Latest Edition Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.4 SUBMITTALS

- .1 Submit, construction details, data sheets and samples in accordance with Section 01 33 00 Submittals.
- .2 Submit the results of all tests conducted in order to verify if the quality of the insulation material is equal or superior to the requirements outlined in this Section in accordance with Section 01 45 00, Quality Control.
- .3 Submit the results of all CCMC air barrier system tests approved according to CCMC-TG-072709.01-15C or CAN/ULC S742 achieving a Rating of A1 conducted to prove that the air barrier system meets National Building Code requirements.

1.5 QUALITY ASSURANCE

- .1 The system applicator shall include and pay the costs for independent testing BASF 3rd party Quality Assurance Program by an approved testing agency.
- .2 Independent Testing Agency shall perform the following independent testing and submit a copy of all results to the Consultant.
 - .1 Witness density, adhesion and cohesion tests performed on site.
 - .2 Third party warranty.
 - .3 Examine application to verify the foam has been installed according to Specifications and ULC standard.
 - .4 Inspect applicators daily reports for the project.
 - .1 Sign the daily report of the inspected job.
- .3 Two tests shall be provided by the Independent Testing Association.

1.6 MOCK-UP

- .1 Create samples as follows (Coordinate all work with other trades through the General Contractor):
 - .1 Sample of 5 m² (54 sq. ft.) minimum, showing both inner and outer corners including transition membrane and must include the thru-wall flashing detail at the top of the foundation at masonry. This sample may be part of the completed work if deemed acceptable.
 - .2 Sample at window head showing adjacent work to ensure proper building envelope seal.
- .2 Using the insulation samples sprayed in-situ above, the following trials must be conducted on site for the first sample:

- .1 Verify core density.
- .2 Verify adhesion between the transition membrane and the substrate.
- .3 Verify cohesion/adhesion between the insulation material and the substrate.
- .4 Ensure results are in compliance and enter them in the MH daily report.

1.7 PROTECTION MEASURES

- .1 Ensure the work area is adequately ventilated.
- .2 Ensure continuous soffit ventilation of the work area, through a fresh air intake and the extraction of foul air, during the course of the application process and for 24 hours thereafter.
- .3 Install temporary partitions in order to prevent any effect on the ambient air - outside of the work area - from the sprayed-on insulation material.
- .4 Ensure all structures are well protected, in accordance with the manufacturer's recommendations.
- .5 Protect all adjacent surfaces and equipment against any damage that may be caused by dispersion and overspray of insulation material beyond prescribed limits.
- .6 All remaining foam particles must be flushed out of the spray gun on a daily basis. This procedure must be performed in areas designated for this purpose, and the contents of the empty containers neutralized according to the procedure established.

1.8 WAREHOUSING AND TRANSPORTATION

- .1 All materials should be delivered and stored in their original packaging bearing the manufacturer's name, quantity, CCMC numbers and other appropriate technical indicators or references. The expiry date must also appear on the containers.

1.9 APPLICATOR QUALITY ASSURANCE

- .1 The insulating material should be sprayed on by personnel who are certified by BASF. These certified individuals must have their certification cards in their possession and available for presentation upon request. If the specification calls for an air barrier system, the qualification card of the applicator must bear both a polyurethane foam applicator number and a certified air barrier system applicator number.
- .2 A copy of the BASF installation manual or guide for the application of sprayed on polyurethane foam should be kept onsite. In cases of transition membrane installation, a copy of the manufacturer's installation manual or guide is required.

- .3 For Air Barrier System Cavity Wall Applications:
- .1 Conduct tests daily on both core density and cohesion/adhesion to the substrate, following procedures established by BASF. The results of these tests are to be entered in the daily report forms.
 - .2 Once the curing time required by the membrane manufacturer has elapsed, a test should be conducted to verify adhesion between the membrane and the substrate. All adhesion tests should be performed using COM-TEN INDUSTRIES Series 301N1M equipment or an equivalent. If adhesion is lower than the required minimum of 103 kPa (15 psi), the membrane must be mechanically fastened.
 - .3 Adhesion tests to be conducted on all corners and building angles, as well as at the wall/cement slab intersections. Do one test on every wall that is less than 30m (100') in length. For walls that are between 30 and 60 m (100 and 200') in length, two tests should be conducted. If the wall is more than 60 m (200') long, do one test every 30 m (100'). If it is not possible to conduct any adhesion tests on the cement slab, the membrane should be mechanically fastened. Repeat this procedure at the wall-roof intersections.
 - .4 Verify the adhesion of the transition membranes at the perimeters of all openings. If the project comprises more than 10 openings, adhesion tests should be conducted on 15% of them. For jobs comprising 10 or fewer openings, 30% of these should undergo adhesion tests.
 - .5 Adhesion tests should be performed on the transition membranes at every tenth column or beam.
 - .6 Adhesion tests are not required if the membrane is a fastened mechanically.
 - .7 Access to the job site by any BASF or MH representative should be permitted for the purposes of technical assistance or verifying operator certification or the quality of the polyurethane foam application.
 - .1 Arrange for site reviews by Manufacturer's authorized agent. Schedule the number of site reviews in accordance with the following schedule:

Coverage Area, sq. m. (sq. ft.)	No. of Site Reviews
1 – 2,323 (1 – 25,000)	1
2,324 – 4,645 (25,001-50,000)	2
4,646 – 6,968 (50,001 – 75,000)	3
over 6,968 (over 75,000)	4+

- .8 The BASF CANADA INC. AIR BARRIER SYSTEM Report (CCMC #13659) must be completed by the certified applicator.

1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Only spray the insulating material if the surface and ambient air temperatures are within the manufacturer's prescribed limits, i.e., - 10°C to + 35°C (+ 14°F to + 95°F).
- .2 Surfaces to be covered with polyurethane foam must be clean and dry, as required by CAN/ULC-S705.2. Since adhesion of the polyurethane foam is of the utmost importance, the substrate must be free of all frost, dust, oil, grease, oxidation, or any other element that may affect this property, nor should it present a high moisture content.
- .3 Metallic surfaces should be checked to ensure no oxidization has occurred. Use of a primer is strongly recommended. Refer to the manual.
- .4 Use the transition membranes specified in this Section. These membranes should be installed in compliance with the manufacturer's recommendations. Adhesion of the transition material to the substrate must be sufficient to resist the stress applied by the polyurethane foam during the curing time (in summer, ± 24 hours and in winter, ± 48 hours).
- .5 All of the following stages must be completed before spraying on the foam:
 - .1 anchoring to masonry
 - .2 furring, unfinished window frames
 - .3 All gypsum sheathing in place
 - .4 all mechanical and electrical work

1.11 CONDITIONS OF USE

- .1 Follow the manufacturer's written instructions when spraying the polyurethane foam (refer to BASF's technical product documentation, application guide section).
- .2 The manufacturer's recommendations should be followed with regard to outside air temperature and substrate conditions (refer to BASF's manufacturer data).
- .3 Spray the foam in consecutive layers of no less than 12.5 mm (½") and no more than 50 mm (2") thick each, or to a maximum thickness as recommended by the manufacturer, until the total specified thickness is achieved.
- .4 All excessively wide joints should be covered before applying the polyurethane spray.
- .5 Install transition membranes in all places recommended in Section 3 of BASF's technical product documentation.

- .6 Polyurethane foam should be sprayed with a tolerance of +6/-0 mm (+1/4"-0") in relation to the specified thickness.
- .7 When spraying polyurethane foam, the formation of sub-layer air pockets should be avoided.
- .8 Avoid spraying the foam on any surfaces other than those indicated. Use dropsheets or masking tape to protect other surfaces.
- .9 Once the foam has hardened, remove all overspray from non-prescribed surfaces while at the same time trying not to damage them.
- .10 Do not allow polyurethane foam, once applied, to be damaged during work by the other trades, unless a prior agreement has been reached.
- .11 Ensure the subsequent coverage of the applied insulating foam will be completed within the manufacturer's prescribed time frame (refer to BASF's technical product documentation, Section 3).
- .12 The polyurethane foam should be sprayed in overlapping layers, so as to obtain a smooth, uniform surface.
- .13 When applying on a flat surface of more than 30 lineal meters (100 lineal feet) in either direction, apply the first layer in 3 m (10') strips at 1m (3') intervals. After the curing period ($\pm$ 4 hrs.) has elapsed, spray the polyurethane foam on the unfilled spaces. The same procedure is applicable in cold weather, for a minimum surface area of 15 lineal meters (50 lineal feet).
- .14 Do not spray polyurethane foam any closer than 75 mm (3") from heating, vents, steam pipes, recessed lighting fixtures and other heat sources. Do not spray the insides of any exit openings or electrical junction boxes (refer to the MH/NECA manual).
- .15 In temperatures below +10°C (+50°F), transition membranes should be fastened mechanically.
- .16 All mechanical fixtures should be covered with polyurethane foam in order to reduce thermal bridges. This can be achieved through the use of a galvanized spring clip for drywall, screwed 200 mm (8") OC through the membrane.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Insulation: Closed cell, spray-applied rigid cellular polyurethane foam air barrier and thermal insulation, medium density meeting the requirements of CAN/ULC S705.1-15, utilizing a HFO blowing agent with GWP<1, having a valid EPD (environmental product declaration) and reporting Long Term Thermal Resistance (LTTR) as tested to CAN/ULC S770-09, with the following physical properties:
 - Density (ASTM D-1622): = 28.9 kg/m³ (1.8 lb/ft.³), minimum

- Thermal resistance: Aged R-Value Long Term Thermal Resistance (LTTR)= R-22 min for 4" thickness. Or other based on the drawing location
 - Dimensional stability (ASTM D-2126): % volume change after 28 days as per the standard CAN/ULC S705.1:
 - 0.2 @ -20°C (-29°F)
 - 8.9 @ 70°C (158°F) @ 97± 3% RH
 - 1.7 @ 80°C (176°F)
 - Flame spread classification (CAN/ULC-S102, including S127): <500
 - Compressive strength (ASTM D-1621): 10% parallel to rise = 201 kPa (29.2 psi)
 - Tensile strength (ASTM D-1623): 325 kPa (47.1 psi)
 - Open cell content (ASTM D-2856): <1%
 - Water absorption (ASTM D2842) by volume: 6%
 - Water vapour permeance (ASTM E-96): <60 ng/Pa.s.m² (Note: This result refers only to the core density, not to the assembly stage (refer to BASF's technical product documentation).
 - Smoke developed: <500
 - VOC results during the curing period were below the detectable limit after 24 hrs.
 - Product reference: WALLTITE v.5 or WALLTITE XL01 by BASF Canada Inc.
- .1 Alternate Product, provided all performance and testing services are equal:
- .1 Heatlok Soya HFO by Demilec Canada.
 - .2 Carlisle SealTite One
 - .3 Insulthane Extreme by Elastochem
- .2 Primers: As recommended in the BASF Technical Manual, taking into account the type and condition of work surfaces.
- .3 Transition Membrane:
- .1 Sheet reinforcement membrane shall be modified bitumen Blueskin SA by Henry Bakor.
 - .2 Top of masonry ledges use Blueskin TWF by Henry Bakor.
 - .3 Coordinate work with Air Barriers and transition membrane section.
- .4 Insulation Stops:
- .1 At perimeter of all exterior wall openings where insulation terminates install bent gauge galvanized steel insulation stops.
 - .2 Material: 18 ga jambs / head and 12 ga sills galvanized steel to ASTM Z275 or aluminum zinc alloy coated steel to ASTM AZ150.
 - .3 Size: 3" x Insulation Thickness in Inches (75 x IT mm) x Lengths required.
 - .4 Fasteners to substrate:

- .1 To masonry or concrete: Powers Tapcon Screws or Drive Pins.
- .2 To metal stud assemblies: Self drilling, self-tapping sheet metal screws, non-corrosive finish of adequate lengths to penetrate gypsum board sheathing and stud framing.
- .5 Sealants
 - .1 At the edge of the membrane and top of foundation wall, Bakor 570-05.
 - .2 At all openings, provide continuous sealant as specified elsewhere.

3.0 EXECUTION

3.1 PREPARATION

- .1 Ensure all surfaces are clean, dry and free of oil, wax, grease, dirt, excess mortar, rust, oxidization and other contaminants.
- .2 Ensure new concrete has cured for a minimum of 14 days and is dry.
- .3 Prime all surfaces to receive self-adhering transition membranes as recommended by the manufacturer.
- .4 Install bent gauge galvanized steel insulation stops around perimeter of exterior wall openings and other locations where a stop for the insulation is required.

3.2 TRANSITION MEMBRANE APPLICATION

- .1 Apply reinforcement membrane to prepared surfaces.
- .2 Apply reinforcement membrane to all control joints, wall penetrations, connections of masonry block or gypsum sheathing to steel or concrete; plywood to steel or concrete, all beams, window and door frames, roof parapets and all other connections.
- .3 Apply membranes centred over joint.
- .4 Roll self-adhering membranes with hard steel or polypropylene hand roller to ensure full contact.
- .5 Connect to all windows, door connections by mechanically fastening through a metal bar or strap, or provide properly designed sealant joint.
- .6 Lap sheet membranes a minimum 3" on each connection substrate and overlap at joints a minimum of 2".
- .7 Use Bakor TWF type membrane for through-wall flashing at top of foundation wall and flashing of lintels at all openings, shelf angles in walls and other areas to be insulated to complete the air barrier system continuity.

- .8 Apply sealants to membrane at top of foundation walls and around all openings using products specified and in accordance with BASF Typical Construction Details for masonry and gypsum board (steel structure).

3.3 SPRAY APPLIED POLYURETHANE FOAM INSULATION/AIR BARRIER SYSTEM

- .1 Spraying should be done using a positive displacement pump with preset ratios specially designed for use with rigid polyurethane foam. Follow the directions for use and the cleaning and maintenance procedures set out in the equipment manufacturer's manual.
- .2 Apply foam in accordance with the Application Guide for the Insulation/Air Barrier System.
 - .1 ULC: ULC ER-41037
- .3 Thickness of applied insulation per the drawings. Aged R-value Long Term Thermal Resistance to be as per manufacturer's published data for thickness required.
- .4 Refer to drawings should alternate thickness be required at a particular detail location.

END OF SECTION

07 26 16-Underslab Vapour Retarder

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED:

- .1 Supply and installation of underfloor vapour retarder.

1.2 RELATED SECTIONS:

- .1 Section 03 20 00: Concrete Reinforcing
- .2 Section 03 30 00: Cast-in-Place Concrete

1.3 REFERENCES

- .1 ASTM D1709 - 09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- .2 ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- .3 ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
- .4 ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .5 ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- .6 ASTM F1249-01 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.4 SUBMITTALS

- .1 Comply with Section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's product data and application instructions.

1.5 QUALITY ASSURANCE

- .1 Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapour retarder.
- .2 Obtain vapour retarder materials from a single manufacturer regularly engaged in manufacturing the product.

- .3 Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

1.6 PRECONSTRUCTION MEETING

- .1 Pre-Construction Meeting: Convene one week prior to installation of underslab vapour retarder. Attendees to be as follows: - Architect, Engineer, General Contractor, Vapour Retarder Installer, and Vapour Retarder Manufacturer to discuss the application in detail.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- .2 Store materials in a clean, dry area in accordance with manufacturer's instructions.
- .3 Protect materials during handling and application to prevent damage or contamination.
- .4 Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness at intervals of no more than 220cm (85").

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Product not intended for uses subject to abuse or permanent exposure to the elements.
- .2 Do not apply on frozen ground.

2.0 PRODUCTS

2.1 MANUFACTURER

- .1 W. R. MEADOWS OF CANADA

2.2 MATERIALS

- .1 Plastic Vapour Retarder
 - .1 Performance-Based Specification: Vapour retarder membrane shall be manufactured from virgin polyolefin resins, and when tested according to all requirements of ASTM E1745, shall meet the following minimum performance requirements:
 - .1 Maximum Water Vapour Permeance (ASTM E154 Sections 7, 8, 11, 12,13, by ASTM E96, Method B or ASTM F1249).
 - .1 As received: 0.0063 perms.
 - .2 After Wetting and Drying: 0.0052 perms.

- .3 Resistance to Plastic Flow and Temperature: 0.0057 perms.
- .4 Effect Low Temperature and Flexibility: 0.0052 perms.
- .5 Resistance to Deterioration from Organisms and Substances in Contacting Soil: 0.0052 perms.
- .2 Puncture Resistance (ASTM D1709): >3,200 grams.
- .3 Tensile Strength ASTM E154, Section 9: 72 Lb. Force/Inch
- .4 Acceptable product: PERMINATOR 15 mil by W. R. MEADOWS.

2.3 ACCESSORIES

- .1 Seam Tape
 - .1 High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4" (100 mm). Perminator Tape by W.R. Meadows.
- .2 Pipe Collars
 - .1 Construct pipe collars from vapour retarder material and pressure sensitive tape per manufacturer's instructions.

3.0 EXECUTION

3.1 SURFACE PREPARATION

- .1 Prepare surfaces in accordance with manufacturer's instructions.
- .2 Level, tamp, or roll earth or granular material beneath the slab base.

3.2 EXAMINATION

- .1 Examine surfaces to receive membrane. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.3 APPLICATION

- .1 Install the vapour retarder membrane in accordance with manufacturer's instructions and ASTM E 1643–98.
- .2 Unroll vapour retarder with the longest dimension parallel with the direction of the pour.
- .3 Lap vapour retarder over footings and seal to foundation walls.
- .4 Overlap joints 152mm (6") and seal with manufacturer's tape.
- .5 Seal all penetrations (including pipes) with manufacturer's pipe boot.

- .6 No penetration of the vapour retarder is allowed except for reinforcing steel and permanent utilities.
- .7 Repair damaged areas by cutting patches of vapour barrier, overlapping damaged area 152mm (6") and taping all four sides with tape.

END OF SECTION

07 27 10-Air Barriers

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 Supply and installation of Air Barriers and accessories.

1.2 RELATED SECTIONS:

- .1 Div 03 – Concrete
- .2 Section 06 10 10: Rough Carpentry
- .3 Section 07 21 13: Board Insulation
- .4 Section 07 21 16: Blanket Insulation
- .5 Section 07 21 19: Foamed-in-Place Insulation
- .6 Section 07 50 00: Roofing
- .7 Section 07 42 10: Aluminum Composite Panel
- .8 Section 07 42 13: Metal Cladding
- .8 Section 07 92 10: Sealants and Caulking
- .9 Section 08 11 14: Metal Frames
- .10 Div 08: Metal Frames, Aluminum Frames, Aluminum Curtain Wall, Windows, Overhead Doors
- .11 Section 09 21 16: Gypsum Board Assemblies

1.3 REFERENCE STANDARDS

- .1 ASTM E96/96M-[2010], Standard Test Methods for Water Vapor Transmission of Materials.
- .2 ASTM E2178 - [2011], Standard Test Method for Air Permeance of Building Materials.
- .3 ASTM E2357 - [2011], Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit product data including manufacturer's literature for air barrier materials and accessories, indicating compliance with specified requirements and material characteristics.
 - .1 Submit list on air barrier manufacturer's letterhead of materials and accessories to be incorporated into Work.
 - .2 MSDS report.
 - .3 Include product name.
 - .4 Prior to commencing the work, submit manufacturers' complete set of standard details for the air/vapour barrier membrane systems showing a continuous plane of air tightness throughout the building envelope which are specific to this project. Generic details are not acceptable.
 - .5 Include contact information for manufacturer and their representative.
- .3 Samples:
 - .1 Submit 100 x 100mm minimum sample of air barrier.
 - .2 Submit 300mm long minimum sample of flashing tape.
- .4 Test Reports:
 - .1 Submit evaluation service reports or other independent testing agency reports showing compliance with specified performance characteristics and physical properties.
- .5 Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer representative's site visit and inspection.

1.5 DELIVERY STORAGE AND HANDLING

- .1 Deliver materials and accessories in air barrier manufacturer's original packaging with identification labels intact and in roll diameter and width to suit project.
- .2 Storage and Handling Requirements: Store materials off ground and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
- .3 Ensure air barrier materials are protected from sunlight and UV radiation.
- .4 Store in original packaging until installed.

- .5 Long Term Storage: Store air barrier materials between 16 °C and 27 °C, and at relative humidity between 40 and 60 %.

1.6 SITE CONDITIONS

- .1 Apply air barrier only when substrate conditions are between minus 18 °C and plus 65°C.
- .2 Service Temperature Range: Minus 40 °C to plus 80 °C.
- .3 Cover air barrier within 6 months of installation.

1.7 MOCK-UP

- .1 Construct mock-up in accordance with Shop Drawings, Product Data, Samples and Mock-Ups.
- .2 Provide mock-up of air/vapour barrier materials.
- .3 Where directed by Consultant, construct typical exterior wall panel, 6'-0" (2m) long by 6'-0" (2m) wide, incorporating substrate, window frame, attachment of insulation and showing air/vapour barrier membrane application details.
- .4 Allow 48 hours for inspection of mock-up by Consultant before proceeding with air/vapour barrier work. Mock-up may remain as part of the work.

1.8 WARRANTY

- .1 Project Warranty: Refer to Contract Conditions for project warranty provisions.
- .2 Warranty period: 1 years commencing on Date of Substantial Performance of Work.

2.0 PRODUCTS

2.1 TRANSITION MEMBRANE SYSTEM

- .1 Entire system (primary and accessory components, etc) shall be of same manufacturer for parapets, openings, gap transitions and the like.
- .2 System Bakor-Henry: Primary sheet air/vapour barrier membrane shall be Blueskin® SA manufactured by Bakor, a SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film. For application temperatures down to minus 12 degrees C use Blueskin® SA LT. Membrane shall have the following physical properties:
 - .1 Thickness: 1.0 mm (40 mils)
 - .2 Air leakage: <0.005 L/s.m² @ 75 Pa to ASTM E283-91
 - .3 Water vapour permeance: 1.6 ng/Pa.m².s (0.03 perms) to ASTM E96
 - .4 Low temperature flexibility: -30 degrees C to CGSB 37-GP-56M
 - .5 Elongation: 200% to ASTM D412-modified

- .3 No alternatives allowed.

2.2 MASONRY THRU-WALL FLASHING MEMBRANE (AT FOUNDATION LEDGES)

- .1 Through-wall flashing membrane (Self-Adhering) shall be Blueskin® TWF manufactured by Bakor, a SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, having the following physical properties:
- .1 Colour: Yellow
 - .2 High Temperature Stability: 110 degrees C min. to ASTM D5147 (resistance to flow)
 - .3 Thickness: 1.0 mm (40 mils) min
 - .4 Air leakage: < 0.005 L/s.m² @ 75 Pa to ASTM E283-91
 - .5 Water vapour permeance: 1.6 ng/Pa.m².s (0.03 perms) to ASTM E96
 - .6 Low temperature flexibility: -30 degrees C to CGSB 37-GP-56M
- .2 No alternatives allowed.

2.3 PRIMERS FOR BAKOR PRODUCTS

- .1 Primer for self-adhering membranes at all temperatures shall be Blueskin® Primer manufactured by Bakor, a synthetic rubber based adhesive, quick setting, having the following physical properties:
- .1 Colour: Blue
 - .2 Weight: 0.8 kg/l
 - .3 Solids by weight: 35%
 - .4 Drying time (initial set): 30 minutes
- .2 Primer for self-adhering membranes at temperatures above -4 degrees C shall be Aquatac™ Primer manufactured by Bakor, a polymer emulsion based adhesive, quick setting, having the following physical properties:
- .1 Colour: Aqua
 - .2 Weight: 1.0 kg/l
 - .3 Solids by weight: 53%
 - .4 Water based, no solvent odours
 - .5 Drying time (initial set): 30 minutes at 50% RH and 20 degrees C

2.4 MASTICS & TERMINATION SEALANTS FOR BAKOR PRODUCTS

- .1 Liquid air seal mastic and insulation adhesive shall be Air-Bloc 21 or 230-21 Insulation Adhesive manufactured by Bakor, a synthetic, trowel applied, rubber based adhesive, having the following characteristics:
- .1 Compatibility: With air/vapour barrier membrane, substrate and insulation
 - .2 Air leakage: 0.013 L/s.m² @ 100 Pa
 - .3 Water vapour permeance: 1.17 ng/Pa.m².s. (0.03 perms)
 - .4 Long term flexibility: CGSB 71-GP-24M
 - .5 Chemical resistance: Alkalis and salt
- .2 Termination sealant shall be POLYBITUME® 570-05 Polymer Modified Sealing Compound manufactured by Bakor, a polymer modified sealing compound having the following characteristics:

- .1 Compatible with sheet waterproofing membrane and substrate
- .2 Solids by volume: 70%
- .3 Vapour permeance: 2.9 ng/Pa.m².s, ASTM E96
- .4 Complies with CGSB 37.29
- .5 Remains flexible with ageing
- .6 Chemical resistance: Alkalis, calcium chloride, mild acid and salt solutions

3.0 EXECUTION

3.1 BAKOR PRODUCTS EXECUTION

.1 EXAMINATION

- .1 Verify that surfaces and conditions are ready to accept the work of this Section. Notify Consultant in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.
- .2 All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill spalled areas in substrate to provide an even plane. Strike masonry joints flush.
- .3 New concrete should be cured for a minimum of 14 days and must be dry before air/vapour barrier membranes are applied.
- .4 Where curing compounds are used they must be clear resin based without oil, wax or pigments.

.2 PRIMER FOR TRANSITION AND THROUGH-WALL FLASHING MEMBRANE (SELF ADHERING)

- .1 Apply primer for self-adhering membranes in strict accordance with manufacturer's printed instructions.
- .2 Apply primer to all areas to receive transition sheet and/or through-wall flashing membrane, as indicated on drawings by roller or spray and allow minimum 30 minute open time. Primed surfaces not covered by self-adhering transition membrane or self-adhering through-wall flashing membrane during the same working day must be re-primed.

.3 TRANSITION MEMBRANE (SELF-ADHERING)

- .1 Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.
- .2 Tie-in to window frames, aluminum screens, hollow metal door frames, spandrel panels, roofing system and at the interface of dissimilar materials as indicated on drawings.
- .3 Promptly roll all laps and membrane with a counter top roller to effect seal.

- .4 Ensure all preparatory work is complete prior to applying liquid applied air vapour barrier membrane.
- .4 THROUGH-WALL FLASHING MEMBRANE & DAMPPROOF COURSE (SELF-ADHERING)
 - .1 Apply through-wall flashing and dampproof coursing membrane in accordance with CSA A371-94 Masonry Construction for Buildings; along the base of masonry veneer walls, over windows, doors and other wall openings required to be protected.
 - .2 Applications shall form a continuous flashing membrane and shall extend up a minimum of 8" (200mm) up the back-up wall.
 - .3 At the end of each work day, seal the top edge of the membrane where it meets the substrate using liquid air seal mastic. Trowel apply a feathered edge to seal termination and shed water.
 - .4 Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. At locations where flashing terminates or intersects wall openings including door frames, 'end dam' flashing to protect openings and redirect water out. Trim off excess as directed by the Consultant.
 - .5 Apply dampproof coursing membrane over slabs on grade, prepare and prime surfaces, align and position membrane between slab and masonry block work.
 - .6 Align and position the leading edge of self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls, self angles and other substrates to be protected, partially remove protective film and roll membrane over surface and up vertically.
 - .7 Press firmly into place. Ensure minimum 2" (50mm) overlap at all end and side laps. Promptly roll all laps and membrane to affect the seal.
 - .8 Ensure all preparatory work is complete prior to applying self-adhering through-wall flashing membrane.
 - .9 Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the Consultant.
- .5 AIR/VAPOUR BARRIER MEMBRANE
 - .1 Apply self-adhering membrane complete and continuous to prepared and prime substrate in an overlapping shingle fashion and in accordance with manufacturers recommendations and printed instructions. Stagger all vertical joints.

- .2 Align and position self-adhering membrane, remove protective film and press firmly into place. Ensure minimum 50 m overlap at all end and side laps. Promptly roll all laps and membrane with a counter top roller to affect the seal.
- .3 At the end of each work day, seal the top edge of the membrane where it meets the substrate using liquid air seal mastic. Trowel apply a feathered edge to seal termination and shed water.
- .4 Tie-in to window frames, aluminum screens, hollow metal door frames, spandrel panels, roofing system and at the interface of dissimilar materials as indicated on drawings. Refer to manufacturers' standard details.
- .5 Ensure all projections, including wall ties, are properly sealed with a caulk application of liquid air seal mastic.
- .6 Mechanically fasten membrane through securement bars to all window, door, louvers and curtain wall sections as recommended by membrane manufacturer where proper adhesion and bonding cannot be maintained.
- .7 Membrane applied to the underside of substrate surfaces shall receive special attention on application to ensure maximum surface area adhesion is obtained.
- .6 INSPECTION
 - .1 Notify Consultant when sections of work are complete so as to allow for review prior to installing insulation.
- .7 PROTECTION OF FINISHED WORK
 - .1 Air-Bloc and Blueskin® membranes are not designed for permanent exposure. Product designed to withstand reasonable job site exposure, however, good practice calls for covering as soon as possible.
 - .2 Damp substrates must not be inhibited from drying out. Do not expose the backside of the substrate to moisture or rain.
 - .3 Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane. Drying time varies depending on temperature and relative humidity. At a temperature of 20 degrees C and 50% RH, protect air barrier work against wet weather conditions for a minimum of 24 hours.

3.2 CLEANING

- .1 Remove all debris and excess material not required by the contract promptly from the site.

END OF SECTION

07 42 10-Aluminum Composite Panels

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 The work under this section shall include all labour, materials, equipment and services for the design, fabrication and erection of the pre-finished composite aluminum building panels as indicated on the drawings and herein specified, briefly described as follows:
 - .1 All composite aluminum building panel facing for fascia, parapet, column covers, wall panels, soffits etc. where detailed on the drawings.
 - .2 Sealants.
 - .3 Back pan sheet metal air barrier and membrane tie-ins where shown.
 - .4 Accessories of trim, connection hardware, sub-girt assemblies, impaling clips, insulation, brackets, fasteners, coatings, membrane flashing, cutouts, etc., required in the framing, support, insulation and installation of panels.

1.2 RELATED WORK

- .1 Section 04 80 00 Masonry Assemblies.
- .2 Section 05 12 00 Structural Steel.
- .3 Section 05 41 00 Structural Metal Stud Framing
- .4 Section 06 10 10 Carpentry & AVB Continuing Strips.
- .5 Building Thermal Insulation.
- .6 Section 0721 19 Polyurethane Spray Applied Insulation Air Barrier System.
- .7 Section 07 55 65 Roofing Membrane.
- .8 Section 07 92 10 Sealants & Caulking.
- .9 Section 08 50 50 Aluminum Windows.
- .10 Section 08 44 13 Glazed Aluminum Curtain Wall.

1.3 REFERENCES

- .1 ASTM International:
 - .1 ASTM D1781 Standard Test Method for Climbing Drum Peel for Adhesives.
 - .2 ASTM D1929 Standard Test Method for Determining Ignition Temperature of Plastics.
 - .3 ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .4 ASTM E108 (Modified) Standard Test Methods for Fire Tests of Roof Coverings.
 - .5 ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .6 ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .7 ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - .8 ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Wall, and Doors by Uniform Static Air Pressure Difference.
- .2 American Architectural Manufacturers Association (AAMA):
 - .1 AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 - .2 AAMA 508 Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.
- .3 International Organization for Standardization (ISO):
 - .1 ISO 9001-2015 Quality Management Systems - Requirements.
- .4 National Building Code of Canada.
- .5 Ontario Building Code.

1.4 DESIGN CRITERIA

- .1 The design, fabrication and erection of a complete composite building panel system is the responsibility of this subcontractor and is based on the performance criteria specified.
- .2 The specified composite aluminum building panel assembly shall be designed to accommodate the structural inter-story drifts and movements without breakage, dislodgement or connection failure.
- .3 The composite aluminum building panel system, including connection hardware and all related components shall be designed to withstand local positive and negative windload pressure at a maximum L/60 under full loading for material and L./175 for the framing system.
- .4 Provide noiseless thermal movement as may be caused by a temperature with National Building Code of Canada, 1995 Edition and the Ontario Building Code Climatic Information, Local Temperature range 2.5% without oil-canning, warping, buckling failure of joint seal under stress on anchors and fasteners. Fabrication,

assembly and erection procedures shall take into account ambient temperature range at the time of the respective operation.

- .5 Allow for movement in cladding caused by deflection in structure.
- .6 Design wall system to allow the unobstructed movement of air between the exterior and interior sides of metal cladding in accordance with industry accepted Rain Screen Principles.
- .7 Ensure panel exhibits no permanent deformation when subjected to design criteria specified.
- .8 The system shall provide clear internal paths of drainage in order to drain any trapped moisture to the exterior, discharging moisture in a manner avoiding staining of architectural finishes, collecting puddles, formation of unsafe icicles and dripping onto pedestrians.
- .9 Assembly shall be weatherproof and prevent infiltration of water into the system.
- .10 Fasten panel assembly to the building structure in a manner, which transmits all loads to the main structure without exceeding the capacity of any fastener.
- .11 Individual panels shall be removed without disturbing other adjacent panels.
- .12 Panels shall not warp or buckle when under full design loads.
- .13 All fastenings and connectors shall be concealed. Connection and attachment devices shall not cause staining to cladding or other adjoining materials. The anchorage system shall be designed so that the panels are secured yet “free-floating”, to accommodate expansion and contraction.
- .14 The system shall not incorporate sealant between the panel joints.
- .15 Anchor assemblies or connection hardware, including all related connections, tracks, girts, fasteners, etc., for and related to the cladding panels shall be designed, engineered, furnished and installed as required in compliance with the specified design, and performance criteria. All such items are schematic and do not necessarily indicate the exact required scope, type, shape or profile. Location and methods of anchoring panels shall be the subcontractors responsibility, who shall design the cladding panels and connections to suit each specific condition in a manner complying with requirements specified.

1.5 SUBMITTALS

- .1 Submit shop drawings and samples for the work of this Section in accordance with Section 01 33 00, Submittals.
- .2 Submit shop drawings detailing construction, assembly, profiles, materials, reinforcement installation for all conditions, method of sealing and flashing, sub-framing and accessories, colours and finishes. All materials, recommendations and detailing describing the proposed use, design and erection procedures for all anchorage shall be documented and fully described on shop drawings.

- .3 Engineered shop drawings shall be prepared, signed and sealed by a professional engineer registered in the Province of Ontario, attesting to the ability of the composite aluminum building system to withstand specified loads.
- .4 Submit 600 mm x 600 mm finished sample panel representative of panel, attachments, reinforcement, construction and finish to the consultant for approval.
 - .1 Submit two (2) 300 mm x 300 mm samples of each colour or finish selected by the consultant.
- .5 Submit copies of composite aluminum building panel fabricator's current system testing (by a third party independent testing agency) to ASTM E283-84 for air infiltration, ASTM E331-86 for water infiltration, and ASTM E330 structural performance for proposed system, prior to bid closing.
- .6 Submit (third party) independent testing agency certification documentation of engineering properties of composite aluminum building material to include Overall Weight, Bond Strength to ASTM C272-91 and Peel Strength to ASTM D1781-76.

1.6 QUALITY ASSURANCE

- .1 Workers shall have a minimum five years in panel manufacture and on site installation proven experience in this type of work and be approved by the manufacturer for installation of their products.
- .2 If requested, submit proof of having successfully completed composite aluminum building panel assemblies of design and size similar to this project within the proceeding five (5) years.

1.7 MOCK-UP

- .1 Approved representative mock-up sample panel shall serve as a quality standard and workmanship to be expected during field quality control inspections of the work be executed and at completion. Mock-up may remain as part of finished work.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver all materials to the site and store in original packages with manufacturer's seals and labels intact.
- .2 Observe proper handling procedures during fabrication, delivery and installation to prevent damage. Replace damaged materials that are stained, cracked, bent, chipped, scratched or otherwise unsuitable for installation at no additional cost to the Owner.
- .3 Store panels under cover and raised above ground to prevent damage and kept free from dampness and element extremes until required for installation.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Environmental conditions for installation of materials shall be within the limits prescribed by the manufacturer of the product.

1.10 WARRANTY

- .1 Panels: Against oil canning or buckling due to thermal movement or building structure deflections.
 - .1 Panel Integrity: 10 years
- .2 Panel Finish: Against non-uniform fading during warranty period to extent that adjacent panels have a gloss and/or colour greater than originally-accepted samples approved by the consultant, pitting or other corrosion resulting from natural elements in local atmosphere, discolouration, staining or streaking of panel surface.
 - .1 Standard 20 and 30 year warranty for coatings as noted.
- .3 Sealant: Against adhesive or cohesive failure of joints between dissimilar material, fluid, migration, dirt pick-up, dirt runoff, chalking or visible colour change on surface or cured sealant.

1.11 MAINTENANCE

- .1 Submit manufacturer's documentation covering care, cleaning and maintenance of panels for incorporation in the owner's operating and maintenance manuals.

2.0 PRODUCTS

2.1 COMPOSITE ALUMINUM PANELS

- .1 Manufacturer: Mitsubishi Chemical America, Inc. ALPOLIC Division
- .2 Quantities: Size, profile, configuration, layout, and extent of composite building panels is as shown on the drawings.
- .3 Factory Finish: FEVE / Lumiflon-based fluoropolymer resin coating that meets or exceeds values in AAMA 2605.
- .4 Coating thickness: 2 coats (1.0 mil total) or 3 coats (1.5 mil total) depending on Series to AAMA #605-4.3.
- .5 Colours / Finishes / Types:
 - .1 Colour-1 – Alpolic – Mica Grey (4-MZG-50.) 30-Year Finish. Standard Core PE.
 - .2 Colour-2 – Alpolic - HWH White (4-HWH-50.) 20-Year Finish. Standard Core PE.

- .6 Protective film: All composite aluminum building panel finish surfaces shall be protected with a protective plastic-coated film and is to be removed at completion of the work and prior to substantial performance of the project.

2.2 PERFORMANCE AND MATERIAL

- .1 Composite Metal Panels:
 - .1 Core: Thermoplastic material that meets performance characteristics specified when fabricated into composite assembly.
 - .2 Face Sheets: Aluminum alloy 3105 H14, 0.020 inch (0.51 mm) thick and as follows:
 - .1 Coil coated with a fluoropolymer paint finish that meets or exceeds values expressed in AAMA 2605 where relevant to coil coatings.
 - .2 Coil coated with specified finish.
 - .3 Thermally bonded in a continuous process, under tension, to the core material.
 - .3 Bond Integrity: Tested for resistance to delamination as follows:
 - .1 Peel Strength (ASTM D1781): 22.5 in-lb/in (100 N-m/m) minimum.
 - .4 Fire Performance:
 - .1 Flamespread (ASTM E84): Class A.
 - .2 Smoke Developed (ASTM E84): Class A.
 - .3 Surface Flammability (Modified ASTM E108): Pass.
 - .4 V-O Rating (4 mm): Comply with UL 94.
 - .5 Product Transparency:
 - .1 Provide a Product Transparency Declaration (PTD) for the Composite metal panels.
- .2 Production Tolerances:
 - .1 Width: +/- 2 mm.
 - .2 Length: +/- .012" per ft (1 mm/meter).
 - .3 Thickness (4 mm Panel): +/- 0.008 inch (0.2 mm).
 - .4 Thickness (6 mm Panel): +/- 0.012 inch (0.3 mm).
 - .5 Bow: Maximum 0.5% length or width.
 - .6 Squareness: Maximum 0.2 inch (5 mm).
 - .7 Edges of sheets shall be square and trimmed with no displacement of aluminum sheets or protrusion of core material.
- .3 Panel Thickness: 4 mm (0.157"), or other recommended thickness requirements to meet project design performance.

2.3 SUB-FRAMING AND ANCHORS

- .1 Galvanized steel sub-girts, angles and brackets: manufactured from galvanized sheet steel in accordance with the requirements of ASTM A446M-89 Grade A with zinc coating designation of ASTM A525M-87, Z275, minimum thickness, 0.048" - 18 ga.

- .2 Anchors, concealed, stainless steel fasteners, type 304.

2.4 LINER SHEET

- .1 Galvanized sheet steel with a zinc coating classification of Z275 or AZ150, 20 gauge.

2.5 INSULATION & MOUNTING ANCHORS

- .1 Insulation: semi-rigid board, 4.0 lb/ft³ density to ASTM C303, Flame Spread 3, Smoke Developed 5, noncombustible in accordance with CAN/ULC-S102-M.
 - .1 Thickness: 4"
 - .2 R-Value: 16
 - .3 Size: 24" x 48"
 - .4 Acceptable Products: Rockwool CavityRock
- .2 Insulation anchors: Continental, Spindle, Insul-Anchors, 12 gauge, length as required, complete with washers.
- .3 Anchor adhesive: Tactoo Adhesive, GPA-72, formulated to bond insulation hangers to various substrates.

2.6 FLASHING / SEPARATOR SHEET

- .1 Bituthane 3000 self-adhering sheet.

2.7 ISOLATION COATING

- .1 Bituminous paint to CAN/CGSB-1.161-M91.

2.8 SEALANT

- .1 Type 'A' in accordance with Section 07915. Colour to Consultant's later selections.
- .2 For lap sealant of liner panels, one part non-skinning butyl rubber conforming to CGSB 19GP 21M.

2.9 FABRICATION

- .1 Machine fabricate all material in accordance with reviewed shop drawings with straight lines, square corners or smooth bends, free from twists, kinks, warps, dents, and other imperfections which may affect the appearance or serviceability.
- .2 Panels shall be flat within 0.8% of width and length, at 21degrees C in all directions across the surface. Panels shall not be more than 3.0 mm out of square when measured across the diagonal. Panel width shall not vary more than +0.203 mm.
- .3 Provide reinforced panels as required to meet the tolerances specified above.

- .4 System shall have a flush appearance from the exterior with no reveal other than the module joint width.
- .5 Panels shall be aligned with no lap or reveal other than joint width to permit expansion and contraction.
- .6 Thickness of the metal and details of assembly and support shall provide sufficient strength and stiffness to resist distortion of finish surface. Exposed edges and ends of metal shall be dressed smooth, free from sharp edges with no uniform minimum radius corners. Connections and joints exposed to weather shall be constructed to exclude water.
- .7 Fasteners shall be concealed.
- .8 Trim and flashing shall be factory fabricated ready for assembly.
- .9 Design and fabricate appropriate type, size, quantity and spacing of all sub-connectors, girts, fasteners and other anchorage devices as required to suit the specified standards.
- .10 Subgirts shall be perforated at regular intervals to permit drainage of cavity.

2.10 FINISHES

- .1 All exposed composite aluminum panels shall be based on approved sample panel colour selection submitted and Final Approval of full size representative sample mock-up constructed on site.
- .2 All exposed surfaces shall have factory-applied removable protective film.

3.0 EXECUTION

3.1 INSPECTION

- .1 Inspect all work of others upon which the work of this section depends and report in writing to the Consultant any defects which would impair the performance of the work.

3.2 ERECTION

- .1 All erection work is the responsibility of the manufacturer and is to be carried out by manufacturer's trained erection crew in accordance with the reviewed shop drawings, manufacturer's specifications and in compliance with the contract documents.
- .2 Erect panels plumb, true and level and in correct alignment with established lines and elevation shown on reviewed shop drawings.
- .3 Set all panels in locations shown on the details and shall be level, square and plumb with correct elevations and in alignment with other work.

- .4 Install all girts, clips, anchors, and flashing securely to surrounding construction spaced to afford maximum rigidity.
 - .1 Install galvanized sheet liner to steel studs back-up and seal with butyl sealant at all laps to form a continuous vapour barrier, where panels are detailed to be insulated. Refer to drawing details for wall locations where insulation is installed as part of the cavity wall system by other Sections.
 - .2 Install -girts over liner in locations required or direct to metal stud framing to support the aluminum panels and secure to sub-framing.
 - .3 Install insulation anchors (impaling clips) to sheet liner with adhesive spaced to adequately hold the insulation sheets to the installed liner and between sub-girt framing where panels are insulated by this Section.
 - .4 Install insulation by impaling over installed insulation anchors, install holding washers and bend end of anchor to secure insulation in place. Insulation shall be tightly fit between elements to provide a complete thermal barrier between exterior and exterior of building envelope.
 - .5 Provide holes for mechanical and electrical services, piping, louvers, lighting fixtures etc. penetrating panels. Provide watertight flanges, flashings, reinforcing and sealant around all penetrations exposed to weather and or shown on the drawings.
 - .6 Joints shall not be less than their dimensioned width or more than five percent Greater than their dimensioned width at any location along their full length and shall not be wavy, out of line or different width panel to panel.
 - .7 Installed panels shall not deviate from overall plane and alignment more than 1.5 mm in 900 mm. Adjacent panels shall not deviate from plane and alignment by more than 0.79 mm along their length.
 - .8 Install al parapet cap flashings of masonry, metal stud and curtain wall locations.

3.3 SEALANTS

- .1 Install sealant to penetrations through panels and at junctions with dissimilar materials in accordance with Section 07 92 10.

3.4 FIELD QUALITY CONTROL

- .1 The manufacturer's or suppliers professional design engineer shall be responsible for production of shop drawings and shall provide periodic inspections during construction as required.
- .2 At completion of the work, the manufacturer's or supplier's professional design engineer shall submit to the consultant copies of field review reports for each site visit made and a final signed and sealed letter of assurance of professional field review and compliance indicating that all composite building panels have been

installed in accordance with the manufacturer's specifications, the standards specified herein and the final reviewed shop drawings.

3.5 CLEANING

- .1 Remove manufacturer's protective film at appropriate time in advance of the date of substantial performance of the project. Review concurrently to ensure there is no damage or marring to the wall panels. Replace damaged or marred panels accordingly to the approval of the consultant.
- .2 Wash panels to remove surface dust, dirt, stains and marks on the panels caused by ambient environmental weather conditions and construction activities. Provide a clean installation of the work.
- .3 Use cleaners approved by the manufacturers of surfaces to be cleaned.
- .4 Remove tools, debris, equipment and surplus of materials from the site.

END OF SECTION

07 42 13-Metal Wall Panels

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work of this section consists of furnishing all materials, labour and equipment necessary to complete the proper installation of Metal Wall Panels.

- .1 Metal wall cladding as indicated on drawings. (Back side of parapets)
- .2 All required fasteners, sub-girts, clip assemblies and furring.
- .3 All necessary pre-finished, pre-formed flashings, closures, corners, drips, weather stripping and sealants necessary for a watertight job.
- .4 Galvanized sheet metal air barrier c/w air barrier membrane overlaps.
- .5 Insulation and hold tabs.

1.2 RELATED SECTIONS:

- .1 Section 05 41 00: Structural Metal Stud Framing
- .2 Section 07 21 13: Board Insulation
- .4 Section 07 21 19: Foamed-in Place Insulation
- .5 Section 07 27 10: Air Barrier
- .6 Section 09 21 16: Gypsum Board Assemblies

1.3 SITE INSPECTION

- .1 It shall be the responsibility of this Contractor to check the accuracy and alignment of the structure. If not within acceptable tolerances the matter shall be brought to the attention of the General Contractor and the Architect in writing before proceeding with the erection of the cladding/panels. Commencement of the work implies acceptance of job conditions and, therefore, responsibility of any remedial measures required if design intent is not met.

1.4 DESIGN STANDARDS

- .1 Determine the sectional properties of the cladding in strict accordance with all requirements of the Ontario Building Code Act, CSA S136 Design of Light Gauge

Steel Structural Members, Canadian Sheet Steel Building Institute (CSSBI)
Standards 10M and 20M.

- .2 The metal panels shall withstand all dead and live loads resulting from a combination of wind, suction, snow and other forces as defined in the Ontario Building Code Act and the National Building Code of Canada without exceeding the maximum working stress.
- .3 The deflection of wall cladding under live load at mid span shall be not more than 1/180th of the span where not backed by solid support.
- .4 Design and fasteners and method of attachment to withstand snow and wind loads and suction as defined in the Ontario Building Code Act and the National Building Code of Canada, job conditions and maintain a weather tight installation. Provide shop drawings stamped by a Professional Engineer registered in Ontario.
- .5 Where required provide closures to close off voids created by the cladding ribs.
- .6 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals or water penetration.
- .7 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with NRC "Rain Screen Principals".
- .8 Maintain following installation tolerances:
 - .1 Maximum variation from plane or location shown on approved shop drawings 10mm/10m of length and up to 20 mm/100m.
 - .2 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

1.5 QUALITY ASSURANCE AND SUBSTITUTIONS

- .1 Manufacturer and applicator of the Wall Cladding System shall demonstrate at least ten (10) years experience in fabrication and installation of Architectural Metal projects similar in scope. Applicator must be approved by the manufacturer.
- .2 Manufacturer and/or approved applicator must have the single source facility to provide:
 - .1 Total design of the Cladding System.
 - .2 Technical literature on tested Cladding Systems.
 - .3 Engineering and drafting facilities.
 - .4 Fabrication of Cladding System and associated components.

- .5 Technical representatives.
- .6 Field installation by approved certified erectors.
- .7 A warranty/guarantee as specified under this section.
- .8 All fabrication/installation drawings must bear the stamp of a professional engineer registered in the Province of Ontario.

1.6 SUBMITTALS

- .1 Indicate dimensions, wall openings, head, jamb, sill, corner detail, materials and finish, anchor details, compliance with design criteria and requirements of related work.
- .2 Prepare shop and erection drawings of all details and erection to the Consultant for review in accordance with Section 01 33 00, Submittals. Provide shop drawings stamped by a Professional Engineer registered in Ontario.
- .3 Submit samples (6" x 6") of prefinished metal sheet in colours and profiles selected by Architect for review prior to fabrication.

1.7 GUARANTEE/WARRANTY

- .1 System and Installation Warranty:
 - .1 Upon substantial performance of the project an industry standard guarantee/warranty shall be provided to the Owner for a period of two (2) years covering material, leaks and installation workmanship for the Metal Wall Cladding System.
- .2 Material Warranty:
 - .1 All material guarantee/warranty for prefinished metal components shall be subject to the terms and conditions set forth by the material coil producer.

1.8 HANDLING AND PROTECTION

- .1 Store all metal panel materials products in accordance with manufacturer's recommendations.
- .2 Protect pre-finished steel during fabrication, transportation, site storage and erection, in accordance with CSSBI Standards.

2.0 PRODUCTS

2.1 EXTERIOR CLADDING

- .1 The exterior cladding shall be fabricated from aluminum-zinc alloy (AZ) coated structural quality steel sheet, CSSBI 20M-91, Grade 33, base thickness .036 inches. Coating Designation AZ150 for painted finish.
 - .1 The prefinished wall and soffit cladding shall be the following:
 - .1 Vic West Steel Inc. - AD300R
 - .2 Approved alternates must have identical profile provided by:
 - .1 Peerless Enterprises
 - .2 CMRM
 - .3 Agway
 - 4 Ideal Roofing Company Ltd. Manufacturers
 - .2 Finish: The paint finish for wall cladding and soffit shall be SMP silicone modified polyester coating system (Weather XL / Signature) as manufactured by Vicwest. The unexposed side shall have a prime coat.
 - .3 Colour: 55174-Deep Grey. Final colour selection shall be confirmed with Consultant before ordering.

2.2 TRIM AND FLASHING

- .1 Trim and flashing shall be fabricated from the same material, thickness and finish as the respective cladding. Final colour selection shall be confirmed with Consultant before ordering.

2.3 CLOSURES AND SILLS

- .1 Notched metal closures and sills shall be provided to close off flutes of the exterior sheet at jamb head, sill and louvre openings duct penetrations as indicated on the drawings. Use foam and metal closures to suit selected profiles and to provide water-tight barrier.

2.4 FASTENERS

- .1 Fasteners shall be cadmium plated steel supplied in accordance with the manufacturer's standard to meet the loading requirements and to maintain a weather tight installation. Any exposed fasteners shall match the panel colour.

2.5 SEALANTS AND BACKER ROD

- .1 Concealed metal to metal sealant to be non-skinning butyl rubber-based sealant conforming to C.G.S.B. 19 GP 21M.
- .2 See Section Sealants and Caulking for sealant for exposed conditions.

- .3 Primers where required are to be as recommended by the sealant manufacturer.
- .4 Backer rod to be white non-absorbent round closed cell polyethylene. Rod shall be 25% wider than joint before installation.

2.6 GASKETS

- .1 Closed cell polyurethane foam, adhesive on two sides, release paper protected.

2.7 TOUCH-UP PAINT

- .1 As recommended by panel manufacturer.

2.8 ISOLATION COATING

- .1 Bituminous paint.

2.9 LINER SHEET

- .1 Galvanized sheet steel with a zinc coating classification of Z275 or AZ150, 20 gauge.

3.0 EXECUTION

3.1 ERECTION - WALL CLADDING PANELS

- .1 Provide all fastenings to completely install metal cladding and maintain a weather tight installation. All sealants shall be in accordance with Item 2.5.
- .2 Protect metal surfaces in contact with masonry mortar or other cementitious surface with isolation coating.
- .3 The exterior sheets shall be fastened to sub-framing with cadmium-plated fasteners. Exposed fasteners, where required, to be colour matched.
- .4 A ribbon of joint sealing compound shall be laid on the face of the supports at the top and bottom of the wall panels to provide an adequate seal.
- .5 All materials, articles and accessories incorporated in the work shall be of a type and quality specified herein and subject to the approval of the Architect. Methods of preparation, construction and installation of such materials, articles and accessories shall be in accordance with the C.S.S.B.I. Standard Code of Practice, manufacturer's printed specifications and as directed by the Consultant.
- .6 Final roof and fascia flashings by Roofing Section.

3.2 FIELD PAINTING

- .1 After pre-finished metal wall and soffit cladding systems have been erected, this Contractor shall repair all scars and abrasions of the finish to manufacturer's recommended method of touch-up repairs and as directed by Consultant.

3.3 CUT OUTS

- .1 All holes and cut outs in panels for louvers, scuppers, etc. are to be marked by trades involved and cutting of panels to be by this Contractor. Provide flashings around cutouts as detailed on the drawings and as required to insure a proper seal.

3.4 CLEANING OF PANELS

- .1 As the panels are erected, this Contractor shall "dry wipe" any dirt marks and remove any excess sealant, etc. from the wall panels.

3.5 SHIPPING & PACKAGING

- .1 Exercise care in packaging, shipping, storing, handling and placing the panels to prevent damage to impair the adequacy or appearance of the material in the finish structure.

END OF SECTION

07 51 13-Built-Up Bituminous Membrane Roofing

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 The work required under this section of the specifications shall include all labour, equipment and materials necessary to complete all Roofing & Sheet Metal and Associated Work as indicated on the drawings, specified herein and briefly described as follows:
 - .1 Four (4) ply membrane, hot-applied hybrid built-up asphalt roofing system on deck with roof surfacing.
 - .2 Vapour retarder.
 - .3 All roof insulation and tapered fibreboard underlay.
 - .4 Roof accessories, specialty flashings, mechanical equipment supports, devices etc.
 - .5 Supply, forming and installation of metal coping and base flashings.
 - .6 Sealants.
 - .7 Membrane underlayment at gas line supports.
 - .8 Walkway material.
 - .9 Warranties.

1.2 RELATED SECTIONS

- .1 Refer to Section 04 80 00: Masonry Assemblies
- .2 Refer to Section 05 41 00: Structural steel and miscellaneous metal work.
- .3 Refer to Section 05 31 00: Metal Deck.
- .4 Refer to Section 06 10 10: Parapet and coping framing/blocking and air barrier.
- .5 Refer to Section 07 21 16: Blanket Insulation
- .6 Refer to Section 07 42 13: Metal Wall Cladding

1.3 REFERENCE STANDARDS

- .1 Roofing and sheet metal work will be performed in conjunction with roofing membrane manufacturers written recommendations of the building code and the CRCA.
- .2 CSA-123.32.14 Standard for Dynamic Wind Up-Lift for roofing.
- .3 Factory Mutual Standard 4470 for corrosion resistance of fasteners.
- .4 CAN/ULC-S704-11, Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, faced.
- .5 CAN/ULC-S107 Standard for fire-performance of roof coverings.
- .6 CAN/ULC-S770-09, Determination of Long-Term Thermal Resistance of Closed Cell Insulating Foams.

1.4 EXAMINATION AND COORDINATION

- .1 The Contractor shall examine all drawings and specifications and visit the site for information affecting the execution and completion of the work.
- .2 Roofing Contractor shall co-ordinate all roofing operations with the General Contractor.
- .3 The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.

1.5 PRODUCT HANDLING, STORAGE & DELIVERY

- .1 Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.
- .2 Comply with the manufacturer's written instructions for proper material storage.
 - .1 Store membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins.
 - .2 Store curable materials (adhesives and sealants) between 60°F and 80°F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60°F minimum temperature before using.
 - .3 Store materials containing solvents in dry, well-ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.

- .3 Insulation must be on pallets, off the ground and tightly covered with waterproof materials.
- .4 Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

1.6 SAFETY

- .1 Respect safety measures described in the manufacturer's instructions and recommendations.
- .2 Throughout roofing installation, maintain a clean site and have one approved ABC fire extinguisher. Respect all safety measures described in technical data sheets.
- .3 The roofing contractor shall be responsible for all means and methods as they relate to safety and shall comply with all applicable local, provincial and federal requirements that are safety related. Safety shall be the responsibility of the roofing contractor.
- .4 All related personnel shall be instructed daily to be mindful of the full-time requirement to maintain a safe environment for the facility's occupants including staff, visitors, customers and the occurrence of the general public on or near the site.

1.7 JOB CONDITIONS AND PROTECTION

- .1 Protect surrounding surfaces against damage from roofing work. Where hoisting is necessary, hang tarpaulins to protect walls. Hoisting area to be within a fenced enclosure. The storage of all roofing material and equipment shall be within a fenced enclosure.
- .2 Co-ordinate with the school the time of all school activities, start/end of day, bus arrival/departures, recess and lunch breaks etc. Roofing activities, vehicle movement within the Place of the Work must be suspended during these times.
- .2 Before commencing work, ensure environmental and site conditions are suitable for installation of materials in accordance with the manufacturer's recommendations.
- .3 Assure that substrates are free of bituminous substances, smooth, clean and dry and of sufficient strength to withstand construction traffic and equipment.
- .4 Notify the Architect in writing of unsuitable surfaces and conditions.
- .5 Where roofing is left incomplete at end of day, apply cut offs to prevent moisture entering the roofing system.

1.8 SUBMITTALS

- .1 Prior to starting work, the roofing contractor must submit the following:

- .1 Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastening spacings and patterns for mechanically fastened components.
 - .1 Base flashings and built-up terminations. Indicate that details meet requirements of this Section.
 - .3 Tapered insulation, including slopes.
 - .4 Crickets, saddles, and tapered edge strips, including slopes.
 - .5 Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 - .6 Membrane fastening or adhesion requirements.
- .2 Sample of the manufacturer's Membrane System Warranty.
- .3 Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
- .4 Include: CSA A123.21 Dynamic Wind Uplift test report and CAN/ULC-S107 listing certificate.
- .5 Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal .015" (15 mil).
- .6 Certification of the manufacturer's warranty reserve.
- .2 Upon completion of the installed work, submit copies of the manufacturer's final inspection to the consultant prior to the issuance of the manufacturer's warranty.
- .3 Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the Consultant review.

1.9 QUALITY ASSURANCE

- .1 This roofing system must be applied by a Roofing Contractor authorized by the membrane manufacturer, having had 5 years experience in the application of this type of roof membrane.
- .2 A technical representative of the membrane supplier shall perform site inspections. The technical representative shall provide written reports regarding the status of the work. Copies shall be submitted to the Architect, Owner and independent testing company within 48 hours of the visit.

- .3 All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the building owner's satisfaction.
- .4 There shall be a supervisor on the job site at all times while work is in progress.
- .5 The membrane roofing system must achieve a UL Class A rating or equivalent.
- .6 Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:
 - .1 An authorized full-time technical employee of the manufacturer.
 - .2 An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.
- .7 Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

1.10 COMPATIBILITY

- .1 Assure that all components are compatible with each other.

1.11 ROOFING INSPECTION

- .1 The Owner/Consultant will appoint an independent inspection company to carry out part time inspections of the roofing and sheet metal material, application and workmanship. This inspection company will act as the Owner's and Architect's agent during the progress of the roofing and sheet metal application. The General Contractor shall pay this roof inspection cost from an allowance in the contract.
- 2. Additionally, the Roofing Membrane Manufacturer representative will make weekly site inspections and issue inspection reports to the contractor, consultant and owner.
- .2 There will be a pre-construction meeting arranged with the successful Roofer, Owner, Architect, Contractor, Roofing Membrane Manufacturer and Inspection Company to review job conditions, specifications and workmanship.
- .3 The Roofing Contractor shall notify the testing company and Manufacturer's rep in ample time of his work schedule and all changes thereto, also he shall co-operate fully with the testing company on the job. There must be roofing inspections for all roofing and sheet metal applications and a final inspection of the completed work.

- .4 A copy of the written reports of these roof inspections shall be forwarded directly to the Consultant and Owner by the testing company with additional copies as required to the Roofer and General Contractor. All reports must be in the Owner's hands before final payment for the roof can be authorized.

1.12 WARRANTY

- .1 Submit extended, non-prorated warranties in accordance with the General Conditions of the Contract in accordance with the following items.
- .2 **ROOFING APPLICATOR WARRANTY** - Roofing applicator to provide a written guarantee to Owner that the roofing installation including all flashings will provide a moisture proof service for a period of two (2) years from the date of total performance of the contract and that any damage resulting from failure to provide this performance shall be repaired to the satisfaction of the Owner at no cost.
- .3 **MANUFACTURER SYSTEM WARRANTEE** - The roof membrane provider shall provide Manufacturers' Extended System Warranty. The Extended System Warranty will provide a total system guarantee that the membrane provider/manufacture will replace the entire roof assembly to existing deck should the roof fail to provide moisture proof service due to manufacturing, weathering or installation defects, at no cost to the Owner for a period of 30 years, commencing from the date of Substantial Performance of the Work. The Extended System Warranty shall include a maximum wind speed coverage shall be peak gusts of 117 kph measured at 10 meters (29') above ground level. Warranty is to include Preventative Maintenance and Inspections as outlined below.
- .4 **WARRANTY MAINTENANCE** - Manufacturer is to arrange at no additional cost to the owner Preventative Maintenance and Inspections at the following intervals.
 - .1 Manufacturer is to arrange at no additional cost to the owner preventative maintenance housekeeping inspections and duties in years 2, 5, 10, 15, 20 and 25 (30-year warranty) and in years 2, 5, 10 and 15 (20-year warranty).
 - .2 The following inspections, maintenance and repairs shall be carried out as required by the Membrane Provider/Manufacturer having issued the warranty whether they are leaking or not.
 - .1 Redressing and Sealing of flashing seams
 - .2 Filling and or topping up of pitch pockets
 - .3 Repairs to blisters and ridges to prevent from future leaks
 - .4 Caulking at metal details as required.
 - .5 Removal of light debris from the roof.
 - .6 Cleaning of drain screens.
 - .7 Written inspection report.
- .5 The Extended System Warranty shall include for the repair of punctures causing leaks due to vandalism or accidental punctures for up to 16 man-hours per year.

- .6 Provide a Reflectivity Warranty Amendment indicating the membrane will meet the Energy Star program reflectivity guidelines for both new and aged membrane for a period of 10 years.
- .7 All warranties must be issued by a Canadian Company. American and/or other jurisdictions are not acceptable.
- .8 Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the Consultant review.

2.0 PRODUCTS

2.1 GENERAL

- .1 All products (including insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the warranty.
- .2 Provided the below performance and technical specifications are met at a minimum, the following are acceptable alternate manufacturers:
 - .1 Firestone
 - .2 Soprema
 - .3 IKO
 - .4 Johns Manville
 - .5 Holcim
- .3 ROOF AREA A (New Addition) - ASSEMBLY (From Top down)
 - .1 Surfacing Material (Roof Ballast)
 - .2 Membrane: Four (4) Ply Hot-Applied Built-up Asphalt Roofing System
 - .3 Recovery / Protection Board
 - .4 Roof Insulation Type I (Tapered)
 - .5 Roof Insulation Type II (Flat)
 - .6 Vapour Retarder
 - .7 Deck (Hollowcore by others)
- .4 ROOF AREA C (Existing Wing) - ASSEMBLY (From Top down)
 - .1 Surfacing Material (Roof Ballast)
 - .2 Membrane: Four (4) Ply Hot-Applied Built-up Asphalt Roofing System
 - .3 Recovery / Protection Board
 - .4 Roof Insulation Type I (Tapered)
 - .5 Roof Insulation Type III (Flat)
 - .6 Vapour Retarder
 - .7 Existing Deck

2.2 PERFORMANCE REQUIREMENTS

- .1 General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to

weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

- .2 The roof assembly must meet the requirements of the Ontario Building Code and be tested to Dynamic Uplift Resistance per CSA A123.21. The assembly is to be tested and approved to meet the minimum of 75 psf (3.6 kPa) using a resistance Factor of 0.65.
- .3 Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with the requirements and recommendations of the following:
 - .1 FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
 - .2 FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
 - .3 Comply with the requirements of Division 07 Section "Sheet Metal Flashing and Trim" and "Roof Specialties".
- .4 Exterior Fire-Test Exposure: CAN/ULC-S107, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- .5 Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings from an applicable testing agency.

2.3 SURFACING MATERIAL (ROOF BALLAST)

- .1 Hot-applied Surfacing Adhesive:
 - .1 Hot-melt asphalt adhesive, SEBS-modified elastomeric, ASTM D6152 .
 - .1 Basis of design product: THERMastic 80 Adhesive.
 - .2 Softening Point, min/max, ASTM D36: 90-95 deg. C (195-205 deg. F).
 - .3 Flash point, minimum, ASTM D92: 274 deg. C (525 deg. F).
 - .4 Low Temperature Flexibility, maximum, ASTM D3111: -8 deg. C (18 deg. F).
 - .5 Elongation at 25 deg. C (77 deg. F), minimum, ASTM D412: 800 percent.
 - .6 Elastic Recovery, minimum, ASTM D412: 95 percent.
- .2 Aggregate Surfacing Material:
 - .1 Aggregate Stone Surfacing: Clean, dry, opaque, water-worn or crushed stone, free of sharp edges.
 - .1 Basis of design product: WHITE Aggregate Stone Surfacing.
 - .2 Size, ASTM D1863: No. 6 or 67.

- .3 Aggregate application rate, average: 19.5 k/m², (400 lb/100 sq ft).
- .4 Colour, WHITE

2.4 MEMBRANE

.1 Base Ply Sheet:

- .1 SBS-modified asphalt coated composite polyester / fiberglass/fiberglass mat reinforced high tensile strength base sheet, ASTM D4601 Type II.
 - .1 Basis of design product: Composite Ply HT.
 - .2 Tensile Strength at 25 deg. C (77 deg. F), minimum, ASTM D5147: Machine direction, 725 N (165 lbf/in); Cross machine direction, 660 N (150 lbf/in).
 - .3 Tear Strength at 25 deg. C (77 deg. F), minimum, ASTM D5147: Machine direction, 1150 N (260 lbf); Cross machine direction, 1120 N (230 lbf).
 - .4 Thickness, minimum, ASTM D5147: 1.5 mm (0.060 inch).

.2 Ply Sheets:

- .1 Asphalt and glass-fibre roofing ply sheet for hot-applied built-up roofing systems, ASTM D2178 Type VI .
- .2 Basis of design product: THERMglass Type IV.
- .3 Net Dry Mass of asphalt impregnated glass felt, ASTM D146: 460 g/sq. m (9.5 lb/100 sq. ft.).
- .4 Breaking Strength, minimum, ASTM D146: Machine direction, 15 kN/m (40 lbf/in); cross machine direction, 12 kN/m (70 lbf/in).
- .5 Pliability, 13 mm (1/2 inch), ASTM D146: Pass.

.3 Membrane Flashing Sheets:

- .1 Flashing Sheet, Thermoset: Elastomeric polyester reinforced sheet with EPDM and SBR elastomers.
 - .1 Basis of design product: Elastomeric Sheeting.
 - .2 Breaking Strength, minimum, ASTM D751: Machine direction 1550 N (350 lbf); Cross machine direction 1330 N (300 lbf).
 - .3 Tear Strength, minimum, ASTM D751: Machine direction 342 N (77 lbf); Cross machine direction 342 N (77 lbf).

- .4 Elongation at Failure, minimum, ASTM D751: Machine direction 30 percent; Cross-machine direction 35 percent.
- .5 Low Temperature Flexibility, minimum, ASTM D2136: -40 deg. C (-40 deg. F) .
- .6 Thickness, minimum, ASTM D751: 1.1 mm (0.045 inch).
- .7 Colour: Black.
- .3 Detailing Fabric:
 - .1 Woven Glass Fiber Mesh, Vinyl-Coated: Non-shrinking, non-rotting, vinyl-coated woven glass mesh for reinforcing flashing seams, membrane laps, and other roof system detailing.
 - .1 Basis of design product: BURmesh.
 - .2 Tensile strength, 70 deg. F, min ASTM D146: Warp, 65 lbf/in (285 N); fill, 75 lbf/in (310 N).
 - .3 Color: Aqua green.

2.5 ASPHALT MATERIALS

- .1 Asphalt primer, water-based, polymer modified.
 - .1 Basis of design product: TREMprime WB.
 - .2 Volatile Organic Compounds (VOC), maximum, ASTM D3960: 2 g/L.
 - .3 Colour: Brown/black.
- .2 Hot-melt asphalt adhesive, SEBS-modified elastomeric, ASTM D6152 .
 - .1 Basis of design product: THERMastic 80 Adhesive.
 - .2 Softening Point, min/max, ASTM D36: 195-205 deg. F (90-95 deg. C).
 - .3 Flash point, minimum, ASTM D92: 525 deg. F (274 deg. C).
 - .4 Low Temperature Flexibility, maximum, ASTM D3111: 18 deg. F (-8 deg. C).
 - .5 Elongation at 77 deg. F (25 deg. C), minimum, ASTM D412: 800 percent.
 - .6 Elastic Recovery, minimum, ASTM D412: 95 percent.
- .3 Hot-melt asphalt adhesive, ASTM D312 Type III .
 - .1 Basis of design product: Premium III Adhesive.

- .2 Softening Point, min/max, ASTM D36: 90 – 96 deg. C (195 – 205 deg. F).
- .3 Ductility at 25 deg. C (77 deg. F), minimum, ASTM D113: 2.5 cm.
- .4 Penetration at 25 deg. C (77 deg. F) min/max, ASTM D5: 15–30 dmm.

2.6 RECOVERY / PROTECTION BOARD

- .1 Roof Insulation Cover Board:
 - .1 Roof Protection Board: Multi-ply semi-rigid asphaltic protection board composed of a mineral-fortified asphaltic core molded between two asphalt-saturated fiberglass reinforcement mats; designed to be used as a protection layer between the insulation and membrane.
 - .1 Basis of design product: Tremboard AC
 - .2 Size: 1200 by 1500 mm (4 by 5 ft), 3 mm (0.125 inch) thick.
 - .3 Puncture Strength: ASTM D6506; Not less than 108.4 Nm (80 lbf/ft).
 - .4 Compression Strength: ASTM D6506; Not less than 24,130 kPa (3,500 psi).
- .2 Coverboard Adhesive:
 - .1 Hot-melt asphalt adhesive, ASTM D312 Type III .
 - .1 Basis of design product: Premium III Adhesive.
 - .2 Softening Point, min/max, ASTM D36: 90 – 96 deg. C (195 – 205 deg. F).
 - .3 Ductility at 25 deg. C (77 deg. F), minimum, ASTM D113: 2.5 cm.
 - .4 Penetration at 25 deg. C (77 deg. F) min/max, ASTM D5: 15–30 dmm.

2.7 CANT STRIPS

- .1 Fibre cants to CAN/CSA-A246-M86, three (3) inch, preformed 45 degree angled.

2.8 ROOF INSULATION TYPE I

- .1 Polyisocyanurate for Roof Areas. Tapered (Not Flat) insulation:
 - RSI: Varies: 1 layer of tapered roof insulation: 3" edge thickness tapered to drains.
- .2 Tapered polyisocyanurate boards to CAN/ULC-S704-2001, meeting the requirements of ULC-S126M and ULC-S107M. Insulation shall be Factory Mutual Class 1 fire rated, I-90 uplift approved board and shall meet all identified code and/or insurance requirements. Polyisocyanurate foam insulation, integrally bonded to inorganic/organic felt facers, manufactured in conformance with all Environment Canada and Provincial Ozone-Depleting Substance Regulations.

- .3 Insulation to conform also to CAN/ULC-S770-00 “Standard Test Method for Determination of Long-Term Thermal Resistance of Closed Cell Thermal Insulating Foams”.
- .4 At roof drains provide insulation panels which sump to drains. Panel size 1220mm x 1220mm x 25mm thickness to suit roof insulation. Confirm all dimensions on site.

2.9 ROOF INSULATION TYPE II

- .1 Polyisocyanurate for Roof Areas. Flat (not tapered) insulation. Install under tapered.

RSI: R-35 min (installed in 2 layers: 3” base layer at R-17.7 and 3” top layer at R-17.7 – Total R Value = 35.4)
- .2 Flat polyisocyanurate boards to CAN/ULC-S704-2001, meeting the requirements of ULC-S126M and ULC-S107M. Insulation shall be Factory Mutual Class 1 fire rated, I-90 uplift approved board and shall meet all identified code and/or insurance requirements. Polyisocyanurate foam insulation, integrally bonded to inorganic/organic felt facers, manufactured in conformance with all Environment Canada and Provincial Ozone-Depleting Substance Regulations.
- .3 Insulation to conform also to CAN/ULC-S770-00 “Standard Test Method for Determination of Long-Term Thermal Resistance of Closed Cell Thermal Insulating Foams”.
- .4 At roof drains provide insulation panels which sump to drains. Panel size 1220mm x 1220mm x 25mm thickness to suit roof insulation. Confirm all dimensions on site.

2.10 ROOF INSULATION TYPE III

- .1 Polyisocyanurate for Roof Areas. Flat (not tapered) insulation. Install under tapered.

RSI: Installed in 1 layer: 1.5” base layer at R-8.9
- .2 Flat polyisocyanurate boards to CAN/ULC-S704-2001, meeting the requirements of ULC-S126M and ULC-S107M. Insulation shall be Factory Mutual Class 1 fire rated, I-90 uplift approved board and shall meet all identified code and/or insurance requirements. Polyisocyanurate foam insulation, integrally bonded to inorganic/organic felt facers, manufactured in conformance with all Environment Canada and Provincial Ozone-Depleting Substance Regulations.
- .3 Insulation to conform also to CAN/ULC-S770-00 “Standard Test Method for Determination of Long-Term Thermal Resistance of Closed Cell Thermal Insulating Foams”.
- .4 At roof drains provide insulation panels which sump to drains. Panel size 1220mm x 1220mm x 25mm thickness to suit roof insulation. Confirm all dimensions on site.

2.11 VAPOUR RETARDER

- .1 Vapour Retarder Membrane:
 - .1 Laminated Polyethylene Sheet: Polyethylene laminate, two layers, reinforced with cord grid, with maximum permeance rating of 0.06 perm (3.5 ng/Pa x s x sq. m), with pressure-sensitive tape of type recommended by vapour-retarder manufacturer for sealing joints and penetrations in vapour retarder.
 - .2 Basis of design product: Laminated polyethylene sheets, reinforced.

2.12 GYPSUM BOARD / THERMAL BARRIER

- .1 1/2" Dens-Glass Gypsum Roof Thermal Board.

2.13 FASTENERS AND PLATES

- .1 Fastening Bar: Galvanized sheet steel, 14 gauge (2.0 mm) ASTM A526-71, coating designation G90 commercial, premanufactured with slot holes 25 mm (1 in.) o.c.
- .2 Fasteners: For securing into steel decks, self-tapping, corrosion resistant fasteners, FMRC approved.
- .3 Fastener Plates: Factory Mutual approved and meeting FM standard 4470 for corrosion resistance. Fasteners and plates shall be approved in writing by the manufacturer for intended use.

2.14 AUXILIARY MEMBRANE ROOFING MATERIALS

- .1 General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
 - .1 Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- .2 Flashing Sheet Adhesive:
 - .1 Bonding and Flashing Adhesive, SEBS/SIS modified asphalt, for elastomeric flashing membranes.
 - .1 Basis of design product: Sheeting Bond.
 - .2 VOC, maximum, ASTM D3960: 250 g/L.
 - .3 Adhesion in peel, minimum, ASTM D1876: 0.5 N/mm (3 lbf/in).
 - .4 Lap shear adhesion, minimum, ASTM D816: 124 kPa (18 psi).
 - .5 Color: Black.
- .3 Asphalt Roofing Cement / Mastic:
 - .1 Roof Cement, Asphalt-Based: ASTM D4586, Type II, Class I, fibrated roof cement formulated for use in installation and repair of asphalt ply and

- modified bitumen roofing plies and flashings; UL-classified for fire resistance.
- .1 Basis of design product: ELS.
- .2 Volatile Organic Compounds (VOC), maximum, ASTM D3960: 190 g/L.
- .3 Non-Volatile Matter, ASTM D4586: 85 percent.
- .4 Resistance to sag ASTM D4586: 3 mm (1/8 in.) .
- .4 Elastomeric Mastic:
 - .1 Roofing Mastic, Low-Volatile: Modified asphalt elastomeric roof mastic, one-part, trowel-grade, formulated for compatibility and use with specified roofing membranes and flashings.
 - .1 Basis of design product: POLYroof LV.
 - .2 Volatile Organic Compounds (VOC), maximum, ASTM D3960: 300 g/L.
 - .3 Elongation at -34 deg. C (-30 deg. F), minimum, ASTM D412: 100 percent.
 - .4 Tensile strength at 25 deg C (77 deg F), ASTM D412: 207 kPa (30 psi).
 - .5 Flexibility at -40 deg. C (-40 deg. F), ASTM D3111: No cracking.
 - .6 Nonvolatile matter, ASTM D4586 : 70 percent.
- .5 Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.
 - .1 Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.
 - .1 Basis of design product: TremSEAL Pro.
 - .2 Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.
 - .3 Hardness, Shore A, ASTM C661: 40.
 - .4 Adhesion to Concrete, ASTM C794: 35 pli.
 - .5 Tensile Strength, ASTM D412: 2410 kPa (350 psi).
 - .6 Colour: Closest match to substrate.
- .6 Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening built up roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.
 - .1 Trufast #15 EHD Fasteners
- .7 Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."
- .8 Miscellaneous Accessories: Provide miscellaneous accessories recommended by built-up roofing manufacturer.

2.15 WALKWAYS

- 1 Walkway pads, ceramic-granule-surfaced reinforced asphaltic composition slip-resisting pads, manufactured as a traffic pad for foot traffic, 1/2 inch (13 mm) thick minimum.
 - .1 Basis of design product: Trem-Tred or Concrete Pavers as detailed.
 - .2 Flexural Strength at max. load, minimum, ASTM C203: 1.5 kPa (218 psi).
 - .3 Granule adhesion (weight loss), maximum, ASTM D4977: 1.1 gram.
 - .4 Impact Resistance at 25 deg. C (77 deg. F), ASTM D3746: No Damage to Roof.
 - .5 Pad Size: 914 by 1220 mm (36 by 48 inch).

2.16 METAL FLASHINGS

- .1 Metal flashings shall be 24 ga. Finish: The paint finish for wall cladding and soffit shall be SMP silicone modified polyester coating system (Weather XL / Signature) as manufactured by Vicwest. The unexposed side shall have a prime coat.
- .2 Colour: Charcoal VW56072. Colour shall be used for pricing only. Final colour selection shall be confirmed with Consultant before ordering.
- .3 Fasteners shall be supplied in accordance with the manufacturer's standard to meet the loading requirements and to maintain a weathertight installation. All exposed fasteners shall match the flashing colour.

2.17 SEALANTS

- .1 Caulking sealants for metal flashings to be one part silicone to conform to C.G.S.B. 19 GP 96. Sealants shall be as manufactured by Canadian General Electric, Dow Corning or approved equal.
- .2 Colour of sealant to match metal flashing colour, obtain approval of colour before ordering sealant.

2.18 ACCESSORIES

- .1 Provide all accessories required for the complete fabrication and installation of all roofing and sheet metal work.

2.19 ROOF DRAINS AND SPECIALTY FLASHINGS

- .1 Products specified are as manufactured by Thaler Metal Industries Ltd. Equivalent products meeting exact specifications of specified products must be approved by Architect and issued by addendum.
 - .1 Vandal-Proof Stack Jack Flashing: Thaler SJ-31. Mounting fastening method per drawings.
 - .2 Hot Pipe Flashing: Thaler MEF - 3A. Use at boiler and domestic hot water heater vents. Co-ordinate with mechanical.
 - .3 Liquid Tight Flexible Conduit Flashing: MEF-2A. Model Type based on conduit size. Coordinate with mechanical and electrical. Where this unit is

not possible to use, use Multi-Roof Penetration Roof Flashing: Portals Plus-Alumi-Flash System consisting of Aluminum Flash base; Model PVC 18S-3 8" diameter opening for multi-pipe penetration and black EPDM pipe boot cap Model 481R 4 pipe portal complete with stainless steel gear clamps. Units as manufactured by Portals Plus Inc., Bensenville, IL (630) 595-7320, Fax: (630) 766-5259.

- .4 Condensing Unit Roof Support: Thaler MERS-900A Air Handling Small Unit support. Mounting fastening method per drawings.
- .5 Electrical Receptacle Roof Support: Thaler MERS-750A. Mounting fastening method per drawings.
- .2 Refer to Roof Plan Drawings and to mechanical and electrical drawings and schedules for trade sizes of the various pipes and vents through the roof. All penetration shall have membrane boots and clamps supplied by the membrane manufacturer.

3.0 EXECUTION

3.1 GENERAL

- .1 Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, jobsite considerations and weather restrictions.
- .2 Install roofing system in accordance with the submitted drawings and details.

3.2 EXAMINATION and INSPECTION OF SURFACES

- .1 Verify that work of other trades which penetrates roof deck or that requires men and equipment to traverse roof deck has been completed.
- .2 Clean all surfaces removing nails and other loose and foreign materials, oil and grease, dispose of all debris. Ensure substrate is dry and within the requirements of the membrane manufacturer. Inspect all deck surfaces and report any areas in question as to its soundness or structural integrity.
- .3 Do not begin any work before surfaces are smooth, dry, free of ice and debris. Use of calcium or salt is forbidden for ice or snow removal.
- .4 Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - .1 Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - .2 Steel Roof Deck: Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1.6 mm (1/16 inch) out of plane relative to adjoining deck.

- .5 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 ROOFING SYSTEM INSTALLATION

- .1 Convene a site meeting with the Architect for a pre-installation review of the vapour barrier system.
- .2 Vapour Retarder Installation: Completely seal vapour retarder/air barrier at terminations, obstructions, and penetrations to prevent air movement into roofing system. Seal vapour retarder to vapour barrier in adjacent construction at perimeter of roofing system.

3.4 ROOFING SYSTEM INSTALLATION

- .1 Comply with built-up roofing manufacturer's written instructions for installing roof insulation.
- .2 Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- .3 Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- .4 Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.
 - .1 Where crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope and not less than 1:48 (1/4 inch in 12 inches) .
- .5 Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 6 mm (1/4 inch) with insulation.
 - .1 Cut and fit insulation within 6 mm (1/4 inch) of nailers, projections, and penetrations.
- .6 Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 70 mm (2.7 inch) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 150 mm (6 inches) in each direction.
- .7 Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- .8 Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

- .9 Mechanically Fastened and Adhered Insulation Application Method: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - .1 Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof. 1 per 2.0 sq.ft (16 parts per 4x8 ft board or 8 parts per 4x4 ft board)
 - .2 Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 14 deg. C (25 deg. F) of equiviscous temperature.
- .10 Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 150 mm (6 inches) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
 - .1 Apply hot roofing asphalt to substrate and immediately bond cover board to substrate.

3.5 HOT-APPLIED ROOFING MEMBRANE INSTALLATION

- .1 Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
 - .1 Base-Ply Sheet: One. Adhering Method: Mopped.
 - .2 Number of Ply Sheets: Three. Adhering Method: Mopped.
 - .3 Granular-Surfaced SBS-Modified Asphalt Cap Sheet: One. Adhering Method: Mopped.
 - .4 Surfacing Type: A (aggregate).
- .2 Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- .3 Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- .4 Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - .1 Provide tie-offs at end of each day's work configured as recommended by NRCA Roofing Manual Appendix: Quality Control Guidelines - Insulation to protect new and existing roofing.
 - .2 Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

- .3 Remove temporary plugs from roof drains at end of each day.
- .4 Remove and discard temporary seals before beginning work on adjoining roofing.
- .5 Retain one of first two paragraphs below. Retain first for traditional roofing asphalt complying with ASTM D312; retain second for SEBS-modified roofing asphalt. Heating and application requirements may differ among roofing manufacturers.
- .6 Hot Roofing Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 14 deg. C (25 deg. F) of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
 - .1 Apply hot roofing asphalt within plus or minus 14 deg. C (25 deg. F) of equiviscous temperature and adhere components to asphalt heated to not less than 218 deg. C (425 deg. F) .
- .7 Hot Roofing Asphalt Heating, SEBS-Modified Asphalt: Heat and apply SEBS-modified elastomeric roofing asphalt according to roofing system manufacturer's written instructions.
- .8 Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.6 ROOFING MEMBRANE INSTALLATION

- .1 Base Ply Sheet: Install lapped base ply sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 - .1 Adhere to substrate in a solid mopping of hot roofing asphalt.
- .2 Ply Sheets: Install ply sheets starting at low point of roofing. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.
 - .1 Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.

3.7 FLASHING AND STRIPPING INSTALLATION

- .1 Install flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to built-up roofing manufacturer's written instructions and as follows:

- .1 Fully adhere flashing sheet to substrate in cold-applied adhesive at rate of 15 sq ft/gal.
- .2 Extend base flashing up walls a minimum of 300 mm (12 inches) above built-up roofing and 150 mm (6 inches) onto field of built-up roofing. Extend base flashing up and over the entire parapets and down the complete exterior fascia board face above built-up roofing and 150 mm (6 inches) onto field of built-up roofing.
- .3 Mechanically fasten top of flashing 12" o.c. securely at terminations and perimeter of roofing.
- .2 Seal top termination of base flashing with a metal termination bar and a continuous bead of joint sealant.
- .3 Install stripping, according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
- .4 Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of compatible mastic/adhesive sealer, as recommended by roofing manufacturer, and extend onto roofing membrane. Apply number of courses recommended by manufacturer.
- .5 Roof Drains: Set 760-by-760 mm (30-by-30 inches) metal flashing in bed of compatible mastic/adhesive sealer, as recommended by roofing manufacturer, on completed built-up roofing. Cover metal flashing with built-up roofing membrane cap-sheet stripping and extend a minimum of 150 mm (6 inches) beyond edge of metal flashing onto field of built-up roofing. Clamp built-up roofing, metal flashing, and stripping into roof-drain clamping ring.
- .6 Install flashing sheet stripping according to roofing manufacturer's written instructions.

3.8 SURFACE AND COATING INSTALLATION

- .1 Hot-Applied Flood Coat and Aggregate Surfacing: Promptly after installing and testing roofing membrane, base flashing, and stripping, flood-coat roof surface with 3.0 kg/sq. m (60 lb/100 sq. ft.) of hot roofing asphalt. While flood coat is hot and fluid, cast the following average weight of aggregate in a uniform course:
 - .1 Aggregate Weight: 20 kg/sq. m (400 lb/100 sq. ft.), unless otherwise indicated in Part 2 product listing.
 - .2 If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at a rate of 0.5 kg/sq. m (10 lb/100 sq. ft.).

3.9 WALKWAY INSTALLATION

- .1 Walkways, General: Install walkways according to roofing manufacturer's written instructions. Install walkways where indicated on Drawings.

- .2 Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
- .3 Sweep away loose aggregate surfacing. Set walkway pads in additional pour coat of hot roofing asphalt.

3.10 METAL FLASHINGS & TRIM

- .1 Complete flashing work using specified materials.
- .2 Unless otherwise specified, nails, staples, screws, bolts, washers and all other metal fasteners, will be made of compatible and rust-proof metals, of same colour as surfaces with which they are in contact.
- .3 Shaping:
 - .1 Take special care when shaping sheet metal with a permanent finish.
 - .2 Bend sheet metal using sheet metal break to profiles and shapes. When possible, use bench and appropriate tools for all shaping, bending and welding work. Form joints with double S-type locks.
 - .3 Foldback all exposed edges by 12 mm (½") to hide and strengthen edges.
 - .4 All corners, fasteners, angles and joint covers must be of same metal, gauge and finish as metal being shaped.
- .4 Installation:
 - .1 All sheet metal work must conform to details, with plumb profiles exempt of all deformities or defects which may hinder appearance.
 - .2 Space angles and fasteners (seams) to allow for normal expansion and contraction. Provide continuous formed lock clips secured to wood coping blocking at 300 mm (12") o/c.
 - .3 No nail or screw can be apparent. All metalwork must be fastened and all corners and angles must be perfectly aligned.
 - .4 Caulk all sheet metal joints and all junctions with other materials.
 - .5 At junctions between roof and masonry surfaces, scrape out joints to a 25 mm (1") depth, insert flashing, fasten and seal with specified sealer.
 - .6 Install appropriate flashing, cap sheet, counter flashing, casings and other accessories to vents, pipes and other ducts to ensure perfect sealing.

3.11 ROOF SPECIALTY FLASHINGS

- .1 Report to the General Contractor in writing any defects of work prepared by other trades and other unsatisfactory site conditions.
- .2 Install flashing in accordance with manufacturer's printed instructions.
- .3 Installation of all flashing and accessories shall be in accordance with manufacturer recommendations.
- .4 Installation of Fall Arrest Anchors shall be tested and certified for the intended capacity and design requirements.

3.12 FIELD QUALITY CONTROL

- .1 Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.
- .2 Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
- .3 Notify Architect and Owner 48 hours in advance of date and time of inspection.
- .4 Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
- .5 Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTION AND CLEAN-UP

- .1 Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- .2 Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

END OF SECTION

07 84 00-FireStopping & Smoke Seals

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 The work of this section consists of furnishing all materials, labour and equipment necessary to complete the proper installation of all fire stopping and smoke sealing of all fire separations rated and non-rated.
- .2 Where smoke seal or firestop is indicated on drawings, it means firestop and smoke seal.
- .3 Refer to drawings for wall ratings to be maintained. At existing wall locations the contractor shall review with the consultant any remedial work required to achieve the intended separations. This trade shall include for 40 lineal feet of 8" block wall to u/s of metal deck having a 4" gap to be fire stopped to maintain a ¾" hour fire separation and firestop caulking around fifty (50) one inch (1") conduits thru a concrete block wall at corridor locations. Cost of the remedial work beyond this given quantity will be paid thru the Cash Allowance.

1.2 RELATED WORK:

- .1 Fire stopping and smoke seals forming part of mechanical assemblies (i.e. insulation, piping, dampers, etc) and electrical assemblies (i.e. conduit, wiring, cable trays) are specified in Divisions 22, 23, 24, 26.

1.3 QUALITY ASSURANCE

- .1 Applicator shall have not less than two years' experience installing ULC classified firestop systems or industry equivalent.
- .2 Materials shall have been tested to provide a fire resistance rating equal to or surpassing that required by the design documents.
- .3 Opening dimensions that are not in keeping with the mechanical or electrical drawing requirements will be the responsibility of the respective sections for correction to meet the requirements of the firestop system.

1.4 SUBMITTALS

- .1 Submit two copies of manufacturer's product data for materials and prefabricated devices, providing descriptions of each type of material required. Include manufacturer's printed instructions for installation.

- .2 Submit shop drawings or manufacturer's detail sheets showing each condition that requires continuous firestopping, location-specific firestopping and / or penetration firestopping systems. These details must be in accordance with the proposed approved system. Details must include materials to be used, anchorage, methods of installation and relationship to all adjacent construction relative to this project. Drawings do not depict extent or complete details of systems or conditions. This contractor to provide all details.
- .3 Make submittals in accordance with Section 01 33 00, Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials undamaged in manufacturer's clearly labelled, unopened containers, identified with brand, type, grade and qualification label where applicable.
- .2 Coordinate delivery and scheduled installation date to allow minimum storage time at site.
- .3 Store materials in clean, dry, ventilated location. Protect from soiling, abuse and moisture. Follow manufacturer's instructions.

1.6 PROJECT CONDITIONS

- .1 Installer shall verify that existing conditions and substrate are acceptable for the proposed application before starting work. Unsatisfactory conditions must be corrected before proceeding.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: In accordance with CAN4-S115-M95.
 - .1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115-M95 and not to exceed opening sizes for which they are intended.
 - .2 Refer to drawings for length of time required for fire-resistance ratings.
- .2 Service penetration assemblies: certified by ULC in accordance with CAN4-S115-M95 and listed in ULC Guide No. 40 U19.
- .3 Service penetration firestop components: certified by ULC in accordance with CAN4-S115-M95 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.
- .4 Fire-resistance rating of installed fire stopping assembly not less than the fire-resistance rating of surrounding floor and wall assembly.

- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.
- .11 Acceptable Materials
 - .1 Firebarrier distributed by Double A/D Distributors Ltd.
 - .2 Fire-Bloc by M. W. McGill Associates Ltd.
 - .3 Dow Corning Corporation, Fire Stop Foam, Fire Stop Sealant, Silicone RTV Foam.
 - .4 Tremco Fire and Smoke Containment Systems
 - .5 Thermal Ceramics, Fire Master Systems.
 - .6 3M Fire Protection Products.
 - .7 Hilti Firestop Systems

3.0 EXECUTION

3.1 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.
- .5 Review Health and Life Safety Plans and all other drawings for locations and ratings of required fire separations.

3.2 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.
- .2 Seal holes or voids made through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

3.3 INSPECTION

- .1 Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.4 SCHEDULE

- .1 Firestop and smoke seal at:
 - .1 Penetrations through fire-resistance rated or non-rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Penetrations at intersections of all steel framing and OWSJ members at walls, bulkheads as necessary.
 - .3 Penetrations through all non-rated fire separations.
 - .4 Top of fire-resistance rated concrete, masonry and gypsum board partitions and cavity shaft walls and system above (floor/roof/etc).
 - .5 Intersection of fire-resistance rated concrete, masonry and gypsum board partitions.
 - .6 Control joints in fire-resistance rated concrete, masonry and gypsum board partitions and walls.
 - .7 Penetrations through fire-resistance rated floor assemblies.
 - .8 Openings between floor assemblies and curtain wall framing.
 - .9 Openings and gaps between floor assemblies and masonry/concrete walls.
 - .10 Around mechanical and electrical assemblies penetrating horizontal and vertical fire separations.

3.5 CLEAN UP

- .1 Remove excess materials and debris and clean adjacent surfaces immediately after application.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION

07 92 10-Sealants & Caulking

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT LIMITED TO:

- .1 The work under this Section of the Specifications shall include all labour, equipment and materials to complete all sealants and caulking indicated on the drawings and specified herein including the following:
 - .1 Interior and exterior door frames - all sides.
 - .2 Around aluminum framing, window and louvre openings - all sides.
 - .3 Under metal thresholds.
 - .4 Control joints in masonry both interior and exterior of building.
 - .5 Perimeter of borrowed light frames in masonry walls.
 - .6 Masonry wall internal corners.
 - .7 Masonry walls to underside of hollow core precast concrete, load bearing and non-loading bearing conditions.
 - .8 Other locations as noted on drawings or required to provide watertight installation.
 - .9 All counter tops.

1.2 RELATED WORK

- .1 Refer to Section 03 30 00: Caulking of saw cuts in exposed concrete floors
- .2 Refer to Section 04 80 00: Masonry Assemblies
- .3 Division 7 - Thermal and Moisture Protection
- .4 Division 8 - Openings
- .5 Refer to Section 07 84 00: Firestopping and Smoke Seals.
- .6 Refer to Section 08 50 50: Structural silicone glazing.
- .7 Refer to Section 09 21 16: Acoustical caulking in association with drywall work.

- .8 Refer to Divisions 22, 23, 24, 25: Caulking work in connection with mechanical and electrical trades.

1.3 QUALITY ASSURANCE

- .1 The work shall be executed by fully trained mechanics employed by an applicator in strict accordance with manufacturer's printed directions.
- .2 Applicator shall be able to supply proof of competence in application of specified material, design and system.
- .3 Use samples of materials to be applied to test primers and elastomeric sealants for compatibility and adhesion to materials requiring sealant.
- .4 Compounds to be non-staining to masonry.
- .5 Ensure compatibility of sealants with site applied paint and other finishes.
- .6 Do not proceed with sealing operations until unsatisfactory conditions have been corrected.

1.4 SUBMITTALS

- .1 Submit manufacturer's technical product data for sealants, including detailed recommendations for joint preparation, use of primers and sealant application.
- .2 Upon request submit to the Architect samples of cured caulking compound as designated. Identify samples as to product name, colour, date, project and sub-contractor. All materials used on the project shall conform with approved samples.
- .3 Colour of caulking compound shall be selected by the Architect from the manufacturer's standard colour range. Submit charts for colour selection, showing manufacturer's complete range of standard colours for each specified type.
- .4 Submit upon request, test reports showing qualifications of caulking material used.
- .5 Job-applied samples: Prepare joints and install samples of materials in selected locations to demonstrate materials and workmanship. Obtain approval of installed samples as an acceptable standard of quality before continuing.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver all caulking materials to site in factory sealed containers or packaged with all labels intact.
- .2 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 acceptable to Labour Canada.

1.6 JOB CONDITIONS

- .1 Environmental Conditions: To avoid frost on surface, material shall not be applied when surface temperature is 7 degrees C or under. Comply with manufacturer's recommendations.
- .2 Protection: Take proper precautions to prevent adjacent surfaces from becoming stained, marked or soiled when doing this work.

1.7 WARRANTY

- .1 The Contractor shall warrant to the Owner in writing sealant material and labour against all defects for a period of five (5) years from the date of acceptance and substantial performance of the contract. Warranty shall not include mechanical damage. Warranty shall be for replacement and installation of defective sealant at no charge to the Owner.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Joint Fillers:
 - .1 General: compatible with primers and sealants, oversized 25%.
 - .2 Polyethylene: extruded closed cell foam, non-gasing, tensile strength 140 to 200 kPa meeting CEGS-07951-9 Standard for back-stop materials.
 - .3 Bond Breaker: pressure sensitive plastic tape which will not bond to sealants as recommended by the sealant manufacturer.
- .2 Sealant Type-A:
 - .1 A one-part, neutral-cure, architectural-grade, cold-applied, non-sagging silicone sealant to effectively resist moisture, abrasion and up to 50% movement. Not for use in below-grade or underwater applications.
 - .2 Applicable Standards: CAN2 19.13 M82 and Federal Specification TT-S-001 543A, Class A and TT-S-00230C, Class A for silicone building sealants.
 - .3 Colours: Architect to select colour from standard colour range to suit locations and building colours.
 - .4 Acceptable Products:
 - .1 Dow (Corning) Dowsil 795 Silicone.
 - .2 Tremco - Spectrum 2
- .3 Sealant Type-B:

- .1 Acrylic latex, one-part compound, non-sag, non-staining, non-bleeding, non-cracking; to remain flexible, quick drying and paintable with alkyd or latex paints, designed for interior joints.
- .2 Applicable Standard: CAN/CGSB-19.17-M90.
- .3 Colour: White.
- .4 Acceptable Products: Tremco Tremflex 834, Hilti CS2311, Mulco Inc. Acrylastic, Sonneborn Sonolac.
- .4 Related Materials
 - .1 Primer-sealers: Non-staining, types required for sealant and surface (as applicable) and recommended by sealant manufacturer for substrate.
 - .2 Solvents, cleaning agents: Recommended by sealant manufacturer for type of sealant, such as Xylol, Xylene, Methyl-Ethyl-Ketone or other suitable oil free solvent; harmless to factory finish of metal and other materials when used on permanent surfaces.

3.0 EXECUTION

3.1 PREPARATION

- .1 Remove dust, paint, loose mortar and other foreign matter. Dry joint surfaces.
- .2 Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.
- .3 Remove oil, grease and other coatings from non-ferrous metals and joint cleaner.
- .4 Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturer's instructions.
- .5 Examine joint sizes and correct to achieve depth ratio $\frac{1}{2}$ of joint width with minimum width and depth of $\frac{1}{4}$ " (6mm), maximum width 1" (25mm).
- .6 Substrate shall be tested for adhesion if required. Ensure adhesion of sealant to paint and compatibility of materials. Applicator shall ensure that joints are visibly clean and sound prior to application of sealant.

3.2 GENERAL INSTALLATION PROCEDURES

- .1 Apply sealants, primers, joint fillers and bond breakers to manufacturer's instructions. Apply sealant using gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.

- .2 Form surfaces of sealant with full bead, smooth, free from ridges, wrinkles, sags, aid pockets, embedded impurities. Neatly tool surface to a slight concave joint.
- .3 Use only proven installation techniques, which will ensure that sealants will be deposited in smooth uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Fill sealant rabbet and tool the sealant to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill the joint to form a slight cove, so that joint will not trap moisture and dirt.
- .4 Apply sealant to joints specified and where indicated.
- .5 Colours of exposed sealants shall match approved samples.
- .6 Remove excess and spillage of compounds promptly as the work progresses, before materials cure or harden. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage or smearing. Do not damage the adjoining surfaces or finishes.
- .7 Do not permit elastomeric sealant and other incompatible materials to come in contact with bituminous materials such as pre-moulded expansion strips.
- .8 Carefully seal all openings in interior masonry partitions, such as spaces around electrical outlets, pipes and ducts, and around door frames, which might permit sound transmission between adjoining spaces.

3.3 WEATHER CONDITIONS AND SCHEDULE

- .1 Do not proceed with installation of liquid sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Generally, apply sealants when ambient temperature is between 7 deg C and 32 deg C.
- .2 Apply primers and sealants only to dry joints.
- .3 Coordinate time schedule of application with work of other trades to avoid delay of project.

3.4 APPLICATION OF TYPE-A SEALANT FOR BUILDING JOINTS

- .1 Use sealant in exterior and interior control joints shown or scheduled to receive Type-A sealant.
- .2 Prior to use of sealant protect unopened containers from heat and direct sunshine. In cold weather store the containers at approximately 22 deg C for at least 16 hours before using.
- .3 Install sealant horizontally in one direction and where possible in vertical joints from bottom end of joint to top of properly prepared joints. Where joints have been primed, install sealant within time limitations of primer.

- .4 Apply sealant with professional gun to a minimum joint width of 1/4" (6mm). Depth of sealant shall be 1/2 of the joint and a minimum of 1/4" (6mm).
- .5 If necessary for smooth bead, tool joints within 10 minutes of application and remove masking immediately. Do not tool unmasked joints.
- .6 Clean excess sealant from non-porous surfaces while in uncured state with a commercial solvent. On porous surfaces while in uncured state with a commercial solvent. On porous surfaces allow excess sealant to cure and then remove by mechanical means.
- .7 Allow sealed joints to cure at least 48 hours before disturbing. When used in subsurface applications, allow one week curing time before disturbing.

3.5 APPLICATION OF TYPE-B SEALANT (ACRYLIC-LATEX)

- .1 Use acrylic-latex compounds for interior as scheduled following or indicated, which do not exceed limitations of manufacture (usually 12 mm by 12 mm deep or 18 mm wide by 9 mm deep).
- .2 Apply sealant with a gun using nozzles of proper size and providing satisfactory bead. Completely fill the joint making sure compound is forced against sides.
- .3 Firmly tool surface with sticking agent to assure complete contact and adhesion. Do not apply agent to adjacent surfaces.
- .4 Clean adjoining surfaces of smears of compound or soiling due to application; remove excess at once with solvent recommended by compound manufacturer.

3.6 SCHEDULE

- .1 Exterior & Interior Sealants
 - .1 Sealant Type-A: For joint sealant locations exposed to exterior temperatures as follows:
 - .1 Control joints in masonry and joints between masonry and concrete.
 - .2 At perimeter of frames for doors, louvers, windows, entrances, and other exterior openings.
 - .3 Under thresholds.
 - .4 Where sealant is shown on drawings in other building locations and the sealant is not specified elsewhere.
 - .5 Between different materials in surfaces where necessary to provide watertight finish and a sealant is not otherwise specified.
- .2 Interior Sealants (In Enclosed Spaces)

- .1 Sealant Type-B: Install acrylic latex sealant continuously in joints of interior surfaces to be painted, except locations specifically shown or specified to receive Type-A sealant, as follows:
 - .1 To fill voids at perimeter of metal door frames, borrowed light frames, louvers, aluminum frames built into interior walls or partitions to be painted.
 - .2 At built-in miscellaneous items installed under this contract, to complete a neat fit at walls for painting.
 - .3 In interior joints between masonry or concrete and metal fabrications of all types to fill cracks and joints for painting.
 - .4 Between window stools and window or curtain wall framing.
 - .5 Masonry wall internal corners and where abutting masonry walls are not bonded (keyed-in).
 - .6 Other interior painted wall locations specifically noted to receive "caulking": or "sealant", except where other type sealants are specifically specified.

3.7 CLEAN UP

- .1 Immediately remove excess compound or droppings which would set or become difficult to remove from adjacent finished surfaces using recommended cleaners as the work progresses.
- .2 Do not use scrapers, chemicals or other tools which could damage the finished surfaces.
- .3 After completion, remove all excess materials and equipment from site.

END OF SECTION

08 11 14-Metal Doors and Frames

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

Supply all material, labour and equipment necessary for the installation of all doors and metal frames as indicated on the drawings and specified herein including the following:

- .1 Hollow metal doors.
- .2 Pressed metal door frames.
- .3 Pressed metal sidelight, borrowed light frames and screens.
- .4 Mortor boxes to supplied and installed at 'ALL' hollow metal frames.
- .5 Provide material order as early as possible to avoid delays. Include in work and cost for temporary doors in place where delivery is not met.

1.2 RELATED WORK:

- .1 Section 04 80 00: Masonry Assemblies
- .2 Refer to Section 08 11 16: Aluminum Doors and Frames.
- .3 Refer to Section 08 71 00: The supply of door hardware.
- .4 Refer to Section 08 80 50: Glass and Glazing.
- .5 Refer to Section 06 10 10: Installation of doors, frames and hardware.
- .6 Refer to Section 09 90 00: Painting of doors and frames.
- .7 Refer to Section 04 80 00: Grouting of door frames in masonry walls.

1.3 DELIVERY, STORAGE & PROTECTION

- .1 When site is ready for installation of doors and frames, deliver material to site and provide storage facilities and protection against damage during and after installation.

1.4 SHOP DRAWINGS

- .1 Prepare and submit shop drawings of door frames to the Architect for review in accordance with section 01 33 00, Submittals.

- .2 Indicate each type of door, frame, material, thickness, anchorage, glazing stops, locations of anchors, mortices and reinforcements.

1.5 WARRANTY

- .1 All doors shall carry manufacturer's standard guarantee for each type of door specified.

1.6 EXAMINATION

- .1 Examine work performed by preceding trades and notify the Architect in writing of any condition which may affect the work of this section. Commencement of work implies this Contractor's acceptance of all job conditions.

1.7 REGULATORY REQUIREMENTS

- .1 Steel fire rated doors and frames labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN/ULC-S104-15 and CAN/ULC-S105:2016 for ratings specified or indicated on drawings.
- .2 Install labeled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

1.8 CO-ORDINATION

- .1 Co-ordinate with door opening construction, door frame and door hardware installation.
- .2 Obtain hardware templates information from hardware supplier.

2.0 PRODUCTS

2.1 PRESSED METAL FRAMES

- .1 All pressed metal door, sidelight, borrowed light frames and screens, as shown on Door Schedule and detailed on drawings, shall be manufactured to the Canadian Steel Door and Frame Manufacturer's Association, (CSDFMA) Canadian Manufacturing Specifications for Steel Doors and Frames, latest edition; except where specified otherwise.
- .2 Frames for all walls shall be shipped set up and welded. Provide engineered frames with throat openings to details for metal stud and drywall partitions, ship set-up and welded. A spreader bar shall be welded to bottom of each frame.
- .3 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Fully weld intermediate and sidelight base members to vertical frames. Cut miters and joints accurately and weld continuously on inside of frame profile.

- .4 All frames shall be 16 ga. (1.61mm) Fabricate frames from wipe coat galvanized steel with a minimum zinc coating of .25 ounces per square foot.
- .5 Frames shall be mortised, reinforced, drilled and tapped for all hardware. Strike and hinge reinforcing shall be protected by metal guard boxes.
 - .1 Door frames for all doors to receive mortice hinges to have extra strength or high frequency hinge reinforcement.
 - .2 Note: The top hinge reinforcing for all doors to receive mortice hinges is to be fully welded, spot welded top reinforcement is not acceptable.
 - .3 Template information will be sent to frame manufacturer by Hardware Supplier.
- .6 Door frames shall have three rubber silencers for single doors, two per head of double doors.
- .7 Provide frames in metal stud assemblies with welded in zee anchors, minimum 16 gauge for attachment of frames to metal studs, 3 per jamb for frames up to 7'-0" (2135mm) and one additional anchor per jamb for doors up to 8'-0" (2440mm) in height. In addition, each jamb shall be provided with a welded in base anchor for securing frames to floor slabs.
 - .1 For masonry or concrete walls, provide three anchors per jamb for doors up to 7'-0" (2135mm) and one additional anchor per jamb for doors over 7'-0" (2135mm) in height and 3'-4" (1015mm) in width.
- .8 Frames to be provided with U.L.C. or Warnock Hersey labels to the fire ratings as listed in the Door Schedules. Labels to match only those as listed. Construct fire rated frames in accordance with standards identified above.
- .9 Frame anchors shall be in accordance with fire tests for each rating as indicated in the Door Schedule.
- .10 Where zinc coating has been removed due to welding or grinding, frames shall have those areas painted with shop applied zinc rich primer.
- .11 Sidelight combination frames and borrowed light frames complete with glazing stops as detailed on the drawings. Provide anchors for fixing at floor, where frames are indicated to extend to the floor.
 - .1 Locate glazing stops for exterior frames on interior building side of frames. Exterior frame stops set for insulating glass as indicated on the door schedule.
 - .2 Locate glazing stops for interior vestibule doors on vestibule side of frames.
 - .3 Locate glazing stops for frames in corridors on the room side of frame (not on corridor side) irrespective of door swing.

- .12 Provide and weld to frame inside profile mortar boxes in heads for motion detectors and/or door contacts and in jambs for electric strikes in ALL locations.
 - .1 Mortar boxes by TAC Systems or Lor Don Manufacturing. Mortar boxes galvanized steel .040" (1mm or 20 ga), complete with knockouts top and bottom for standard conduit fittings.
- .13 All frames for doors which are to receive continuous hinges shall be provided with a shop installed ½" (12.7mm) thick rigid styrofoam backer installed on the inside profile of the frame on the hinge side, secured in place using adhesive, double face tape or other compatible means for securing the insulation to the frame.

2.2 HOLLOW METAL DOORS

- .1 Hollow metal doors of various types as shown on the Door Schedule and detailed on the drawings shall be manufactured to the Canadian Steel Door and Frame Manufacturer's Association, (CSDFMA) Canadian Manufacturing Specifications for Steel Doors and Frames, latest edition; except where specified otherwise.
- .2 Doors shall be fabricated of wipe coat galvanized steel with a minimum zinc coating of .25 ounces per square foot.
 - .1 All hollow metal doors to be steel stiffened and insulated column.
 - .2 Steel stiffened doors to have 18 gauge face panels reinforced with vertical steel 20 gauge stiffening ribs at 6" (150mm) centres with intermediate spaces filled with semi-rigid fibreglass insulation.
- .3 Steel stiffened doors shall be flush with no face seams and have welded edge seams, filled and ground smooth. Honeycomb core doors to have welded edge seams, filled and ground smooth.
- .4 Doors shall have a ⅛" (3mm) bevel in 2" (50mm) on hinge and lock side. Door shall be of size and type as listed in the Door Schedule.
- .5 Doors shall be reinforced, mortised, drilled and tapped for all hardware. All doors to have extra strength or high frequency hinge reinforcement. Template information will be sent to Door Manufacturer by Hardware Supplier. Provide case retainers for door to receive mortise locksets.
- .6 Doors for exterior openings shall be provided with steel top weather cap closures.
- .7 Where zinc coating has been removed due to welding or grinding, door shall have those areas touched up with shop applied zinc rich primer.
- .8 Doors to be prepared with glass light configurations as detailed on the drawings. Reinforce perimeter of all cutouts.
- .9 Doors to be provided with U.L.C. or Warnock Hersey labels to the fire ratings as listed in the Door Schedule. Labels to match only those listed. Construct fire doors in accordance with standard listed above.

3.0 EXECUTION

3.1 HOLLOW METAL FRAMES

- .1 Field check all job site conditions.
- .2 Door frames shall be installed plumb, rigid and in true alignment. Securely brace all frames until built into walls.
- .3 Secure base anchors on door and sidelight frames in metal assemblies with a minimum of two (2) powder actuated drive pins at each vertical jamb or frame member to concrete floor slabs.
- .4 Fire door frames shall be installed strictly in accordance with manufacturer's printed instructions and NFPA 80 including the installation of all hardware. Underwriter's label to be installed on all fire resistive rated frames.

3.2 DOORS

- .1 Doors shall be installed in locations indicated on drawings complete with finish hardware.
- .2 Fire doors shall be installed strictly in accordance with manufacturer's printed instructions and label requirements and NFPA 80 including the installation of all hardware. Underwriters label must be fastened to all fire doors.

END OF SECTION

08 11 16-Aluminum Doors and Frames

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 The work required under this section of the Specifications shall include all labour, equipment and materials to complete all aluminum framing, doors and hardware as indicated on the drawings and herein specified including:
 - .1 Aluminum entrance doors and vestibule and storefront framing and door hardware.

1.2 RELATED WORK:

- .1 Refer to Section 04 80 00: Masonry Assemblies.
- .2 Refer to Sections 05 12 00 and 05 50 00: Structural Steel and Metal Fabrications.
- .3 Refer to Section 06 10 10: Rough Carpentry
- .4 Refer to Sections 07 21 19 and 07 27 10: Foamed-in-Place Insulation and Air Barriers, Transition Membranes
- .5 Refer to Section 08 80 50: Glass and Glazing.
- .6 Refer to Section 08 71 50: Automatic Door Operators.
- .7 Refer to Section 08 44 13: Glazed Aluminum Curtain Wall.
- .8 Refer to Section 09 21 16: Gypsum Board Assemblies
- .9 Refer to Section 08 71 00: Finish Hardware
- .10 Other related work.

1.3 SHOP DRAWINGS AND SUBMITTALS

- .1 Prepare and submit checked shop drawings of all work in this section in accordance with Section 01 33 00, Submittals.
- .2 All work described in this section and shown on the drawings to be confirmed and designed through shop drawings submitted prior to fabrication. This includes all interior and exterior framing systems. All work to meet the structural load requirements of the Ontario Building Code and must be designed by a Professional

Engineer registered in the Province of Ontario. All shop drawings shall be sealed, signed and dated by the design Engineer.

- .3 Show each type of entrance, framing and doors with appropriate details for head, jamb, sills, intermediate mullions, anchorage, isolation coating, glazing system, hardware, finishes and type of glazing.
- .4 Submit hardware list for doors provided.

1.4 DELIVERY, STORAGE AND PROTECTION

- .1 When job is ready for installation, deliver material to the site and provide storage facilities and protection against damage during and after installation. Adequately protect all components from damage and wracking.

1.5 PERFORMANCE REQUIREMENTS

- .1 Comply with CAN/CSA-A440-00 for all fixed framing units.

1.6 ALUMINUM PRODUCTS

- .1 Aluminum trade names and types in this section are specified only to establish a standard of quality for materials and workmanship including the methods of expansion and weather tightness. However, substitutions must meet the approval of the Architect. Supporting technical literature, samples, drawings and performance data to CAN/CSA-A440-00 from an independent testing laboratory must be submitted.
- .2 Any request for substitution must be submitted seven (7) days prior to tender. Submit all data and samples with any request for substitution in accordance with Submittals section and note obligations and conditions therein.

1.7 CONTRACTOR QUALIFICATION

- .1 Work of this Section shall be executed by a company with a minimum of five (5) years proven first class experience in this field, having skilled personnel to complete the work in accordance with the specifications.

1.8 HARDWARE TEMPLATES

- .1 Receive template information and manufacturer's literature from hardware supplier and where applicable templates for hardware specified in Section 08 71 00 in ample time to facilitate the progress of the work.
- .2 Co-operate and co-ordinate with the Owner's Security Contractor for interfacing and preparation of electrified devices which interface with the work of this Section.

1.9 WARRANTY

- .1 This Contractor hereby warrants aluminum entrances against leakage, defects and malfunction under normal usage for five (5) years.

2.0 PRODUCTS

2.1 ALUMINUM FRAMING

- .1 Aluminum framing members for vestibule doors and storefronts shall be extruded aluminum alloy 6063-T5, free from defects impairing appearance, strength or durability. All screws, bolts and other accessories shall be stainless steel or cadmium plated stainless steel all of sufficient strength to perform the functions for which they were intended. Framing shall be one of the following:
 - .1 Interior Frames
 - .1 Alumicor Limited, FlushGlaze 1800 Series.
 - .2 Kawneer Company Canada Limited, Trifab VG450, centre IG.
 - .3 Oldcastle FG-2000.
- .2 Finish: Provide components with AA-M12 C22 A31, Class II, clear anodized finish for all surfaces.
- .3 Structural requirements: Design framing for a maximum deflection of L/175 for 20 P.S.F. wind load and allowable stress with a safety factor of 1.65.
- .4 Air infiltration shall be tested in accordance with ASTM E283. Infiltration shall not exceed .06 CFM per square foot of fixed area or to latest equivalent.
- .5 Water infiltration shall be tested in accordance with ASTM E331. No water penetration at a test of 8 PSF or to latest equivalent.
- .6 Construction - Framing
 - .1 Fabricate framing from extrusions of sizes and shapes shown on approved shop drawings.
 - .2 Provide intermediate horizontal rail to match height of door centre housing as shown on the exterior elevations and frame elevations.
 - .3 All joints to be drawn together and secured with shearblock joinery or screw spline split mullion design.
 - .4 All framing joints to be accurately machined to allow factory or shop assembly and sealing, providing neat weather tight connections.
 - .5 Coupling mullions where used shall be designed to eliminate any seam joint on the exterior while providing a functional split to permit unit module construction and allow for thermal expansion. Reinforcing mullions shall be provided where necessary to meet structural requirements.

- .7 Glass and glazing shall be as specified in Section 08 80 50 and installed in accordance to manufacturer's instructions.
- .8 Frames to be prepared and reinforced for door hardware specified following and provided by this Section. Screws for reinforcement shall colour match framing system.
- .9 Refer to door schedule and frame types for doors within the framing specified in this Section.

2.2 ALUMINUM DOORS

- .1 Aluminum doors shall be fabricated from extruded aluminum alloy 6063-T5 free from defects impairing appearance, strength or durability, sized as scheduled on the drawings.
- .2 Door finish shall match framing system.
- .3 Corner construction shall consist of both sigma deep penetration weld and mechanical fastening. Use glazing stops of snap-in type with neoprene bulb type glazing. Do not use exposed screws to secure stops.
- .4 Provide glass stops to suit specified glazing in Section 08 80 50.
- .5 Weather strip door frames three sides with metal backed pile cloth installed on the frame. All exterior doors shall be weather stripped at bottom rail to match door finish.
- .6 Doors shall be complete with the following hardware: (Guide for Hardware)
 - .1 Interior Vestibule Doors:
 - .1 Doors shall be one of the following:
 - .1 Alumicor Limited, Canadiana, Series 400B.
 - .2 Equal to above by Kawneer Company Canada Limited.
 - .3 Equal to above by OldCastle.
 - .2 Hinges - Markar Products continuous aluminum hinge, Model HG-105. Finish 622 - flat black.
 - .3 Pulls - Canadian Builders Hardware, CBH 6039 - 1" x 60" on both push and pull side, No. 3 mounting. Finish to match door.
 - .4 Closures - LCN 4040XP with adaptor plate and arm, min. 100 deg. mounting, finish to match framing.
 - .5 Automatic door operator by Section 08 71 50.

- .6 Electric Strike, mortice cylinder and removable core cylinder by Section 08 71 00.
- .7 Door contact, card reader, motion sensor and power supply by Security Contractor.
- .2 Exterior Doors:
 - .1 Doors shall be one of the following:
 - .1 Alumicor Limited, Thermaport Series 400B.
 - .2 Equal to above by Kawneer Company Canada Limited.
 - .3 Equal to above by US Aluminum of Canada.
 - .2 Hinges - Markar Products continuous aluminum hinge, Model HG-105. Finish 622 - flat black.
 - .3 Pulls - Canadian Builders Hardware, CBH 6039 - 1" x 60" on pull side, No. 3 mounting. Finish to match framing.
 - .4 Exit Device -Von Duprin 33A-NL-OP 626. Prior to commencement of any work, confirm with Finish Hardware that this unit is same as all other doors. Notify Architect immediately if different.
 - .5 Closures - LCN 4040XP with adaptor plate and arm, min. 100 deg. mounting, finish to match framing.
 - .6 Threshold: KN Crowder Model CT-407 frost-barrier and barrier-free threshold. Coordinate thermal break dimensions with GC for submittal prior to concrete pour.
 - .7 Automatic door operator by Section 08 71 50 for Active Door.
 - .8 Electric Strike, mortice cylinder and removable core cylinder by Section 08 71 00.
 - .9 Door contact, card reader, motion sensor and power supply by Security Contractor.
 - .10 Weather stripping.

2.3 SEALANTS

- .1 Sealants shall be as specified in Section 07 92 10 of the Specifications.

2.4 ACCESSORIES

- .1 Provide all compatible accessories, closures, covers, filler pieces, clips, caps, etc. required for a complete and weather tight installation.

3.0 EXECUTION

3.1 EXAMINATION

- .1 Verify substrate conditions are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive storefront system and sill plate is level in accordance with manufacturer's acceptable tolerances.
- .2 Verify actual measurements/openings by field measurements before fabrication. Co-ordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.2 ALUMINUM DOORS AND FRAMING

- .1 Set frames plumb, square and level at correct elevation in alignment. Anchor securely.
- .2 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
 - .1 Set interior vestibule doors to ensure matt clearance allowance at bottom of doors. Confirm with Owner prior to commencement of any work.
- .3 Adjust operable parts for correct function.
- .4 Make allowances for deflection of structure to ensure that structural loads are not transmitted to frames.
- .5 Seal joints to provide weather tight seal at outside and vapour seal at inside. Integrate framing to building air barrier membrane at exterior openings.
- .6 Check drawings for each door location and ensure that specified hardware is templated to function to its intended purpose.

3.3 PROTECTION AND CLEANING

- .1 Provide the General Contractor in writing instructions for proper methods and materials to be used in final cleaning which is not included in this section.
- .2 Protect installed product's finish surfaces from damage during construction. Protect aluminum systems from damage from grinding and polishing compounds, lime, acid, cement and other harmful contaminants.

3.4 CLEAN UP

- .1 Remove all debris and excess material not required in the contract immediately from the site.

END OF SECTION

08 14 10-Wood Doors

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 Supply all material, labour and equipment necessary for the fabrication and delivery of architectural wood doors and transoms as indicated on the drawings and specified herein.
- .2 Provide material order as early as possible to avoid delays. Include in work and cost for temporary doors in place where delivery is not met.

1.2 RELATED WORK:

- .1 Refer to Section 08 11 14: Metal Doors and Frames
- .2 Refer to Section 08 11 16: Aluminum Storefront Framing
- .3 Refer to Section 08 71 10: The supply of finish hardware.
- .4 Refer to Section 06 10 10: Installation of doors.
- .5 Refer to Section 08 80 50: Glazing

1.3 REFERENCE STANDARDS

- .1 Architectural Woodwork Standards 1st Edition 2009, published jointly by the Architectural Woodwork Institute (AWI), the Architectural Woodwork Manufacturer Association of Canada (AWMAC), and the Woodwork Institute (WI).
- .2 ANSI/WDMA I.S. 1A-11 Industry Standard for Architectural Wood Flush Doors
- .3 CAN/ULC S-104-10 Standard Method for Fire Tests of Door Assemblies
- .4 NFPA 80-13 Standard for Fire Doors and Other Opening Protectives
- .5 NFPA 252-12 Standard Method of Fire Tests of Door Assemblies
- .6 ITS/Warnock Hersey Mark for Fire Door Test Certification
- .7 ASTM E90-09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- .8 ASTM E413 - 10 Classification for Rating Sound Insulation.

1.4 DELIVERY, STORAGE & PROTECTION

- .1 Deliver, store, protect and handle products in compliance with the Architectural Woodwork Standards; Section 2 Care & Storage, and manufacturer's care and handling instructions.
- .2 Deliver materials only when the project is ready for installation and the general contractor has provided a clean storage area.
- .3 Accept doors on site in manufacturer's standard packaging. Inspect for damage.
- .4 Protect all doors from exposure to natural and artificial light after delivery.

1.5 SUBMITTALS

- .1 Prepare and submit shop drawings of door fabrication details in accordance with Section 01 33 00, Submittals.
- .2 Submit shop drawings in conformance to the requirements of the Architectural Woodwork Standards 1st Edition 2009.
- .3 Shop Drawings: illustrate door opening information such as location, size types, construction, swings, undercuts, special bevelling, hardware location and preparation requirements, blocking for hardware in mineral core doors, fire ratings, lite cut-outs, factory finish, glass, and other pertinent data.
- .4 Product Data: Indicate door core materials, thickness, construction, veneer species.
 - .1 Indicate manufacturer's full lifetime warranty.
- .5 Samples:
 - .1 Provide door construction samples with door faces, edges, and core, representative of the specified door type.
 - .2 Provide pre-finished veneer sample to illustrate the color of the specified door face.

1.6 WARRANTY

- .1 Provide manufacturer's standard lifetime warranty for "Full Life of Original Installation", including hanging and finishing.
- .2 Include coverage for delaminating, warping, bow, cup and telegraphing of core construction beyond warranty tolerances.

1.7 EXAMINATION

- .1 Examine the existing conditions, verify the work of other sections which interface with this section before commencing fabrication.

- .2 Verify that the work performed by preceding trades has been properly completed.

2.0 PRODUCTS

2.1 MANUFACTURER

- .1 Acceptable Manufacturers:
 - .1 Lambton Doors
 - .2 Masonite Architectural (Baillargeon) Doors
 - .3 RK Doors, Vaughan, ON

2.2 COMPONENTS

- .1 Flush Wood Doors
 - .1 Manufacture doors to ANSI/WDMA I.S. 1A-11 Heavy Duty performance level.
 - .2 Faces of wood veneered doors intended for transparent finish: AA Grade, Plain Sliced, White Birch, Book Match, Centre Balance Match.
 - .3 Identify doors in pairs and sets on door schedule by door numbers, including doors separated by a mullion.
 - .4 Doors with transoms to be End Matched.
 - .5 Provide composite cross band.
 - .6 Adhesives: AWS Type I.
- .2 Non-Rated Wood Doors
 - .1 Core for non-rated doors to be Particleboard.
 - .2 Stiles for non-rated doors: structural composite lumber laminated to hardwood.
 - .3 Top and bottom rails for non-rated doors: structural composite lumber.
- .3 Fire-rated Wood Doors
 - .1 Core for 20-minute fire-rated doors to be Particleboard
 - .2 Core for 45-minute fire-rated doors to be Mineral Core
 - .3 Core for 60-minute fire-rated doors and 90-minute fire rated doors to be Mineral Core.

- .4 Stiles and rails for fire-rated wood doors: manufacturer's standard, conforming to the requirements of the manufacturer's labelling agency.

2.3 ACCESSORIES

- .1 Glazing Stops
 - .1 Non-rated glazing stops to be same species as door face.
 - .2 Fire-rated glazing stops to be Metal Vision Frames.

2.4 FABRICATION

- .1 Doors shall meet the requirements of ANSI/WDMA I.S. 1A-11 Heavy Duty performance level.
- .2 Doors shall be 5 ply construction.
- .3 Fully bond stiles and rails to core and abrasive plane assembled unit prior to lamination of faces.
- .4 Assemble doors using AWS Type 1
- .5 Edges for veneered doors: AWS Type D, constructed with 1" (25mm) of structural lumber laminated to 7/16" (11mm) of hardwood of the same species as face veneer.
- .6 Rails for doors minimum 1-7/6 (36mm) of structural composite lumber.
- .7 Edges for veneered doors minimum 1" (25mm) structural composite lumber laminated to 7/16" (11mm) of hardwood of the same species as face veneer. Wood veneer edges are not permitted.
- .8 Construct fire-rated doors to the requirements of all applicable labelling agencies.
- .9 Provide blocking on all non-rated and fire-rated doors, as required for hardware to prevent the need for through-bolting.
- .10 Factory drill pilot holes for hinges and all other hardware within the hardware schedule.
- .11 Bevel lock and hinge stile to Architectural Woodwork Standard 1st Edition 2009, 3 degree bevel.

2.5 FINISHES

- .1 Factory Finishing: All products provided in this Section shall be factory finished using Architectural Woodwork Standards 1st Edition 2009, System 9 UV Curable System.

- .1 Factory stain: Water-based stain with ultraviolet (UV) curable polyurethane.
- .2 Factory opaque finish: Water-based paint with ultraviolet (UV) curable polyurethane.
- .3 Factory seal top and bottom of doors.
- .4 Provide Touch-up Kit for field touch-ups.

3.0 EXECUTION

3.1 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable and ready to receive this work.
- .2 Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.2 INSTALLATION

- .1 Install non-rated and fire-rated doors in accordance with NFPA 80, manufacturer's instructions and to ITS/Warnock Hersey/ULC requirements
- .2 Install factory finished doors just prior to substantial completion.
- .3 Allow a fitting clearance of 3mm (1/8").
- .4 Trim non-rated door widths as required by cutting equally on both edges. Reseal and refinish all cut or planed surfaces immediately to match factory finish.
- .5 Trim door height by cutting bottom edges to a maximum 19mm (3/4").
- .6 Trim fire door heights at bottom edge only in accordance with fire rating requirements.
- .7 Do not trim fire rated door widths.
- .8 Factory drill pilot holes.
- .9 Coordinate installation of doors with installation of frames and hardware.
- .10 Install door louvers and light kits plumb and level.
- .11 Adjust doors for smooth and balanced door movement and operation.

3.3 TOLERANCES

- .1 Conform to the Architectural Woodwork Standards 1st Edition 2009 standards and testing methods for warp, cup, bow, and telegraphing.

END OF SECTION

08 44 13-Glazed Aluminum Curtain Walls

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

The work required under this section of the Specifications shall include all labour, equipment and materials to complete all aluminum, curtain wall and entrance framing as indicated on the drawings and herein specified including the following briefly described:

- .1 Aluminum curtain wall framing.
- .2 Aluminum doors in curtainwall.
- .3 Spandrel liner panels.
- .4 Flashings and Accessory items.
- .5 Provide material order as early as possible to avoid delays. Include in work and cost for temporary doors in place where delivery is not met.

1.2 RELATED WORK:

- .1 Concrete. Refer to Section 03 30 00.
- .2 Masonry. Refer to Section 04 80 00.
- .3 Structural and Miscellaneous Metal.
- .4 Carpentry. Refer to Section 06 10 10.
- .5 Insulation and Air Barrier System. Refer to Section 07 21 19.
- .6 Metal Wall Cladding. Refer to Section 07 42 13.
- .7 Aluminum Composite Panels. Refer to Section 07 42 10.
- .8 Aluminum Windows. Refer to Section 08 50 50.
- .9 Glass and Glazing. Refer to Section 08 80 50.
- .10 Automatic Door Operators. Refer to Section 08 71 50.
- .11 Aluminum Doors and Framing. Refer to Section 08 11 14.
- .12 Final Cleaning of Aluminum and Glass. Refer to Section 10 95 00.

- .13 Tile Systems. Refer to Section 09 30 13.
- .14 Sealants and Caulking Section 07 92 10.
- .15 Finish Hardware. Refer to 08 71 00.
- .16 Mechanical and Electrical. Divisions 15 and 16.

1.3 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 DAF 45, latest edition, Designation System For Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA).
 - .1 AAMA-501, latest edition, Methods of Test for Exterior Walls.
 - .2 AAMA-2603 latest edition, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - .3 AAMA-2604 latest edition, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - .4 AAMA-2605, latest edition, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 - .5 AAMA CW DG-1, latest edition, Aluminum Curtain Wall Design Guide Manual.
 - .6 AAMA CW-10, latest edition, Care and Handling of Architectural Aluminum From Shop to Site.
 - .7 AAMA CW-11, latest edition, Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing.
 - .8 AAMA-TIR A1, latest edition, Sound Control for Fenestration Products.
- .3 ASTM International (ASTM).
 - .1 ASTM A653 / A653M – [09a], or latest edition, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B209, latest edition, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .3 ASTM B221, latest edition, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .4 ASTM C612, latest edition, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .5 ASTM E283, latest edition, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .6 ASTM E331, latest edition, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .7 ASTM E413, latest edition, Classification for Rating Sound Insulation.

- .8 ASTM E1105, latest edition, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .9 ASTM D2240, latest edition, Standard Test Method for Rubber Property—Durometer Hardness.
- .4 Canada Green Building Council (CaGBC).
 - .1 LEED® Canada-NC Latest Version, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations including any Addenda.
- .5 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-12.8, latest edition, Insulating Glass Units.
 - .2 CAN/CGSB-12.20-M89, latest edition, Structural Design of Glass for Buildings.
 - .3 CAN/CGSB-19.13-M87, latest edition, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
- .6 CSA International (CSA)
 - .1 CAN/CSA-S157, latest edition, Strength Design in Aluminum.
 - .2 CAN/CSA-S136, latest edition, North American Specification for the Design of Cold-Formed Steel Structural Members.
 - .3 CAN/CSA W59.2-M1991, latest edition, Welded Aluminum Construction.
- .7 Underwriter's Laboratories
 - .1 UL 2761, latest edition, Sealants and Caulking Compounds.
- .8 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-710.1, latest edition, Standard for Bead-Applied One Component Polyurethane Air Sealant Foam.
 - .2 CAN/ULC-711.1, latest edition, Standard for Bead-Applied Two Component Polyurethane Air Sealant Foam.

1.4 SUBMITTALS

- .1 Submit items identified below in accordance with Section 01 33 00, Submittals.
- .2 Product Data: Submit product data including manufacturer's literature for glazed aluminum curtain wall extruded members, panels, components and accessories, indicating compliance with specified requirements and material characteristics.
 - .1 Submit list on curtain wall manufacturer's letterhead of materials, components and accessories to be incorporated into Work.
 - .2 Include product names, types and series numbers.
 - .3 Include contact information for manufacturer and their representative for this Project.
- .3 Shop Drawings: Show each type of curtain wall, entrance, framing, window and accessories with appropriate details for head, jamb, sills, intermediate mullions,

anchorage, isolation coating, glazing system, hardware, finishes and type of glazing.

.4 Samples:

.1 Submit duplicate 300 x 300 mm (12 x 12 inches) sample sections showing prefinished aluminum surface, finish, colour and texture, and including section of infill panel.

.2 Submit duplicate 300 x 300 mm (12 x 12 inches) sample sections of insulating glass unit showing glazing materials and edge and corner details.

.5 All work described in this section and shown on the drawings to be confirmed and designed through shop drawings submitted prior to fabrication. This includes all interior and exterior framing systems. All work to meet the structural load requirements of the Ontario Building Code and must be designed by a Professional Engineer registered in the Province of Ontario. All shop drawings shall be sealed, signed and dated by the design Engineer.

.6 Thermal Performance: Submit verification that Insulating Glass Units used in curtain wall system meet RSI (R) values specified.

.7 Test Reports:

.1 Submit test reports showing compliance with specified performance characteristics and physical properties including air infiltration, water infiltration and structural performance.

.8 Field Reports: Submit manufacturer's field reports within 3 days of manufacturer representatives site visit and inspection.

.9 Installer Qualifications:

.1 Submit letter verifying installer's experience with work similar to work of this Section.

.10 Operation and Maintenance Data: Supply maintenance data for curtain wall for incorporation into manual specified in Section 01 77 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND PROTECTION

.1 When job is ready for installation, deliver material to the site and provide storage facilities and protection against damage during and after installation. Glass units shall bear manufacturer's label identifying kind and grade and shall not be removed until after the glass has been accepted. Adequately protect all components from damage and wracking.

1.6 QUALITY ASSURANCE, PERFORMANCE and TESTING REQUIREMENTS

- .1 Comply with CAN/CSA-A440-Series 00 for curtain wall. Ensure products and design meet the latest requirements and must meet the following equivalent levels of performance:
 - .1 Air Tightness -A3
 - .2 Water Tightness -B7
 - .3 Wind Load Resistance -C5
 - .4 Condensation Resistance -I55 (minimum)
- .2 Work of this Section shall be executed by a company with a minimum of five (5) years proved first class experience in this field, having skilled personnel to complete the work in accordance with the specifications.
- .3 Testing: Contractor to install one window unit complete with glazing and all accessories. Prior to continuation of any more work, this first unit is to be tested in-situ. The unit is to be tested for overall system performance including but not limited to joinery, workmanship and drainage. Test to be performed by CANWEST, ENERTECH or Exp Services. Assume all costs for testing under this contract. This testing is not part of the cash allowance for testing and inspection – but is to be carried under this trade's work. Coordinate all work with related sections such as glazing. Tested unit forms the basis for all subsequent work.

1.7 ALUMINUM PRODUCTS

- .1 Aluminum trade names and types in this section are specified only to establish a standard of quality for materials and workmanship including the methods of expansion and weather tightness. However, substitutions must meet the approval of the Architect. Supporting technical literature, samples, drawings and performance data to CAN/CSA-A440-Series 00 from an independent testing laboratory must be submitted.
- .2 Any request for substitution must be submitted seven (7) days prior to tender. Submit all data and samples with any request for substitution.

1.8 IDENTIFICATION MARKINGS

- .1 The manufacturer's identification is to be permanently marked so that the identification is visible in a semi-concealed location when the window is installed.
- .2 Classification shall be in accordance with the official A3, B7, C5, I55 (minimum) CAN/CSA-A440-Series 00 label. This label need not be a permanent marking.

1.9 WARRANTY

- .1 This Contractor hereby warrants aluminum curtain wall, entrances against leakage, defects and malfunction under normal usage for five (5) years.

2.0 PRODUCTS

2.1 CURTAIN WALL FRAMING

- .1 Framing
 - .1 Curtain wall frame members shall be extruded aluminum alloy 6063-T5, free from defects impairing appearance, strength or durability. All screws, bolts and other accessories shall be stainless steel or cadmium plated stainless steel all of sufficient strength to perform the functions for which they were intended.
 - .2 Design is based on Alumicor Curtain Wall Framing ThermaWall 2600 capped and SSG as drawn. Acceptable alternates are as follows:
 - .1 Windspec Inc: equal to above
 - .2 Oldcastle: equal to above
 - .3 Kawneer: equal to above
 - .3 Framing may be unitized construction provided all specification requirements and criteria are met.
- .2 Thermal Break
 - .1 Extruded flexible polyvinylchloride thermo-barrier compressed to seal between main sections and pressure plates.
- .3 Glazing Seals
 - .1 Glazing seals shall be extruded polymer with integral spacer on the exterior and a hollow compressed EPDM or Neoprene extrusion on the interior.
- .4 Structural Requirements
 - .1 The framing system shall be designed for a maximum deflection of L/175 for curtain wall wind loadings specified in the Ontario Building Code Toronto, ON.
 - .2 Conform to CSA-S157, Strength Design in Aluminum.
- .5 Sheet Aluminum
 - .1 Aluminum Association alloy AA1100-H14 anodizing quality with finish to match curtain wall components.
- .6 Design: The system shall provide:
 - .1 Such gaskets, baffles, overlaps and seals as required to provide a "Rain Screen" barrier to effectively drain rain water entry into the cavities of the system.
 - .2 Where applicable structural silicone glazing spacer gaskets compatible with the structural silicone sealant.

- .3 The necessary air seals to minimize air passage from the system cavities into the building and vice-versa, to assure adequate pressure equalization of the system cavities with the outside.
- .4 The air and vapour seals required to minimize air borne vapour exfiltration from the building into the system cavities.
- .5 Openings between these cavities and the outside of sufficient cross-section to provide pressure equalization. All openings must be effectively baffled or otherwise guarded to minimize direct water entry.
- .6 Thermally, the grid members shall have a resistance to heat transfer equal to or better than that of the area along the bottom of the 25 mm (1") sealed glass units.
- .7 Construction
 - .1 Fabrication by the manufacturer or authorized dealer to shapes shown on the approved shop drawings.
 - .2 Mullions shall be tubular extruded members when system is designed for shearblock joinery or interlocking extruded mullion halves when screw and spline joinery is used. Employ internal steel reinforcement where required.
 - .3 Overall assembled curtain wall member profile dimensions: refer to window elevations for backbox sizes.
 - .4 All horizontal members must form individual pressure equalized and sealed gutter members.
 - .5 Vertical expansion and construction joints shall be provided and designed for baffled overlaps with a compressed resilient air-seal laid in between the mullion ends.
 - .6 Structural anchors shall have three-way adjustment and welded after curtain wall alignment. Field paint touch-up following welding operation.
 - .7 Provide door adaptor components for integrating doors into the system where doors are shown.
- .8 Glass and Glazing
 - .1 Glass and glazing for curtain wall system as specified in Section 08 80 50.
- .9 Performance
 - .1 Air in-or-exfiltration performance shall exceed industry standards of 0.0003 m³/s (0.06 c.f.m./sq. ft.) of curtain wall at 3.2 kPa/m² (6.24 p.s.f.) pressure difference.
 - .2 There shall be no water infiltration into the building under 20% of design wind load up to a maximum pressure of 7.72 kPa/m² (15 p.s.f.).

- .3 No condensation shall form on any interior surfaces of the aluminum members before any of the exposed area of the 25 mm (1") sealed units reaches the dew point temperature.
- .10 Aluminum Sills
 - .1 Extruded aluminum alloy 6063-T5, minimum 3 mm (.125") thick, where detailed, complete with chairs and clips for securing to substrate. The finish shall match exterior of curtain wall framing.
 - .2 Refer to details for sills that are concrete or precast concrete.

2.2 SPANDREL PANEL

- .1 To ASTM C612 standard. Panel to be fabricated from 100 mm (4") thick Rockwool (Roxul) CurtainRock Semi-Rigid stone wool insulation board bonded with waterproof adhesive and impaling clips to a back-up panel of 0.95 mm (20 gauge) galvanized steel with returns and lip for glazing into the curtain wall framing.
- .2 Include for expansion clearances on perimeter.
- .3 Where backpans are exposed to the interior, supply and install a break-form aluminum sheet to exposed side (interior side). Sheet size to be suitable for size of frame and able to withstand abuse. Securely fasten to framing as required and provide continuous sealant at perimeter edge. Sheet to be installed flush to adjacent framing. Sheet to be finished in same material and colour as main curtainwall framing system.

2.3 FINISHES

- .1 Exterior exposed aluminum surfaces: To AA DAF-45-M10C21A41, Architectural Class I, 18 µm (0.0007") minimum thickness.
 - .1 Acceptable material: Alumicor Ltd., Class I, Anodic Finish.
 - .2 Colour: Clear

2.4 SEALANTS

- .1 Sealants shall be as specified in Section 07 92 10 of the Specifications.

2.5 ACCESSORIES

- .1 Provide all compatible accessories, anchors, connectors, closures, covers, filler pieces, clips, caps, etc. required for a complete and weather tight installation.
- .2 Spray foam insulation to be installed around all perimeters. Single component polyurethane-based foam, low-expansion, insulating sealant to CAN/ULC S102 or ASTM E84. Acceptable Products:

- .1 GREAT STUFF PRO Foam Sealant by Dow / Dupont
- .2 ADFOAM Pro by Adfast
- .3 Where installation temperatures exceed limits of above products, an alternate product shall be reviewed with Consultant prior to commencement of any work.

3.0 EXECUTION

3.1 CURTAIN WALL INSTALLATION

- .1 Examination
 - .1 Check structural elements and adjoining work verifying dimensions and clearances to insure all conditions are satisfactory before proceeding with installation. Commencing work implies acceptance of the conditions and any faults occurring in installed work must be corrected at no cost to the Owner.
- .2 Installation
 - .1 Framing shall be factory prepared for shop or job site assembly as recommended by the manufacturer.
 - .2 Framing shall be installed, glazed and adjusted by experienced workers in accordance with the manufacturer's instructions and approved shop drawings.
 - .3 All items shall be set in their correct location and shall be set level, square, plumb and at proper elevations and alignment with other work.
 - .4 All joints shall be accurately machined, assembled and sealed to provide weathertight joints. Shielded drainage and pressure equalization vents shall be provided where required. All horizontal members shall be sealed to vertical members to provide individual compartments within the system in accordance with the rain screen principal.
 - .5 Anchor assemblies to structure. Execute all drilling, tapping and welding required. Welding shall comply with CSA W59.1, and requirements of CSA W47.1 and CSA W47.2.
 - .6 Correctly locate and secure supplementary steel reinforcing members, brackets, inserts, clip angles, straps, bolts, nuts, washers, etc. required in the installation.
 - .7 Coat all aluminum surfaces in contact with cementitious materials or steel with isolation coating.

- .8 Integrate framing to building air barrier membrane. Seal joints between openings with sealant to provide weather tight seal at outside and vapour seal at inside.
- .9 Foam insulate into the void between the aluminum exterior frames and adjacent construction at perimeter of all exterior openings.
- .10 Operable windows and doors shall be installed in curtain wall in locations indicated by experienced workmen in accordance with manufacturer's instructions and shop drawings.
- .11 Check drawings for each door location and ensure that specified hardware is templated to function to its intended purpose. Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
- .12 Framing shall be protected from other building materials during and after installation.

3.2 CLEANING

- .1 Provide the General Contractor in writing instructions for proper methods and materials to be used in final cleaning which is not included in this section.

3.3 BREAKAGE

- .1 At the completion of the work, replace all glass broken due to improper setting. Glass shall be judged to be improperly set when broken due to loose setting, binding in the sash, unevenly bedded, improper workmanship or other similar causes. After glazing mark glass with large 'X' to safeguard against breakage.

3.4 CLEAN UP

- .1 Remove all debris and excess material not required in the contract immediately from the site.

END OF SECTION

08 50 50-Aluminum Windows

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work required under this section of the Specifications shall include all labour, equipment and materials to complete all aluminum windows and accessories as indicated on the drawings and herein specified including the following:

- .1 Aluminum windows, glass and framing.
- .2 Operable window units.
- .3 Accessory items.

1.2 RELATED WORK:

- .1 Section 04 80 00: Masonry Assemblies
- .2 Refer to Section 06 10 10: Rough Carpentry
- .3 Refer to Section 07 21 19: Foamed-in-Place Insulation
- .4 Refer to Section 07 27 10: Air Barriers
- .5 Refer to Section 07 92 10: Sealants and Caulking
- .6 Refer to Section 08 80 50: Glazing

1.3 CONTRACTOR AND QUALITY ASSURANCE

- .1 The window manufacturer shall have not less than five (5) years continuous experience in the fabrication, manufacturing and installation of the window component product so specified within this document.
- .2 Work of this trade shall be executed by a company with a minimum of five (5) years proved first class experience in this field, having skilled personnel to expediently complete the work in an efficient and workmanlike manner.
- .3 All materials not of Canadian manufacture shall be identified and the country of origin clearly stated. Any assemblies not manufactured by the contract bidder shall be identified as to the supplier and location of manufacture

1.4 DELIVERY, STORAGE AND PROTECTION

- .1 Upon delivery of material to site, the Contractor will be responsible for providing storage facilities in which all material must be placed in, for protection against damage during and after installation. Glass units shall bear manufacturer's label identifying kind and grade and shall not be removed until after the glass has been accepted. Adequately protect all components from damage and wracking.

1.5 STANDARDS

- .1 AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS—North American Fenestration Standard/Specification for windows, doors and skylights (NAFS-08).
- .2 A440S1, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-08.

1.6 PERFORMANCE REQUIREMENTS

- .1 Comply with CSA Standard CAN3-A440-M90 for all horizontal sliding window units. Ensure levels of performance as follows:
 - Air Tightness -A3
 - Water Tightness -B7
 - Wind Load Resistance -C5
 - Condensation Resistance -I=55 (minimum)
- .2 Comply with CSA Standard CAN3-A440-M90 for all projected window bottom hinged, inward opening window units. Ensure levels of performance as follows:
 - Air Tightness -A3
 - Water Tightness -B7
 - Wind Load Resistance -C5
 - Condensation Resistance -I=52 (minimum)
- .3 Comply with CSA Standard CAN3-A440-M90 for all fixed window box frame units. Ensure levels of performance as follows:
 - Air Tightness -Fixed
 - Water Tightness -B7
 - Wind Load Resistance -C5
 - Condensation Resistance -I=55 (minimum)
- .4 Comply with Ontario Building Code, Supplementary Standards, SB-10.
- .5 Where above performance criteria are superseded by new Code criteria, the more stringent criteria shall be used.

1.7 ALUMINUM PRODUCTS

- .1 Aluminum window trade names and types in this section are specified only to establish a standard of quality for material and workmanship including the methods of expansion and weather-tightness. However, substitutions must meet the approval of the Board's Representative. Supporting technical literature, samples,

drawings and performance data to CAN/CSA-A440-M90 from an independent testing laboratory must be submitted.

.2 The test data reports provided shall be based on the following performance criteria;

.1	Air Tightness	-All windows
.2	Water Tightness	-All windows
.3	Wind Load Resistance	-All windows
.4	Condensation Resistance	-All windows
.5	Blocked Operation	-Sliding windows only
.6	Ease of Operation	-Windows with operable lights only
.7	Screen Strength	-Windows with operable lights only
.8	Deflection	-All windows
.9	Blow-Out	-All windows
.10	Safety Drop	-Vertical sliding windows only
.11	Resistance to Forced Entry	-Operable windows only
.12	Sash Strength and Stiffness	-Projecting windows only

.3 The Contractor shall supply the following criteria data on the window unit being proposed and installed, indicating manufacturer's name.

Information Required;

- .1 Test data reports conforming to items above.
- .2 Sample window unit detailing and indicating actual complete operational package including all components and operating hardware.
- .3 Sample of cross-sectional corner detailing and indicating actual interior and exterior trim.
- .4 Location of manufacturers nameplate and window classification label.

1.8 WINDOW IDENTIFICATION MARKINGS

- .1 The window manufacturer's identification is to be permanently marked on each window so that the identification is visible in a semi-concealed location when the window is installed.
- .2 Window classification shall be identified in accordance with the official A3/B7/C5/I=55 (minimum) or A3/B7/C5/I=52 (minimum) or Fixed/B7/C5/I=55 (minimum), CAN/CSA-A440-M90 labels or latest variant.

1.9 OPERATION AND MAINTENANCE DATA

- .1 Upon completion of installation, the window manufacturer's installation foreman will arrange with and demonstrate to the building facility/custodial staff, window operation, sash removal, cleaning, re-glazing and general maintenance procedures.

1.10 WARRANTY

- .1 Provide written warranty stating that the complete aluminum window system units and all accessories are warranted against leakage, defects, delaminating and malfunction under normal usage for a period of ten (10) years from the date of substantial performance.

1.11 EXTENDED WARRANTY

- .1 Provide written warranty stating that all factory sealed thermo units carry a full ten (10) year warranty against seal failure. Warranty shall be for replacement and installation of defective units at no charge to the Owner. Warranty period to commence on date of substantial performance.

1.12 SHOP DRAWINGS

- .1 This Contractor shall prepare shop drawings of all work in accordance with Section 01 33 00, Submittals.
- .2 All work described in this section and shown on the drawings to be confirmed and designed through shop drawings submitted prior to fabrication. This includes all interior and exterior framing systems. All work to meet the structural load requirements of the Ontario Building Code and must be designed by a Professional Engineer registered in the Province of Ontario. All shop drawings shall be sealed, signed and dated by the design Engineer.
- .3 Shop drawings shall provide a clear understanding of the following details:
 - .1 All extruded aluminum members.
 - .2 All fasteners, anchors and other fixing devices.
 - .3 All glass.
 - .4 All gaskets, thermal separation and sealants.
 - .5 All insulation and other accessories.
 - .6 All reinforcing.
 - .7 All flashing and cover plates required for a complete installation.
 - .8 All hardware and finishes.

2.0 PRODUCTS

2.1 APPROVED MANUFACTURERS

- .1 The following fixed window box frame units meet the requirements of CAN/CSA-A440-M90, Fixed (Air Tightness), B7 (Water Tightness), C5 (Wind Load

Resistance) and I=55 (minimum (Condensation Resistance) Performance Classification Levels.

- .1 Alumicor Rainblade 1970 Series, Extruded Aluminum fixed window unit with thermal barrier. (System to meet the requirements of SB-10).
 - .2 Equivalent to above by WindSpec Inc.
 - .3 Equivalent to above by Oldcastle Building Envelope.
 - .4 Equivalent to above by Kawneer Company Canada Limited.
- .2 Vents: The following units meet the requirements of CAN/CSA-A440-M90, A3 (Air Tightness), B7 (Water Tightness), C5 (Wind Load Resistance) and I=52 (minimum (Condensation Resistance) Performance Classification Levels.
- .1 Alumicor Limited - Model 1350 Series Insulvent, extruded aluminum, thermally broken, top-hinged project-outward operable thermally broken. (System to meet the requirements of SB-10).
 - .2 Equivalent to above by WindSpec Inc.
 - .3 Equivalent to above by Oldcastle Building Envelope.
 - .4 Equivalent to above by Kawneer Company Canada Limited.

2.2 ALUMINUM WINDOWS

- .1 The Contractor shall note that he has the entire responsibility for the window installation achieving or surpassing the design and performance criteria list below.
 - .1 **Frame**
 - .1 Sash and frame members shall be extruded aluminium alloy Alcan 50S-T5 or ASTM 6063-T5, having a minimum wall thickness of .062", free from defect, impairing appearance, strength or durability. Exterior and interior frame members shall be designed with continuous locking fins.
 - .2 Frame sections shall incorporate integral screw ports for mechanical fastening of all corners and intermediate joints.
 - .2 **Finishes**
 - .1 Comply with Aluminum Association Designation System for finishes. Provide windows with AA-A31 (.0007"), Class I, clear anodized (for use on exterior finishes).
 - .3 **Thermal-Barrier**
 - .1 The thermal barrier connection shall provide complete metal to metal separation between the two main frame members. No

connecting screws, clips or other devices will be permitted which would tend to bridge the two frame members or restrict in any manner the expansion and contraction of the individual separated frame members.

- .2 Exterior and interior frame members incorporating a continuous minimum ½” thermoplastic barrier with the sash shall have a self-extinguishing rigid thermoplastic surround for added thermal protection. The assembled window frame shall have a “U” factor no greater than .455.

.4 Glazing Beads

- .1 Extruded aluminium to match window framing and to suit glazing specified.

.5 Glazing

- .1 Refer to glazing information and specification section.

.6 Weather Stripping

- .1 All weather stripping shall be installed next to the rigid thermoplastic edging to provide all-round protection and secured to prevent shrinkage, movement or loss when removing sash for cleaning or glass replacement.
- .2 Double weather strip window units at all sash perimeters. Conceal weatherstripping to prevent accumulation of foreign matter or matting due to cleaning, operation or handling which would reduce effectiveness or life of seal.
- .3 All weather stripping in the sash shall be concealed to prevent the accumulation of foreign matter or matting through cleaning, operation or handling, which would reduce the effectiveness of life of the weather stripping.

.7 Fasteners

- .1 Non-magnetic, stain and corrosion resistant stainless steel to ASTM E-149.

.8 Screens

- .1 Screens to have hollow frames of extruded aluminum with mechanical reinforced corners. The screen mesh will be heavy duty classification 18/14 mesh size, stainless steel conforming to CSA/CAN3-A44-M90.
- .2 Screen construction shall be stated on the shop drawings listing: type, mesh of screen cloth, extrusion sizes and mesh holding spline material or device and the manner of fastening and removal.

.3 The cloth holding spline material will not be allowed to be exposed or secured on the exterior side, it is to be located and secured only on the interior face side (room side) of the window screen unit.

.4 For projected window bottom hinged, inward opening window/panel units, the screen units provided are to be secured to the exterior frame unit with a minimum of two self-tapping sheet metal screws. All screens are to be drilled to an identical pattern.

.8 Limiters

.1 Limit opening of vent/casements to 100mm, unless directed by Consultant.

2.3 ALUMINUM WINDOWS FABRICATION

.1 The fabrication shall comply with the following items below.

.1 General

.1 Fabricate windows using two separate frames joined by means of a thermal break, and as follows:

.1 Cope and butt join all joints in main frame and sash neatly in weather tight manner and secure by means of screws anchored into integral screw ports.

.2 Secure sash corners with thread-cutting type screw to ensure tight corners when assembling the sash unit or re-assembling the sash unit after glass repairs have been made. Internally seal all sash corners.

.3 Deburr and make smooth all sharp milled edges and corners of sash and screen frames.

.4 Provide tubular sections for all screen frames.

.5 Provide sill members with minimum 5 deg. slope.

.6 Provide sill weep system which will facilitate drainage of water accumulating in sill area while preventing passage of air, dirt and insects to interior.

.7 Fabricate and anchor both inner and outer frames using specified screw fasteners without violating the thermo-barrier.

.8 Fabrication of the entire (jamb/head/sill) extruded aluminum perimeter box frame unit including mullions, will consist of an equal depth size. Inserts such as sash units (horizontal sliders, fixed and hopper operating) and panel

units will be fabricated in a manner to maintain this equal depth size consistency appearance of the entire window wall elevation unit.

- .9 Fabricate entire window in a manner that will allow easy replacement of any defective, damaged or worn components, hardware or weather stripping.
- .10 Completely separate all operating sash surfaces from metal to metal contact.
- .11 Pull handle may be an integral part of the vertical sash member or secured vandal proof aluminum handle fasteners. All handles to be constructed of extruded aluminum alloy Alcan 50S-T5 or ASTM 6063-T5, having a minimum thickness of .125".
- .12 Projected window bottom hinged, inward opening window units will be equipped with two friction arms (as manufactured by Anderburg (Truth)) and a water deflector guard, (secured and located on the exterior side of the unit at the sill level, caulk continuously at the top), a water guard is also required within the perimeter frame of the sill section, stopping water from penetrating into the room interior when the unit is in the open position, bottom window units will be equipped with cam lever type handle and keeper to permit opening by hand, and top window units will be equipped with spring catch and keeper to permit opening by pole. One window extension pole (minimum of 6'-0" in height) complete with wall clip bracket will be provided and installed in each individual room. Upon closure of all sash units, locking mechanism must be secured immediately causing no movement whatsoever within the sash units.

2.4 GLAZING

- .1 Provide sash frames which will permit glass replacement without the use of special tools. Install glass using flexible wrap around PVC glazing gasket.

2.5 ACCESSORIES

- .1 Provide all compatible accessories, closures, covers, filler pieces, clips, caps, etc. required for a complete and weather tight installation.
- .2 Spray foam insulation to be installed around all perimeters complete as shown on elevations. Single component polyurethane-based foam, low-expansion, insulating sealant to CAN/ULC S102 or ASTM E84. Acceptable Products:
 - .1 GREAT STUFF PRO -Windows and Doors - Foam Sealant by Dow / Dupont

- .2 ADFOAM Pro 1875 by Adfast
- .3 Where installation temperatures exceed limits of above products, an alternate product shall be reviewed with Consultant prior to commencement of any work.

3.0 EXECUTION

3.1 ALUMINUM WINDOWS INSTALLATION

- .1 Preparation
 - .1 Install windows without causing damage to adjacent surfaces such as; walls, floors, ceilings, heating radiation convectors and landscaping that would result from work under this section of the specification.
- .2 Installation
 - .1 All work is to be executed by competent mechanics skilled in the trade.
 - .2 All field site dimensioning shall be the responsibility of the Contractor.
 - .3 During installation, the contractor shall be responsible for any damage to the window material and/or any other work caused by his operations.
 - .4 Entire window units shall be constructed in a manner that will allow easy replacement of any defective, damaged or worn parts, hardware or weather stripping.
 - .5 All materials shall be erected plumb, level and true relative to the building structure. The maximum variation from plum and level shall not exceed 1/8" in 10 feet vertically or horizontally.
 - .6 Foam insulate into the void between the exterior aluminum frame and the window opening and in between steel columns and aluminum trim capping using sprayed foam as specified within this Section. The void around the interior aluminum frame not to be filled with foam insulation.
 - .7 Coat all aluminum surfaces in contact with cement materials or steel with isolation coating.

3.2 CLEAN UP

- .1 Remove all debris and excess material not required in the contract immediately from the site.

END OF SECTION

08 71 00-Finish Hardware

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 Supply of all Finish Hardware materials and work indicated herein and identified on the drawings and included in the Finish Hardware Schedule.
 - .1 Refer to attached Finish Hardware Schedule prepared by Knell's Door & Hardware (14 pages).
- .2 Supply of door hardware for exterior aluminum doors, for installation by the Aluminum Door manufacturer.
- .3 Supply of locksets and hardware for doors at tall millwork where shown in classrooms.
- .4 Supply of locksets and hardware at Childcare half-doors / gates.
- .5 Supply and installation of automatic operators, emergency call hardware, push to lock, and accessories.
- .6 Supply and installation of low voltage wiring for hardware. Conduit is supplied and installed under Division 26.
- .7 Coordination with electrical subcontractor to ensure all electrical requirements are met and all back boxes and conduit are placed to suit hardware requirements.
- .8 Supervision and inspection of door hardware installation by hardware supplier.

1.2 WORK UNDER OTHER SECTIONS

- .1 Installation of all hardware specified in this section.
- .2 Supply of related items – See Automatic Door Operator Section
- .3 Doors, screens and frames
- .4 Electrical work.

1.3 TEMPLATES

- .1 Check the Hardware Schedule, Drawings and Specifications, and furnish promptly to the applicable trades any patterns, templates, template information and

manufacturer's literature required for the proper preparation for and application of hardware in ample time to facilitate the progress of the work.

1.4 QUALITY CONTROL

- .1 Contractor shall coordinate a hardware pre-installation meeting with hardware installer, hardware supplier and hardware sub-consultant (original hardware specifier). Payment for original hardware sub-consultant's time to attend meeting shall be paid for through the cash allowance included for inspections (except where hardware supplier is also the hardware sub-consultant). Review installation procedures with the hardware suppliers.
- .2 Supplier and installer shall hold regular review meetings (at least every second week) during the installation period. Submit minutes of meetings to the Consultant.
- .3 The Contract contains a cash allowance for independent inspection, as noted above. Supplier and installer shall attend such inspections; costs associated with their attendance shall be included in the Contract.
- .4 Substitutes: Only approved products specified will be accepted. Make substitution request in accordance with Division 01. Include product data and indicate benefit to the project.
- .5 Supplier Qualifications: The successful hardware distributor shall have a minimum of five (5) years of experience in the door and hardware industry. The distributor to have on staff an Architectural Hardware Consultant (A.H.C.) who will be responsible for scheduling, detailing, ordering and co-ordination of the finishing hardware for this project. This individual shall be required for jobsite visits, as outlined below and when so requested by the Consultant.
- .6 Designated Installer: Hardware Installers must have a minimum of five (5) years of experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. All installers to attend review meetings with the Hardware Distributor.

1.5 SUBMITTALS

- .1 Submit hardware schedule in accordance with Section 01 33 00, Submittals indicate all hardware, including make, model number, material function, finish and other pertinent information.
- .2 Wiring Diagrams: Furnish a written description of the functional use of all electrical hardware. Include door and frame elevations showing the location of each item of electrical hardware to be installed, including a diagram showing number and size of all conductors. Include drawings showing all terminal connections.
- .3 Maintenance Materials: Provide maintenance materials, in accordance with Section 01 78 00, Closeout Submittals. Supply four sets of wrenches for door closers, locksets, latchsets, and exit devices. Supply four sets of other special parts or tools required for proper maintenance and adjustment of door hardware. Provide emergency keys and core extraction key.

- .4 Keying: Submit a detailed keying schedule for review and approval prior to fabrication, indicating all key groups, levels, and quantities.

1.6 DELIVERY AND STORAGE

- .1 Package each item of hardware, including fastenings, separately or in like groups of hardware. Label each package as to item definition and location and corresponding with the hardware list.
- .2 Ensure shipments are made in a timely manner to ensure progress of the Work and to comply with the Contractor's construction schedule.
- .3 Store hardware in a locked, clean and dry area and in a manner to allow easy access to each item group as needed, without disruption of the storage arrangement. Provide a written confirmation to the Consultant that the storage area is adequate and secure.

1.7 WARRANTY

- .1 Warrant for a period of ten (10) years for door closures, five (5) years for exit devices locks and locksets, from date work is certified as substantially performed.
- .2 Door hardware warranties shall cover all defects in material and workmanship that become apparent during the warranty period and such defects shall be made good or the defective product shall be replaced, to the satisfaction of the Owner and at no cost to the Owner.

2.0 PRODUCTS

2.1 GENERAL

- .1 Supply the following Finish Hardware as required for the doors in the door schedule. Handing as per drawings.
- .2 Unless requested and identified differently in the Finish Hardware Schedule, products listed shall be from the following manufacturers:

ITEM MANUFACTURER NAME

Full Mortise Hinges	Ives
Continuous Hinges	Ives
Locksets, Latchsets/Deadbolts	Schlage
Cylinders	Schlage
Exit Devices	Von Duprin
Surface/Flush Bolts	Ives
Door Closers	LCN
Overhead Door Holders/Stops	Glynn Johnson
Door Pulls/Flatware	Canadian Builders Hardware
Wall/Floor Stops	Ives
Weather/Smoke/Sound Seals	Zero
Door Sweeps/Thresholds	Zero

Automatic Door Operators/Actuators	LCN
Keyswitch/Magnetic Locks	Schlage Electronics
Electric Strikes	Von Duprin
Access Controllers	Schlage Electronics
Power Supplies	Schlage Electro, Von Duprin
Finger Guards at Childcare	See Schedule

2.2 FINISHES

- .1 All finishes shall be confirmed by Architect through submittals procedure.

2.3 KEYING

- .1 Provide all cylinders, cores, and keying fully integrated into the Owner's existing keying and master keying system.
 - .1 Coordinate directly with the Owner and/or Owner's designated keying authority prior to ordering hardware to confirm current keying standards, system type, and keyway requirements.
 - .2 Match existing manufacturer, keyway, and system configuration unless otherwise directed by the Owner.
 - .3 Provide all new locks and cylinders keyed into the existing master key system, including grand master, master, and sub-master levels as required.
 - .4 Supply all keys, including master and sub-master keys, in quantities as directed by the Owner. Stamp or tag keys in accordance with Owner standards.
 - .5 Provide construction (temporary) keying where required and remove/convert to permanent keying at Substantial Performance.
 - .6 Deliver all permanent keys, cores, and keying records directly to the Owner. Do not retain copies of keys or keying information.

3.0 EXECUTION

3.1 GENERAL

- .1 Furnish door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware. Advise door and frame manufacturers to be aware that strike heights as listed in the table below are required for this project.
- .2 Supplier shall furnish manufacturers' instructions for proper installation of each hardware component.
- .3 Coordinate work with Electrical sections and drawings.

3.2 EXAMINATION

- .1 Ensure that doors and frames are properly prepared and reinforced to receive finish hardware prior to installation.
- .2 Ensure that door frames and finished floor are plumb and level to permit proper engagement and operation of hardware.
- .3 Submit in writing a list of deficiencies determined as part of inspection prior to hardware installation to supervising consultant. Correct door frame installation before proceeding with finish hardware installation.

3.3 FIELD QUALITY CONTROL

- .1 Architectural Hardware Consultant:
 - .1 The hardware supplier shall have in its employ an Architectural Hardware Consultant who is a current member of the Door and Hardware Institute, and who shall be made available for consultation during the course of construction at no additional cost to the Owner.
 - .2 The Architectural Hardware Consultant shall supervise hardware installation, assist the Hardware Installer, and carry out inspection and provide written certification of the finished door hardware installation.
 - .3 Allow for a minimum of three inspections during the course of hardware installation and one final inspection.
 - .1 Provide inspection reports listing progress of work, unacceptable work and corrective measures.
 - .4 Ten percent (10%) of this subtrade's contract will be considered as fair value for supervision and inspection with regard to progress certificates.
- .2 Verify each door leaf opens closes and latches properly. Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements. Test access control system and electrified hardware devices for proper operation, owner to sign off on verification of operation. Verify electric door release hardware operates properly upon activation of the fire alarm system.
- .3 Upon completion of finish hardware installation, the Architectural Hardware Consultant and the Contractor shall inspect work and provide a list of all hardware deficiencies. The Architectural Hardware Consultant shall re-inspect when notified by the Contractor as to the clearing of deficiencies. Final inspection must ensure all hardware items operate as per manufacture requirements. Coordinate inspections with manufacturer's representatives as required to establish warranties.
- .4 Once any deficiencies have been corrected, the Architectural Hardware Consultant and the Contractor shall certify in writing that all hardware items and their installation are in accord with requirements of Contract Documents.

- .5 At the discretion of the Owner, a third-party inspection may be required. Contractor shall arrange for post installation review of hardware by an independent hardware sub-consultant appointed by, or acceptable to, the Owner (original hardware specifier or other independent hardware sub-consultant). The deficiency report shall be prepared by the independent hardware sub-consultant. The cost of the first inspection and one follow-up inspection only, shall be paid through the cash allowance included for hardware inspection. The cost of any subsequent inspections, required for the correction of deficiencies, shall be borne by the Contractor.

3.4 INSTALLATION

- .1 Install hardware to manufacturer's written instructions.
- .2 Install hardware at mounting heights as specified in the manufacturer's templates or specific references in approved hardware schedule or approved elevation drawings.
- .3 Where mounting height is not otherwise specified, install hardware at mounting heights as per referenced standards.
- .4 Install hardware using only manufacturer supplied and approved fasteners in strict adherence with manufacturers published installation instructions.

3.5 ADJUSTING, TESTING AND CLEANING

- .1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.
- .2 Adjust doors with self-closing devices or automatic closing devices for operation after the HVAC system is balanced and adjusted. Adjust spring power of non-sized door closers to close and latch the door.
- .3 Hardware to be left clean and free of disfigurements.
- .4 Instruct owner personnel in the proper operation, adjustment and maintenance of hardware.

3.6 PROTECTION

- .1 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.

END OF SECTION



Knell's
DOOR & HARDWARE

2090 Shirley Drive Kitchener Ontario N2B 0A3

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Schedule of Finish Hardware

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WINDSOR ON N8W 5V7
PHONE - 519-256-3131
FAX -

CONTRACTOR:

PHONE -
FAX -

PROJECT: WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST
CAMBRIDGE ON N1S 3H1
7665

PROJECT CONSULTANT: VISHAL KACHCHHI

PREPARED: September 26, 2025

REVISED: September 26, 2025
December 15, 2025

SUBMITTAL
RIVISION 01



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DOOR INDEX

Mark	Heading #	Mark	Heading #	Mark	Heading #
V01.1	V01.1	105.1	105.1		
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V02.3	V02.3	109.1	109.1		
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103.2	103.2				
104.1	104.1				



KNELLS DOOR & HARDWARE

WCDSB - ST. GREGORY CES ADDITION

2090 SHIRLEY DRIVE

KITCHENER

Tel: 519-578-1000

ON

N2B 0A3

Fax: 519-578-3262

Control No.7665

7665

Hardware Finishes

Finish	Description
26D	SATIN CHROMIUM PLATED
626	SATIN CHROMIUM
630	SATIN STAINLESS STEEL
689	POWDER COAT, ALUMINUM
ALUMINUM	ALUMINUM
C.A.	CLEAR ANODIZED
C26D	SATIN CHROMIUM
C32D	STAINLESS STEEL, SATIN
CL	CLEAR
US26D	SATIN CHROMIUM PLATED
US32D	SATIN STAINLESS STEEL



KNELLS DOOR & HARDWARE

2090 SHIRLEY DRIVE

KITCHENER

Tel: 519-578-1000

ON

N2B 0A3

Fax: 519-578-3262

WCDSB - ST. GREGORY CES ADDITION

Control No.7665

7665

December 13, 2025

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # 101.1

1 SGL DOOR 101.1 MAIN OFFICE CORRIDOR TO OSR 101F

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	STOREROOM LOCK	175F X E7 X G3	26D	MRK
1	CYLINDER	20J200V1-26-DQM (AB,F)	626	
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

Heading # 101.2

1 SGL DOOR 101.2 MAIN OFFICE CORRIDOR TO FLEX 101A

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	PRIVACY SET	175L X E7	26D	MRK
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

Heading # 101.3

1 SGL DOOR 101.3 MAIN OFFICE CORRIDOR TO PRINCIPAL 101C

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	ENTRY LOCK	175AB X E7 X G3	26D	MRK
1	CYLINDER	20J200V1-26-DQM (AB,F)	626	
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL
1	AUTO DOOR BOTTOM	CT-50 X 965MMOA	C.A.	KNC

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # 101.4

1 SGL DOOR 101.4 MAIN OFFICE CORRIDOR TO MEETING RM 101B

90° LH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	ENTRY LOCK	175AB X E7 X G3	26D	MRK
1	CYLINDER	20J200V1-26-DQM (AB,F)	626	
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

Heading # 101.5

1 PR DOORS 101.5 MAIN OFFICE CORRIDOR FROM CLOSET 101D

90° LHRA

965/965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

6	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
2	FLUSH BOLT, MANUAL	282D	US26D	HAG
1	STOREROOM LOCK	175F X E7 X G3	26D	MRK
1	CYLINDER	20J200V1-26-DQM (AB,F)	626	
1	OVERHEAD STOP, SURFACE	904S	US32D	GLY
1	CLOSER	4040XP.RWPA.689.SRT	689	LCN
1	DROP PLATE	4040XP-18G.689	689	LCN

Heading # 101.6

1 SGL DOOR 101.6 CORRIDOR C101 TO STAFF WR 101E

90° LH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	STOREROOM LOCK	175F X E7 X G3	26D	MRK
1	CYLINDER	20J200V1-26-DQM (AB,F)	626	
1	INDICATOR DEADBOLT	D271 X 30-253 X 10-094	626	FAL
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

INSTALL INDICATOR DEADBOLT 6" C/L ABOVE 161.

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # 102.1

1 SGL DOOR 102.1 COATS 102B TO WR 102A

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM
1	PASSAGE LEVER	175N X E7
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
26D	MRK
C32D	GAL
C26D	GAL

Heading # 103.1

1 SGL DOOR 103.1 CORRIDOR C101 TO KINDERGARTEN 2

90° LH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM
1	INTRUDER LOCK	195DB X G3
2	CYLINDER	20J200V0-26-DQM (DB,S)
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
26D	MRK
626	
C32D	GAL
C26D	GAL

Heading # 103.2

1 SGL DOOR 103.2 COATS 103B TO WR 103A

90° LH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM
1	PASSAGE LEVER	175N X E7
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
26D	MRK
C32D	GAL
C26D	GAL

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # 104.1

1 SGL DOOR 104.1 VESTIBULE 003 TO SPRINKLER RM 104

90° RH

965 x 2134 x 45 HMD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM
1	STOREROOM LOCK	175F X E7 X G3
1	CYLINDER	20J200V1-26-DQM (AB,F)
1	CLOSER	4040XP.RWPA.689.SRT
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
26D	MRK
626	
689	LCN
C32D	GAL
C26D	GAL

Heading # 105.1

1 SGL DOOR 105.1 CORRIDOR C102 TO CLASSROOM 105

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM
1	INTRUDER LOCK	195DB X G3
2	CYLINDER	20J200V0-26-DQM (DB,S)
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
26D	MRK
626	
C32D	GAL
C26D	GAL

Heading # 106.1

1 SGL DOOR 106.1 CORRIDOR C102 TO CLASSROOM 106

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM
1	INTRUDER LOCK	195DB X G3
2	CYLINDER	20J200V0-26-DQM (DB,S)
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
26D	MRK
626	
C32D	GAL
C26D	GAL

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # 107.1

1 SGL DOOR 107.1 CORRIDOR C102 TO CLASSROOM 107

90° LH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	INTRUDER LOCK	195DB X G3	26D	MRK
2	CYLINDER	20J200V0-26-DQM (DB,S)	626	
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

Heading # 108.1

1 SGL DOOR 108.1 CORRIDOR C102 TO CLASSROOM 108

90° RH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	INTRUDER LOCK	195DB X G3	26D	MRK
2	CYLINDER	20J200V0-26-DQM (DB,S)	626	
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

Heading # 109.1

1 SGL DOOR 109.1 CORRIDOR C102 TO CLASSROOM 109

90° LH

965 x 2134 x 45 WD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 114MM X 114MM	26D	MCK
1	INTRUDER LOCK	195DB X G3	26D	MRK
2	CYLINDER	20J200V0-26-DQM (DB,S)	626	
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM	C32D	GAL
1	WALL STOP	GSH 240	C26D	GAL

HARDWARE SCHEDULE - CODE # 7665

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # 201.1

1 SGL DOOR 201.1 EXIST. CORRIDOR FROM EXIST. CORRIDOR

90° RHR

1016 x 2134 x 45 HMD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

3	HINGE, 4 1/2, HVY WT	MPB68 127MM X 114MM
1	RIM EXIT DEVICE TRIM ALWAYS OPERABLE	12-8815J 965MMW X ETL X 649
1	CLOSER	4040XP.RWPA.689.SRT
1	KICK PLATE	GSH 80A X 2-SIDED TAPE X 203MM X 927MM
1	WALL STOP	GSH 240

26D	MCK
US32D	SAR
689	LCN
C32D	GAL
C26D	GAL

Heading # RESERVED

Heading # V01.1

1 PR DOORS V01.1 EXTERIOR FROM VESTIBULE 001

90° RHR,LHR

965/965 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

2	CONTINUOUS HINGE	SL27 CL LL X 2108MM X SDTF
2	RIM EXIT DEVICE EXIT ONLY OR DUMMY TRIM	16-8810J 965MMW X NO TRIM X 649 (DEVCYL-NONE)
2	CYLINDER	10J0200-26-DQM-Z20 (1-1/8 CYLINDER W/ SARGENT T CAM)
1	CYLINDER	10K0403-26-7GS (KEYMARK CYLINDER FOR SARGENT EXITS)
2	PULL	GSH 1180-1 X #2
2	OVERHEAD STOP, CONCEALED	104S
2	CLOSER	4040XP.RWPA.689.SRT
2	DOOR SWEEP	W-38S X 965MMW
1	THRESHOLD	CT-75 X 1930MM
2	DROP PLATE	4040XP-18G.689

CL	SEL
US32D	SAR
626	G&A
626	G&A
C32D	GAL
US32D	GLY
689	LCN
C.A.	KNC
ALUMINUM	KNC
689	LCN

INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.
FIXED MULLION BY ALUMINUM.

HARDWARE SCHEDULE - CODE # 7665

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # V01.2

1 PR DOORS V01.2 VESTIBULE 001 FROM EX. CORRIDOR 129

90° RHR,LHR

965/965 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

2	CONTINUOUS HINGE	SL11 CL HD600 X 2108MM X SDTF
2	DUMMY EXIT DEVICE	8893J X 42MMW
2	PULL	GSH 1180-1 X #2
2	OVERHEAD STOP, CONCEALED	104S
2	CLOSER	4040XP.RWPA.689.SRT
2	DOOR SWEEP	W-38S X 965MMW
2	DROP PLATE	4040XP-18G.689

CL	SEL
US32D	SAR
C32D	GAL
US32D	GLY
689	LCN
C.A.	KNC
689	LCN

INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.

Heading # V02.1

1 SGL DOOR V02.1 EXTERIOR FROM VESTIBULE 002

90° RHR

965 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

1	CONTINUOUS HINGE	SL27 CL LL X 2108MM X SDTF
1	RIM EXIT DEVICE EXIT ONLY OR DUMMY TRIM	16-8810J 965MMW X NO TRIM X 649 (DEVCYL-NONE)
1	CYLINDER	10J0200-26-DQM-Z20 (1-1/8 CYLINDER W/ SARGENT T CAM)
1	CYLINDER	10K0403-26-7GS (KEYMARK CYLINDER FOR SARGENT EXITS)
1	ELECTRIC STRIKE	9600-12/24D-630
1	PULL	GSH 1180-1 X #2
1	OVERHEAD STOP, CONCEALED	104S
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)
1	DOOR SWEEP	W-38S X 965MMW
1	THRESHOLD	CT-75 X 965MM

CL	SEL
US32D	SAR
626	G&A
626	G&A
630	ES-CD
C32D	GAL
US32D	GLY
AL	G&A
C.A.	KNC
ALUMINUM	KNC

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.

ACCESS CONTROL BY SECURITY.

INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.

HARDWARE SCHEDULE - CODE # 7665

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # V02.2

1 SGL DOOR V02.2 EXTERIOR FROM VESTIBULE 002

90° LHR

965 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

1	CONTINUOUS HINGE	SL27 CL LL X 2108MM X SDTF	CL	SEL
1	RIM EXIT DEVICE EXIT ONLY OR DUMMY TRIM	16-8810J 965MMW X NO TRIM X 649 (DEVCYL-NONE)	US32D	SAR
1	CYLINDER	10K0403-26-7GS (KEYMARK CYLINDER FOR SARGENT EXITS)	626	G&A
1	CYLINDER	10J0200-26-DQM-Z20 (1-1/8 CYLINDER W/ SARGENT T CAM)	626	G&A
1	ELECTRIC STRIKE	9600-12/24D-630	630	ES-CD
1	PULL	GSH 1180-1 X #2	C32D	GAL
1	OVERHEAD STOP, CONCEALED	104S	US32D	GLY
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)	AL	G&A
1	DOOR SWEEP	W-38S X 965MMW	C.A.	KNC
1	THRESHOLD	CT-75 X 965MM	ALUMINUM	KNC

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.
ACCESS CONTROL BY SECURITY.

Heading # V02.3

1 SGL DOOR V02.3 VESTIBULE 002 FROM COATS 103B

90° RHR

965 x 2134 x 45 ALD Door/ ALF Frame

45 MIN Door/45 MIN Frame

1	CONTINUOUS HINGE	SL11 CL HD600 X 2108MM X SDTF	CL	SEL
1	DUMMY EXIT DEVICE	8893J X 42MMW	US32D	SAR
1	PULL	GSH 1180-1 X #2	C32D	GAL
1	OVERHEAD STOP, CONCEALED	104S	US32D	GLY
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)	AL	G&A
1	DOOR SWEEP	W-38S X 965MMW	C.A.	KNC

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.
INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.

HARDWARE SCHEDULE - CODE # 7665

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # V02.4

1 SGL DOOR V02.4 VESTIBULE 002 FROM COATS 102B

90° LHR

965 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

1	CONTINUOUS HINGE	SL11 CL HD600 X 2108MM X SDTF
1	DUMMY EXIT DEVICE	8893J X 42MMW
1	PULL	GSH 1180-1 X #2
1	OVERHEAD STOP, CONCEALED	104S
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)
1	DOOR SWEEP	W-38S X 965MMW

CL	SEL
US32D	SAR
C32D	GAL
US32D	GLY
AL	G&A
C.A.	KNC

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.
INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.

Heading # V03.1

1 PR DOORS V03.1 EXTERIOR FROM VESTIBULE 003

90° RHR,LHR

1000/1000 x 2134 x 45 ALD Door/ ALF Frame

45 MIN Door/45 MIN Frame

2	CONTINUOUS HINGE	SL27 CL LL X 2108MM X SDTF
2	RIM EXIT DEVICE EXIT ONLY OR DUMMY TRIM	16-8810J 965MMW X NO TRIM X 649 (DEVCYL-NONE)
1	CYLINDER	10K0403-26-7GS (KEYMARK CYLINDER FOR SARGENT EXITS)
2	CYLINDER	10J0200-26-DQM-Z20 (1-1/8 CYLINDER W/ SARGENT T CAM)
1	ELECTRIC STRIKE	9600-12/24D-630
2	PULL	GSH 1180-1 X #2
2	OVERHEAD STOP, CONCEALED	104S
1	CLOSER	4040XP.RWPA.689.SRT
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)
2	DOOR SWEEP	W-38S X 965MMW
1	THRESHOLD	CT-75 X 1930MM
1	DROP PLATE	4040XP-18G.689

CL	SEL
US32D	SAR
626	G&A
626	G&A
630	ES-CD
C32D	GAL
US32D	GLY
689	LCN
AL	G&A
C.A.	KNC
ALUMINUM	KNC
689	LCN

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.
ACCESS CONTROL BY SECURITY.
INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.
FIXED MULLION BY ALUMINUM.

HARDWARE SCHEDULE - CODE # 7665

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # V03.2

1 PR DOORS V03.2 VESTIBULE 003 FROM CORRIDOR C101

90° RHR,LHR

1067/1067 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

2	CONTINUOUS HINGE	SL11 CL HD600 X 2108MM X SDTF
2	DUMMY EXIT DEVICE	8893J X 42MMW
2	PULL	GSH 1180-1 X #2
2	OVERHEAD STOP, CONCEALED	104S
1	CLOSER	4040XP.RWPA.689.SRT
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)
2	DOOR SWEEP	W-38S X 965MMW
1	DROP PLATE	4040XP-18G.689

CL	SEL
US32D	SAR
C32D	GAL
US32D	GLY
689	LCN
AL	G&A
C.A.	KNC
689	LCN

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.

Heading # V04.1

1 PR DOORS V04.1 EXTERIOR FROM VESTIBULE 004

90° RHR,LHR

1000/1000 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

2	CONTINUOUS HINGE	SL27 CL LL X 2108MM X SDTF
2	RIM EXIT DEVICE EXIT ONLY OR DUMMY TRIM	16-8810J 965MMW X NO TRIM X 649 (DEVCYL-NONE)
2	CYLINDER	10J0200-26-DQM-Z20 (1-1/8 CYLINDER W/ SARGENT T CAM)
1	CYLINDER	10K0403-26-7GS (KEYMARK CYLINDER FOR SARGENT EXITS)
1	ELECTRIC STRIKE	9600-12/24D-630
2	PULL	GSH 1180-1 X #2
2	OVERHEAD STOP, CONCEALED	104S
1	CLOSER	4040XP.RWPA.689.SRT
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)
2	DOOR SWEEP	W-38S X 965MMW
1	THRESHOLD	CT-75 X 1930MM
1	DROP PLATE	4040XP-18G.689

CL	SEL
US32D	SAR
626	G&A
626	G&A
630	ES-CD
C32D	GAL
US32D	GLY
689	LCN
AL	G&A
C.A.	KNC
ALUMINUM	KNC
689	LCN

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.

ACCESS CONTROL BY SECURITY.

INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.

FIXED MULLION BY ALUMINUM.

HARDWARE SCHEDULE - CODE # 7665

WCDSB - ST. GREGORY CES ADDITION
34 OSBORNE ST

Heading # V04.2

1 PR DOORS V04.2 VESTIBULE 004 FROM CORRIDOR C102

90° RHR,LHR

1067/1067 x 2134 x 45 ALD Door/ ALF Frame

NON-RTD Door/NON-RTD Frame

2	CONTINUOUS HINGE	SL11 CL HD600 X 2108MM X SDTF	CL	SEL
2	DUMMY EXIT DEVICE	8893J X 42MMW	US32D	SAR
2	PULL	GSH 1180-1 X #2	C32D	GAL
2	OVERHEAD STOP, CONCEALED	104S	US32D	GLY
1	CLOSER	4040XP.RWPA.689.SRT	689	LCN
1	AUTO OPERATOR	MICOM KIT 25222 HARD WIRED ADO (SW800 ADO & 2 WIRED BUTTONS - INSTALLED)	AL	G&A
2	DOOR SWEEP	W-38S X 965MMW	C.A.	KNC
1	DROP PLATE	4040XP-18G.689	689	LCN

120VAC TO HEADER, ALL CONDUIT AND LOW VOLTAGE WIRING BY ELECTRICAL.
INTEGRAL WEATHERSTRIP BY ALUMINUM SUPPLIER.

08 71 50-Automatic Door Operators

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF THE WORK

- .1 The work required under this Section of the Specifications shall include all labour, equipment and materials necessary to complete the automatic swing door operators for exterior and interior vestibule doors indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

- .1 Refer to Section 08 11 16: Aluminum doors, frames and hardware.
- .2 Refer to Section 08 11 14: Metals Door and Frames
- .3 Refer to Section 08 14 10: Wood doors
- .4 Refer to Section 08 71 00: Finish hardware
- .5 Refer to Electrical.

1.3 QUALITY ASSURNACE

- .1 Comply with ANSI A117.1 – Standard for Buildings and Facilities – Providing Accessibility and Usability For Physically Disabled People.
- .2 Provide automatic door operators that comply with applicable requirements of Low-Energy Automatic Door Standards ANSI A156.19 or High Energy Power Operated Door System as defined by ANSI A156.10.
- .3 Provide units produced by a Company with not less than five (5) years continuous experience in the manufacture of automatic entrance operators of the type required for this project.
- .4 All automatic equipment to comply with UL325.
- .5 The installer shall be an authorized representative of the automatic operator manufacturer for both the installation and maintenance of the type of units required for this project.

1.4 SUBMITTALS

- .1 Submit manufacturer's product data and standard details for operators, finish, accessories and other components of the work. Include rough-in diagrams, wiring diagrams, parts list and maintenance instructions.
- .2 Furnish templates, diagrams and other data to fabricators and installers of related work as needed for coordination of operator installation.

1.5 WARRANTY

- .1 Operators and installation to be warranted against defect in material and workmanship for a period of two (2) years from date of substantial performance of the contract as issued by the Consultant.
- .2 Provide only genuine parts and supplies as used in the manufacture of the original equipment on call back warranty service.

1.6 COORDINATION

- .1 Co-ordinate the preparation work required with related sections and Division 26.

2.0 PRODUCTS

2.1 MANUFACTURER

- .1 Door operators: Nabco (Gyro Tech), Series 8710 ADA, Medium Duty – Low Energy Swing Door Operator.

2.2 EQUIPMENT

- .1 Model GT8710 Side Load Swing Door System as indicated on door schedule and details.
- .2 Mode of Operation: Hydraulic Close operator shall open door by energizing motor and shall stop door by electrically reducing voltage and stalling motor against mechanical stop. Door shall close slowly by means of an adjustable hydraulic closer independent of the motor and electric control. Closing speed shall be fully adjustable. Manual door operation shall require less than 15 pounds of force applied to door stile. System shall also operate as a manual door in event of a power failure. Hold open time shall be adjustable from 1-60 seconds.
- .3 Components:
 - 1. Operator Housing
 - 2. Nabco (Gyro Tech) Swing Door Operator
 - 3. Microprocessor Control
 - 4. Connecting Hardware
- .4 Operator Housing shall be 5 1/2" (140mm) deep by 6" (152mm) high aluminum extrusion with finished end caps and shall be prepared for mounting to new or existing door frames. Hinged housing cover shall be able to be raised and secured or removed to provide service access. Plastic covers are not acceptable.

- .5 All structural sections shall have a minimum thickness of .166" (4mm) and shall be fabricated of 6063-T5 aluminum alloys. Housing cover shall be removable to provide service access and shall be extruded from 6063-T5 aluminum alloys to a minimum thickness of .100" (3mm). Plastic covers shall not be acceptable.
- .6 Finish: Aluminum shall have a standard finish of AA-M12-C22-A31, 204R1, clear finish.
- .7 Power Operator completely assembled unit shall include silent bevel gear and roller chain transmission. Gears and chain coated with a special lubricant for extreme temperature conditions. Closer to be an adjustable self-contained, sealed, spring/hydraulic unit. Attached to the transmission system shall be a DC permanent magnet motor. Motor shall operate from electronic control and require less than 3 amps at full power stall. Complete unit shall be mounted with provisions for easy replacement without removing door from pivots or frame.
- .8 Electrical Control: Shall be a solid-state microprocessor unit. The microprocessor control shall allow the opening speed, closing speed, back check and latch check speed each to be adjusted separately and independently from each other to meet specific site conditions. Adjustable opening and closing speeds shall be set in accordance with ANSI A156.19. Control shall include time delay, Push-N-Go functionality and sequential mode operation. All adjustments shall be specific and reproducible.
- .9 Connecting Hardware: Conversion Unit (C.U.) outswing doors shall be connected to operator by a two-piece drive arm with self-aligning rod ends and connecting door bracket for push-type operation. Inswing drive arm with a urethane covered roller, shall ride in a track fabricated of 6061-T6 or A380 aluminum alloy attached to the door rail where required for pull-type operation. Overhead Concealed (OHC) power operator drive arm to door with a pin linkage rotating in a self-lubricated bearing, within a self-adjusting slide block, traveling in an interconnected steel track and top door pivot assembly. The (OHC) unit will independently support the door on heavy-duty steel top and bottom door pivots. To allow for durability and easy serviceability, the door shall not pivot on shaft of operator.

2.3 ACTIVATING DEVICES

- .1 Wall Switches: Easy Touch, Exit-Enter Buttons, 6" diameter stainless steel surface, engraved HC Universal Symbol.

2.4 FINISH

- .1 The header shall be anodized aluminium in CL 204R1 clear aluminium finish to match framing.

2.5 FUNCTIONAL REQUIREMENTS AND MARKINGS

- .1 Exterior, Vestibule and Interior Door Operators:

- .1 The equipment must be designed to handle swing doors up to a weight of 250 lbs. (113 kg).
- .2 Opening speed:
 - .1 Opening speed to fully open shall be adjusted as required in ANSI/BHMA A.156.10-2005 for high energy doors and ANSI/BHMA A.156.19-2002 for low energy doors.
- .3 Hold open:
 - .1 The door shall be field adjusted to remain fully open for not less than 1.5 seconds for high energy doors and 5 seconds for low energy doors.
- .4 Closing speed:
 - .1 Doors shall be field adjusted to close from 90° to 10° as required in ANSI/BHMA A156.10-2005 or ANSI/BHMA A.156.19-2002 dependent upon final door weight.
 - .2 Doors shall close from 10° to fully closed in not less than 1.5 seconds.
- .5 The force required to prevent a stopped door from opening in the last 10° of opening, or at any point in closing shall not exceed 40 lbs. (133 N) applied 1" (25 mm) from the latch edge of the door.
- .6 In the event of a power failure, doors shall open with a manual pressure not to exceed 30 lbs. (133 N) at a point 25mm (1") from the latch edge of the door.
- .7 Doors shall be equipped with a sign(s) visible from either side, instructing the user as to the operation and function of the door. Signs or stickers should include the following:
 - 1. PUSH TO OPERATE
 - 2. PULL TO OPERATE
 - 3. AUTOMATIC PUSH SWITCH TO OPEN
 - 4. CAUTION – AUTOMATIC DOOR
- .8 Upon completion of the work, apply a sticker to the operator header case where the Owner can easily read the installer's name, address and phone number in the event a service call is needed.
- .9 The microprocessor control shall be easily field adjustable to comply with ANSI/BHMA A156.10-2005 Standard for Full energy Automatic Door Systems or ANSI/BHMA A156.19-2002 Standard for Low Energy Automatic Door Systems.
 - .1 Code requirements:

- .1 Field adjustments for door opening speed, door opening force, door closing speed, and door closing force shall be standard within the unit and adjust independently from all other external requirements. The same unit will be able to be converted easily in the field from full energy to low energy without the necessitation of a new unit being provided.

.10 Display board:

- .1 Unit will provide the ability to determine diagnostic evaluation of problematic issues through a digitized display panel. When provided, the display will provide confirmation that the door is performing properly and also provide error codes when it is not. This same panel shall also provide systematic information such as counters for usage determination and provide the installing contractor's telephone number in the event of service requirements.

2.6 SYSTEM OPERATION

.1 Exterior and Vestibule Doors:

- .1 Doors will be operable through the use of press/push plates that fall under the knowing act regulation as defined in ANSI A156.10-2005. Safety systems which include a door mounted system will prevent the door from making contact with a user should the presence area be activated while the user is within the detection zone.

2.7 ACCESSORIES

- .1 Wall mounted: to be Easy Touch as manufactured by International Electronics Inc., solid state pressure sensitive switch, weatherproof, with handicap universal symbol only, no power required, rated up to 40V, operating force between 6 to 12 oz., operating temperature between -20 deg F to 180 deg F., clear anodized finish.

2.8 REQUIREMENTS FOR WORK SPECIFIED IN OTHER SECTIONS

- .1 Electrical contractor shall furnish and install 120V, 60C, 1p, 15 amp service to operator and install boxes and conduits for low voltage wiring to controls.
- .2 This section shall install and connect low voltage wiring and control switches in boxes and raceways provided.
- .3 Co-ordinate with aluminium door trade for interfacing of operator and door stop.

3.0 EXECUTION

3.1 INSPECTION

- .1 Verify job conditions meet the manufacturer recommendations for installation.
- .2 Field check and verify all schedules and site conditions.

3.2 INSTALLATION

- .1 Install low voltage wiring and control switches in boxes and raceways provided by Division 26. Conduits are not provided in aluminum framing.
- .2 120V, 15 amp power to operator location and installation of all boxes and conduit for low voltage wiring by Div 16. Coordinate work.
- .3 Install initiating devices and connect.
- .4 Do all installation of operator and devices in accordance with manufacturer's shop drawings and instructions.
- .5 Check for proper operation. Adjust moving parts for smooth operation.

END OF SECTION

08 80 50-Glazing

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work required under this section of the Specifications shall include all labour, equipment and materials to complete all glass and glazing as indicated on the drawings and herein specified including the following:

- .1 Glass and glazing for the work of Sections 08 11 14, 08 11 16, 08 14 10, 08 44 13 and 08 80 50.
- .2 Miscellaneous Glazing at interior locations.
- .3 Accessory items and components.
- .4 Sealants for the work of this Section.

1.2 RELATED WORK

- .1 Refer to Section 07 92 10: Sealants & Caulking
- .2 Refer to Section 08 11 14: Metal Doors and Frames
- .3 Refer to Section 08 14 10: Wood Doors
- .4 Refer to Section 08 11 16: Aluminum Doors and Frames
- .5 Refer to Section 08 80 50: Aluminum Windows
- .6 Refer to Section 08 54 13: Fiberglass Windows
- .7 Refer to Section 08 44 13: Glazed Aluminum Curtain Wall
- .8 Refer to Section 10 28 10: Washroom Mirrors
- .9 Other Sections as applicable to this work.

1.3 REFERENCE STANDARDS

- .1 Comply with the latest editions of the following:
 - .1 Safety Glass, Tempered or Laminated Safety Glass: CAN/CGSB-12.1-2017.

- .2 Flat, Clear Float Glass: CAN/CGSB-12.3-M91 (R2017).
- .3 Insulating Glass Units: CAN/CGSB-12.8-2017
- .4 Spandrel Glass: Latest current standard
- .5 Wired Safety Glass: Latest current standard
- .6 Structural Design of Glass for Buildings: Latest current standard
- .7 Elastomeric Joint Sealants: ASTM C920-18 and Latest current CAN/CSA standard.
- .8 High Performance Silicone Sealant: ASTM C920-18, Type 'S' and Latest current CAN/CSA standard.
- .9 Elastomeric Cellular Preformed Gasket and Sealing Material: ASTM C509-06(2015).
- .10 Dense Elastomeric Compression Seal Gasket, Setting Block and Spacers: ASTM C864.
- .11 Dense Elastomeric Silicone Rubber Gasket and Accessories: ASTM C1115
- .12 Preformed Tape Sealants for Glazing Applications: ASTM C1281.
- .13 Specification for Decorative Architectural Flat Glass: GANA/GTA 95-1-31.
- .14 Fire Tests of Door Assemblies: ULC Standard CAN4-S104.
- .15 Fire Tests of Window and Glass Block Assemblies: ULC Standard CAN4-S106.
- .16 Standard Methods of Fire Endurance Tests: CAN/ULC-S101, latest edition
- .17 Window, Door and Skylight Installation: CAN/CSA-A440.4-07 (R2012)

1.4 SUBMITTALS

- .1 Provide, well in advance of fabrication, the following in accordance with Section 01 33 00, Submittals:
 - .1 List of proposed products and product data.
 - .2 Provide the following samples prior to order or fabrication:
 - .1 12" x 12" min. Sealed unit for each glass type
 - .2 6" x 6" sample of all other glass

- .3 Sample of all proposed sealants and glazing tape.
- .3 Manufacturer's certificates that:
 - .1 Glazing materials meet or exceed specified requirements.
 - .2 Sealants have been tested for adhesion to and compatibility with glass and glazing substrates including warm edge spacers.
 - .3 Fabricator's certificate: Certify that safety glass units and sealed insulating glass units meet or exceed specified requirements.
 - .4 Manufacturer's installation and protection instructions.
 - .5 Copy of warranties for review.
 - .6 Material Safety Data Sheets (MSDS): Submit MSDS information for glass materials including sealants, tape and gasket.
 - .7 All glazing described in this section and shown on the drawings to be confirmed and designed through shop drawings submitted prior to fabrication. This includes all interior and exterior glazing systems. All work to meet the structural load requirements of the Ontario Building Code and the shop drawings must be designed and stamped by a Professional Engineer registered in the province of Ontario. Stamp must be provided on all shop drawing submittal sets and must include all products/components.

1.5 QUALITY ASSURANCE

- .1 Glass Manufacturer: Company specializing in manufacture of clear, tinted, coated and other glass products with 10 years minimum successful experience.
- .2 Source Quality Control: To ensure uniformity, all tinted and coated glass used for Project shall be obtained from single manufacturer.
- .3 Glass Fabricator: Company specializing in fabricating insulating, heat strengthened, tempered, laminated, glass units with 5 years minimum successful experience.
- .4 Glass Installer: Company installing glass on site shall specialize in this type of work and have 5 years minimum successful experience.
- .5 Safety Glazing: Comply with CAN/CGSB 12.1 and 12.11 and other applicable safety requirements. Each piece of safety glazing shall be permanently labelled with appropriate marking.
- .6 Insulating Glass Units: Permanently labelled with one of the following testing agency certifications:

- .1 Insulating Glass Certification Council (IGCC).
- .2 Associated Laboratories Inc. (ALI).
- .3 National Accreditation and Management Institute (NAMI).

1.6 DELIVERY, STORAGE AND PROTECTION

- .1 When job is ready for installation, deliver material to the site and provide storage facilities and protection against damage during and after installation. Glass units shall bear manufacturer's label identifying kind and grade and shall not be removed until after the glass has been accepted.
- .2 Protect glass and glazing materials during delivery, storage and handling in accordance with manufacturer's instructions.
- .3 Prevent edging chipping and damage from condensation, temperature changes and exposure to sunlight.
- .4 Insulating Glass Unit: Comply with fabricator's instructions for venting and sealing when units are exposed to substantial altitude changes.

1.7 WARRANTY GUARANTEE

- .1 Insulated Units: This contractor shall have the manufacturer warrant to the Owner, in writing, all insulating glass units against seal failure for a period of ten (10) years from the date of acceptance and total completion of the building. Warranty shall be for complete replacement, materials and labour, of defective units at no charge to Owner.
- .2 Mirror Glass Units: 5 years manufacturer's warranty to cover replacement in event of peeling, cracking and deterioration of coating.
- .3 All Other Glass Units: 5 years manufacturer's warranty to cover total replacement in event defective performance.

2.0 PRODUCTS

2.1 ACCEPTABLE GLASS MANUFACTURERS

- .1 AGC Glass (formerly AFGD Glass), Atlanta, Georgia
- .2 Guardian Industries Corporation, Carleton, Michigan
- .3 Interpane Glass Company, Clinton, North Carolina
- .4 Vitro Architectural Glass (formerly PPG Industries Inc, Pittsburgh, Pennsylvania)
- .5 Viracon, Owatonna, Minnesota

- .6 Fire rated product manufacturers as listed below
- .7 Manufacturers of equivalent products submitted and approved in accordance with Section 01 33 00. Consultant reserves the right to reject proposed substitutions on basis of colour, tint and reflective appearance even though material and performance values are equivalent.

2.2 GLASS

- .1 Insulating glass in accordance with CAN/CGSB-12.8 and Spandrel Glass to the latest current standard. All insulating glass units in the exterior building envelope to consist of glass lites separated by a dehydrated airspace that is hermetically dual sealed with a primary seal of polyisobutylene (PIB), or thermo plastic space (TPS) and a secondary seal of silicone.
- .2 **GL-1**
 - .1 Vision Units: Double-glazed units: Insulated units shall be made of two lites of 6 mm tempered glass and a 12.7mm desiccate filled air space bound with a warm edge spacer, argon filled (90% argon/10% air) and silicone secondary seal. Exterior lite to be Vitro Solarban 70 sputter coat low-e on #2 surface or approved equal. Interior lite to be clear tempered glass. Spacer to be Technoform I Spacer or approved equal - colour to be black finish. 25.4mm total thickness. Daylight visible light transmittance of insulating glass unit is 64%. Solar Heat Gain Coefficient of insulating glass unit is 0.27. Winter U Value 0.28 or better.
 - .3 Tempered glass: Sizes and thicknesses are denoted for each location on the drawings.
 - .4 Fire-rated Glass: 5/16" (8mm) overall thickness. Acceptable products:
 - .1 FireLite Plus minimum – Standard Finish - manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products
 - .5 Mirrored Glass: 6mm polished plate glass in accordance with CAN/CGSB-12.5-M86-Mirrors, Silvered. Edges of mirrors where exposed to be Arrised.
 - .1 Mirrors complete with reinforced scrim backing to CAN/CGSB – 82.6 – M86.
 - .2 Backing – woven polymer scrim. Thickness – 6 mil. Adhesion – 2.8 – 3.4 lbs. Per inch widths. Tensil Grab Strength – LBF – WARP – WEFT – 100/100. Nominal Tear Strength – LBF 55.
 - .3 Mirror "J" Channels. C.R. Laurence, 1/4" standard "J" channel, Polished finish # D636P.
 - .4 Mastic, purpose made for bonding mirrors. Acceptable product: C.R. Laurence, CRL Palmer Mirro-Mastic.

2.3 SEALANTS

- .1 Sealants and backer rod shall be as specified in Section 07 92 10 of the Specifications except as follows:
 - .1 For structural silicone glazing adhesive to curtain wall mullions:
 - .1 Dow Corning 795 silicone sealant adhesive
 - .2 GE Silicones Construction Products, Ultraglaze SSG4000
 - .3 Tremco Spectrem 2, High Performance Silicone Sealant.
 - .2 For butt glazed joints between glass spandrel panels:
 - .1 Dow Corning 99A silicone building and glazing sealant, colour black
 - .2 GE Silicones Construction Products, Silpruf Sealant, colour black.
 - .3 Tremco Spectrem 2, High Performance Silicone Sealant, colour black.

2.4 ACCESSORIES

- .1 Provide glazing accessories for specific applications of type recommended by glass manufacturer and glass fabricator and as required for complete, functional, weather tight installation.
- .2 Cleaners and Primers: Compatible with substrate and glazing materials and application condition.
- .3 Setting Blocks: Elastomeric material with Shore A durometer hardness between 80 and 90. Provide fire-performance listed setting blocks at fire-rated glass per manufacturer's tested systems.
- .4 Spacer Shims: Elastomeric material blocks or extrusions with 50 to 60 Shore A durometer hardness.
- .5 Edge Blocks: Elastomeric material of hardness required to limit lateral movement of glass.
- .6 Glazing Tape: Performed butyl compound, non-staining, non-migrating in contact with non-porous surfaces, coiled or release paper. Black and complying with ASTM C1281 and AAMA 800.
- .7 Glazing Gaskets: Provide type, profile and hardness as required to maintain watertight seal.
 - .1 Dense Compression Type: Molded or extruded material, black.
 - .1 EPDM gasket complying with ASTM C864.

- .2 Silicone complying with ASTM C1115.
- .3 Thermoplastic polyolefin rubber complying with ASTM C1115.
- .2 Soft Compression Type: Molded or extruded, closed-cell, integral-skinned, black gasket complying with ASTM C509, Type II.
 - .1 EPDM
 - .2 Silicone
 - .3 Thermoplastic polyolefin rubber.

3.0 EXECUTION

3.1 DISTRIBUTION OF GLASS and ACCESSORIES

- .1 Refer to drawings for locations of all units designated 'GL' above.
- .2 Tempered glass in the following locations:
 - .1 At Insulated Units as above.
 - .2 All interior doors and sidelights and screens in non-rated fire separation walls. Rated fire-separation walls are those designated as 30-minute fire separation or greater and are shown on the Life Safety Plans.
- .3 Fire-rated glass to be used in all fire-resistive rated doors, sidelights, borrowed lites and screens to receive glazing throughout except as otherwise indicated above. Fire Separations with Fire-resistive ratings are those designated as 30-minute fire separations or greater and are shown on drawings and/or in Door Schedule.
- .4 Mirrored Glass in washrooms.

3.2 PREPARATION

- .1 Verify glass framing is accurately sized, structurally sound, square, and without bow.
- .2 Verify surfaces on glazing channels and recesses are clean, free of obstructions, and ready to receive glazing.
- .3 Inspect edges of glass. Install only glass with clean-cut edges. Do not bump, drag, or brush edges against sash or hard objects. Avoid scratching.
- .4 Immediately prior to glazing, clean contact surfaces with solvent and wipe dry.
- .5 Prime surfaces as required for adhesion of sealants.

3.3 INSTALLATION

- .1 Comply with GANA Glazing Manual, approved shop drawings, and manufacturer's instructions.
- .2 Damaged Glass: Do not install glass with edge damage or other imperfections. Remove from site and replace.
- .3 Install setting block and spacers as recommended by reference glazing standards and glass manufacturer's recommendations. Set blocks in sealant.
- .4 Provide edge blocking as required to prevent sideways movement of glass in glazing channel.
- .5 Ensure glazing channels and stops provided required bite on glass, minimum edge and face clearances, and adequate sealant thickness.
- .6 Tape Glazing:
 - .1 Cut glazing tape to length and set continuously against permanent stops and projecting slightly above sightline.
 - .2 Tape Joints: Butt joints. Do not overlap tape. Seal joints with compatible sealant.
 - .3 Rest glass on setting blocks and push against tape for full contact at perimeter of lite.
 - .4 Remove tape release immediately prior to placing glass.
 - .5 Dry Tape Glazing: Install dense compressible gasket against glass and secure with removable glazing stop.
- .6 Dry/Wet Tape Glazing:
 - .1 Place spacer below sightline and install removable glazing stop against spacers.
 - .2 Fill gap between glass and removable glazing stop sealant to uniform line level with bite of frame.
 - .3 Knife trim protruding edge of glazing tape.
- .7 Gasket Glazing:
 - .1 Fabricate two-piece compression gasket to exactly fit openings.
 - .2 Install soft compression gasket against permanent stops. Miter cut and bond together corners.

- .3 Rest glass on setting block. Insert dense compression gasket to press glass against soft gasket and lock in place against removable stop.
- .4 Apply sealant to gasket joints.
- .5 Install gasket protrude slightly beyond glazing stops.
- .8 Wet Sealant Glazing:
 - .1 Install spacers and sealant backing between glass and stops. Position to control depth and width of sealant.
 - .2 Apply sealant to glazing channels without voids. Ensure complete bond of sealant to glass and channel surfaces.
 - .3 Tool exposed sealant surfaces to provide wash away from glass.

3.4 CLEANING

- .1 Clean glass immediately following installation. Remove sealants and other glazing materials from adjacent finished surfaces.
- .2 Remove labels, tape and stickers.

END OF SECTION

09 21 16-Gypsum Board Assemblies

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

Supply all labour, material and equipment necessary for the installation of all gypsum board and framing system work as indicated on the drawings and schedules including the following:

- .1 Gypsum wallboard panel surfaces for walls, ceilings and bulkheads as detailed on the drawings and called for on Room Finish Schedule.
- .2 Drywall finishing and accessories.
- .3 Sound attenuation insulation.
- .4 Metal stud framing and sheathing assemblies.
- .5 Acoustic caulking.

1.2 RELATED WORK

- .1 Section 04 80 00: Masonry Assemblies
- .2 Refer to Section 06 10 10: Wood blocking and backing within wall assemblies.
- .3 Refer to Section 07 21 16: Blanket Insulation
- .4 Refer to Section 08 11 14: Metal Doors and Frames
- .5 Refer to Section 09 30 13: Tile and Marble
- .6 Refer to Section 09 90 00: Painting
- .7 Refer to Mechanical and Electrical sections for access doors.

1.3 QUALIFICATIONS

- .1 Drywall work shall be done by mechanics skilled in this trade in accordance with C.S.A. Standard A82.31 and to the Manual of Gypsum Wallboard Construction by Gypsum Drywall Contractors International.
- .2 Furring and lathing shall be done by mechanics skilled in this trade in accordance with C.S.A. Standard A82.30 -M1980.

1.4 ENVIRONMENTAL CONDITIONS

- .1 Ensure temperature of surrounding areas is within the recommended range.
- .2 For drywall and plaster, minimum, 12 deg. C., maximum 21 deg. C., 24 hours before, during and after entire gypsum wallboard and joint treatment operations. Avoid concentrated or irregular heating during drying.
- .3 Ensure proper ventilation to eliminate excessive moisture.

1.5 PROTECTION

- .1 Protect work of this section against damage by others.
- .2 Protect work of other sections against damage resulting from work of this section. Special care shall be taken to avoid spattering of surfaces adjacent to plastered areas, particularly aluminum and glass. All plaster droppings shall be promptly removed. Where machines are used, adjacent surfaces should be masked. Repair and make good damage to other sections caused by this work.

1.6 JOB CONDITIONS

- .1 Verify all conditions and dimensions at the building.
- .2 Ensure that surrounding areas are maintained within the recommended temperature range and have proper ventilation to eliminate excessive moisture.
- .3 Report any unsatisfactory conditions in writing to the Architect. Start no work until conditions are satisfactory. Commencement of work shall imply acceptance of conditions.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- .1 No outside storage is permitted. Do not remove wrappings until ready for use.
- .2 Stack wallboard flat on clean, level and dry surface without overhanging boards. Protect bagged and boxed products from excessive moisture or wetting.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Gypsum Board/Panels (GWB):

All gypsum panels shall conform to CSA A82.27-M1977.
 - .1 For exterior wall sheathing on metal studs, ½" thick Georgia Pacific, Dens-Glass Gold Sheathing.

- .2 For all interior ceilings and bulkheads 5/8" thick, tapered edge Type 'X' gypsum board. Refer to drawings for drywall thickness, number of layers and fire resistance requirements of wall assemblies.
- .3 For all interior walls, 5/8" tapered edge Mold Tough VHI (Very High Impact) Firecode X gypsum board to ASTM C1629. Refer to drawings for non-tile locations.
- .4 For interior wall sheathing applied to metal studs with wall tile finishes, 5/8" Georgia Pacific, Dens-Shield Fireguard Tile Backer to ASTM D3273 and ASTM D6329-98. Refer to drawings for tile locations.
- .2 Fasteners
 - .1 Screws to be self-drilling, self-tapping, case hardened of length as recommended by manufacturer for each application.
 - .2 Screws for exterior cement board sheathing (if required on drawings) attachment to face and soffit framing, 1 5/8" Duracrete. Steel screws, wafer head, anticorrosive coating.
 - .3 Screws for exterior sheathing attachment to metal studs, corrosion resistant, Type S-12.
- .3 Tape
 - .1 Tape for gypsum board shall be as recommended by gypsum board manufacturer made from perforated kraft paper with feathered edges, minimum 2" width.
- .4 Joint Filler
 - .1 Joint filler for drywall work shall be type recommended by gypsum board manufacturer, mixed in strict accordance with directions given on container.
- .5 Adhesive
 - .1 Adhesive shall be type recommended by gypsum board manufacturer, equal to CGC Durabond.
- .6 Trim
 - .1 Where drywall abuts other wall, ceiling materials or other component, trim shall be CGC Metal Trim, Bailey Metal Products Limited or Architect's approved equal and as recommended by manufacturer for each condition.
- .7 Corner Beads
 - .1 Corner beads to be CGC Dur-A-Bead, Bailey Metal Products Limited or Architect's approved equal.

- .8 Casing Beads
 - .1 Casing beads to be CGC #200, Bailey Metal Products Limited or Architect's approved equal.
- .9 Control Joints
 - .1 Control joints to be CGC #093 or Architect's approved equal.
- .10 Caulking
 - .1 Acoustic caulking shall comply to CAN/CGSB-19.17-M90 or latest standard.
 - .1 Product: Tremco Acoustical Sealant
- .11 Steel Stud Components
 - .1 For interior partitions, steel studs and runners, 33 mils thick (20 gauge) galvanized steel complying with ASTM C645 to sizes shown on the drawings.
 - .2 For all interior partitions, provide top plate deflection runners.
- .12 Anchors
 - .1 To CSA - 82.30 - M1990.
- .13 Cold Rolled Channels
 - .1 Carrier channels, standard 1 ½" cold rolled, 18 gauge, galvanized steel complying with ASTM C645.
- .14 Hanger Wire
 - .1 Wire for hangers shall be No. 8 gauge, galvanized wire.
- .15 Tie Wire
 - .1 Tie wire shall be galvanized annealed 18 gauge.
- .16 Furring Channels
 - .1 Steel framing channels, roll formed hat section, 25 gauge galvanized steel complying with ASTM C645.
- .17 Drywall Suspension System
 - .1 Conform to ASTM A653, Zinc-Coated Hot dipped galvanized steel, ASTM C635, heavy-duty main beam classification and ASTM C645, Standard Specification for Rigid Furring Channels for Screw Applications of Gypsum Board.

- .2 All locations: USG Drywall Suspension System by CGC Inc. complete:
 - .1 Main Tees: 38mm x 38mm, single web construction.
 - .2 Wall-to-Wall Main Tees: 38mm x 38mm, single web construction.
 - .3 Cross Tees: 38mm x 38mm, single web construction.
 - .4 Cross Channels: 73x22mm, with 37mm face width.
 - .5 Wall Channels: 40x25mm, "C" channel.
 - .6 Wall Molds: 38 x 25mm "L" profile.
 - .7 Splice and Transition clips: purpose-made, roll formed from hot-dip galvanized steel sheet by USG, or an approved alternative.
 - .8 Suspension wire: 2.75mm galvanized wire.

3.0 EXECUTION

3.1 INSTALLATION

- .1 General
 - .1 Conform to CSA A82.31-M91 for drywall work and CSA A82.30-M1980 for plaster work except as otherwise specified herein.
 - .2 Co-operate with mechanical, electrical and other trades to accommodate fixtures, fittings and other items in wallboard areas.
 - .3 Carry out work of this Section only when temperature is maintained and controlled in the range of 13 deg C to 21 deg C for at least 24 hours before installing gypsum wallboard and is so maintained until joint cement and adhesives are cured.
 - .4 Erect casing and corner beads plumb or level with minimum number of joints. Do not use scrap pieces.
- .2 Metal Stud Partitions
 - .1 Provide accurately aligned partition tracks at top and bottom of partitions. Secure at 600 mm o/c (24" o/c).
 - .2 Erect studs vertically in partition tracks at 400 mm o/c (16" o/c) and not more than 50 mm (2") abutting walls, openings and each side of corners. Extend wall studs from floor to roof deck.
 - .3 Extend studs on each side of openings from floor to deck above. Provide double stud at all door openings, secure studs together. Frame doors to receive control joints extending from head of door frame to control joint pattern on drawings.
 - .4 Install cut to length piece of runner horizontally over door frames.

- .5 Install cut to length intermediate vertical studs in same manner and spacing as wall studs, over door frames and above and below other openings.
- .6 Where studs extend over 3655 mm (12'-0") in height provide horizontal bracing spaced approximately 2440mm (8'-0") o.c. vertically and provide double studs at each side of door frames.
- .7 Size, brace and reinforce studs as necessary to provide sturdy, rigid partitions to heights and lengths required. Attach studs to floor and ceiling track and runner.
- .8 Frame with studs to obtain profiles indicated on drawings for bulkheads, recesses and reveals where indicated. Framing indicated on the drawings is schematic. Do not regard as exact or complete. Conform to profiles detailed. Build in control joints shown on drawings.
- .9 Co-ordinate erection of studs with installation of door and borrowed light frames and with the Mechanical and Electrical divisions.
- .10 Securely anchor partitions track to building structure and make a 12.5 mm (1/2") allowance in partition studs for deflection of structure above to avoid transmission of structural loads on partitions. Use double deflection track slip joint or provide expansion material to allow for deflection.
- .11 Where horizontal runs of service lines are to be installed arrange with applicable trades to have lines installed prior to wallboard application.
- .3 General Metal Framing
 - .1 Where indicated on the drawings provide metal stud back-up framing to accommodate the work of other sections of the specifications. Co-ordinate suitable spacing's and configurations to insure compatibility of the work of others.
- .4 Gypsum Wallboard - Taped
 - .1 Partitions, Ceilings & Bulkheads
 - .1 Apply gypsum wallboard to metal framing systems floor to underside of deck with required screws, all locations.
 - .2 Erect wallboard with long dimension parallel to supports. Locate end joints over supporting members. Offset joints on opposite sides of partitions.
 - .3 Locate vertical joints at least 12" from jamb lines of openings.
 - .4 Space screws at 200 mm o/c (8" o/c) at board edges and 300 mm (12") o/c on board field.

- .5 Apply single layer wallboard to concrete block surfaces, where indicated, using laminating adhesive.
- .6 Conform to details and profiles indicated on drawings.
- .2 Partition Fasteners
 - .1 Perimeter screws shall be not less than $\frac{3}{8}$ " nor more than $\frac{5}{8}$ " from edges and ends and shall be opposite screws on adjacent boards.
 - .2 Drive screws with power screw gun and set with counter-sunk head slightly below surface of board.
- .3 Finish all joints
- .5 Build-in access doors supplied by Mechanical Division where required in wallboard installations, in accordance with manufacturer's recommendations to match and blend with surrounding surfaces.

Co-ordinate locations to avoid interference with ductwork, piping and lighting.
- .6 Control Joints
 - .1 Install control joints using control joint strip as specified at spacing not to exceed and in locations indicated on drawings.
 - .2 Install control joints where shown on reflected ceiling plans in ceilings, bulkheads and exterior soffits or at intervals not exceeding 25' in length and at corners. Confirm locations with Architect prior to proceeding.
 - .3 Install in accordance with manufacturer's instructions.
 - .4 Frame all doors to receive control joints extending from head of door frame to above ceilings at all locations both sides of wall.
- .7 Finishing
 - .1 Joint Treatment
 - .1 Do filling either manually, using tools of trade, or by mechanical taping and filling machine of proven efficiency.
 - .2 Apply joint filler, tape and topping cement according to manufacturer's directions.
 - .3 Finish work shall be to a LEVEL 4. All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads and accessories. All joint compound shall be smooth and free of tool marks and ridges.

- .4 Finished work shall be smooth, seamless, plumb, true and flush, having square, neat corners.
- .5 Tape and fill one coat joints above ceiling lines.

3.2 EXTERIOR SHEATHING SYSTEM

- .1 General
 - .1 Co-operate with masonry, carpentry, mechanical, electrical, glazing, cladding and other trades to which the work of this section interfaces.
 - .2 Carry out the work of this section only when temperature is within the limitations specified.
- .2 Sheathing Installation
 - .1 Apply exterior sheathing to the framing system with non-corrosive screws.
 - .2 Erect sheathing with long dimension parallel to supports, minimize number of joints.
 - .3 Space screws at 200 mm (8") o.c. at board edges and within field of board.
 - .4 Perimeter screws shall not be less than 10 mm ($\frac{3}{8}$ ") nor more than 14 mm ($\frac{5}{8}$ ") from edges and ends shall be opposite screws on adjacent boards.
 - .5 Drive screws with power screw gun and set flush with the surface of sheathing, do not countersink screws. Ensure tight bearing of sheathing to framing.

3.3 ACOUSTIC CAULKING

- .1 Apply acoustic caulking at all wall to floor and ceiling structures. Refer to drawings for locations for intent only. Maintaining the acoustic value of the wall system with acoustic caulking is required at all locations.

3.4 EXTERIOR STUD FRAMING

- .1 Supply and install exterior stud framing at parapet walls, roof transitions, cladding systems, etc. as indicated on drawings. Coordinate work with structural stud framing section.

3.5 CLEAN UP

- .1 Following erection, remove and replace all ceiling tiles that are chipped, cracked or have other imperfections. Clean dirty or discoloured units. Promptly remove all debris and excess material not required by contract from the site.

END OF SECTION

09 30 13-Tile and Marble

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

Supply all labour, equipment and materials necessary to complete all Tile and Marble Work as indicated on the drawings and specified herein, including the following:

- .1 Tile wall finishes, floors and bases.
- .2 Shower waterproofing.
- .3 All bonding and grouting materials and additives.
- .4 Marble window stools.
- .5 Accessory items.

1.2 RELATED WORK

- .1 Refer to Section 03 30 00: Cast-in-Place Concrete
- .2 Refer to Section 04 80 00: Masonry Assemblies
- .3 Refer to Section 09 21 16: Gypsum Board Assemblies
- .4 Resilient Flooring and base.
- .5 Millwork, Visual Display, Toilet Compartments and other wall accessories

1.3 QUALIFICATIONS

- .1 The Contractor shall be registered as members in good standing with the Terrazzo, Tile and Marble Association of Canada (TTMAC). Only mechanics trained and experienced in the work of this section to be installers of the materials herein specified.

1.4 SAMPLES

- .1 Prepare samples of tile to instructions of the Architect and submit same for approval in accordance with Section 01 33 00, Submittals.
- .2 Submit a sample panel of each type and colour of tile with accepted grout mounted on 600mm x 600mm x 16mm (24" x 24" x 5/8") plywood, prior to commencement of any work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Products shall be delivered, stored and handled in a manner to prevent damage.
- .2 Keep delivered materials dry and free from staining inside weatherproof structure or otherwise protected from freezing and the elements. Store cementitious materials off damp surfaces.

1.6 PROJECT CONDITIONS

- .1 Take all required measurements at the building before commencing work.
- .2 Examine the areas in which the work of this section is to be applied and determine the limitations, criteria and co-ordination required to relate to the physical and environmental conditions which will be existing at the time the work is scheduled.
- .3 Immediately prior to proceeding with the application, examine the conditions including temperature of structural base and general area of work affecting the proper installation of the work of this Section. Improper conditions shall be reported to the Architect and work shall not proceed until conditions are satisfactory. Installation of this Contractor's work shall constitute acceptance of the base surface.
- .4 Protect the work of this section and the work of others during installation and curing period and until such time as traffic will not affect the installation. Walls, dados and trim shall especially be covered during operations to minimize final cleaning. Any stained or damaged work shall be removed and replaced or made good to the satisfaction of the Architect.
- .5 Co-ordinate the work with the schedules prepared for the project and co-operate with other trades working on the project.
- .6 Examine all drawings and specifications for all trades throughout the building for information affecting the work of this Section.
- .7 Notify all other trades when materials to be supplied by them to be set in the work of this trade will be required, also notify all other trades when and where the exact locations of openings, chases, etc. to be located by them will be necessary.
- .8 Supply to other trades any articles that will be required to be built in to receive the work of this trade including bolts and anchors and notify all other trades of any preparations required to be made by them for properly attaching, securing or executing the work of this Section.
- .9 In the event of his failure to furnish correct and prompt information, openings or anchors, etc. this Contractor shall complete all cutting or patching required at his own expense and make good to the satisfaction of the Architect.
- .10 All holes for piping and similar projections through ceramic tile shall be executed to ensure neat fitting without resorting to small cut pieces.

1.7 MAINTENANCE MATERIAL

- .1 Provide one-hundred square feet or 2%, whichever is greater, of each type of tile and colour used on this project, except for custodial closet service wells, from the same manufacturing run for maintenance use.
- .2 Submit maintenance material in accordance with Section 01 77 00, Project Closeout.

1.8 WARRANTY

- .1 All components and installation to be warranted against defect in material and workmanship for a period of two (2) years from date of substantial performance of the contract as issued by the Consultant.

2.0 PRODUCTS

2.1 TILE TYPES

- .1 CER-1 - Ceramic Tile: To CAN/CGSB-75.1-M88, from product supplied by:
 - .1 Olympia Colour Dimensions Series, 100mm x 400mm (4" x 16"), or;
 - .2 CeraGres BLOC series, 100mm x 400mm (4" x 16")
 - .3 No Alternates Allowed.
- .2 POR-1 - Porcelain Tile: To CAN/CGSB-75.1-M88, Class MR1. Double-loaded, thru-bodied porcelain. Size: 300 x 600mm (12" x 24") nominal size for all floors as indicated on schedule. All base to be 100mm (4") high X same length as floor tile nominal size of same product with vertical base joints aligning with floor joints. Products:
 - .1 Centura: "Integra" (matte)
 - .2 Ceragres: Caesar Line – "Wide" (matte).
 - .3 Olympia Tile: "Lea Stone" (matte)
 - .4 Olympia Tile: "Uptown" (matte)
 - .5 No Alternates Allowed.
- .3 For all tile types, the contractor to provide the Architect with the proposed manufacture/product. The Architect will then select the colour from the full range of product colours.
- .4 Include for the manufacturer's FULL colour range in specified products. More than one colour of any specified product may be used. The Architect will provide the contractor layouts for tile pattern.
- .5 Tile to be installed in accordance with manufacturer's printed instructions and to Specification Guide 09 30 00 Tile Installation Manual of the Terrazzo, Tile and Marble Association of Canada as outlined in Part 3 of this Specification.

2.2 SETTING AND GROUTING MATERIALS

- .1 Provide Architect with full manufacturer's colour range for grouts. Manufacturer of premix grouts, mortars and additives shall be of one of the following:
 - .1 Laticrete International Inc.
 - .2 Mapei Corp.
 - .3 TEC.
 - .4 Custom Building Products
- .2 Interior Setting System Floors and Walls: Premium Dry Set Mortar to ANSI A118.1 with Thin-set Mortar Additive to ANSI A118.4. Acceptable Products:
 - .1 Laticrete 272/3701 as manufactured by Laticrete International Inc.
 - .2 Mapei, Kerabond/Kerlastic, manufactured by Mapei.
 - .3 TEC, Premium Mortar Ultimate 6 Plus (487)
 - .4 MegaLite, Ultimate Crack Prevention Mortar by Custom Building Products
- .3 Dry Curing Grout for Interior Work: to ANSI A118.6, High density, factory prepared cementitious type grouting compound and latex grout additive. Acceptable Products:
 - .1 TEC, Power Grout 550- Premium Sanded Grout with TEC Acrylic Grout Additive.
 - .2 Alternate by Laticrete or Mapei provided it is equal to above and product is approved seven days prior to tender close.
 - .3 Prism Ultimate Performance Grout by Custom Building Products
- .4 Chemical Resistant Epoxy Grout for Washroom Floors and Custodial Closet Service Well Walls: performance standard to ANSI A118.3, 100% solids epoxy grout. Two part, pre-sanded, thermosetting and coldwater cleanable. Part of complete system passing ASTM C-627 Heavy Duty Performance Rating as outlined in the TTMAC Specification Guide. Acceptable Products:
 - .1 Latapoxy SP100.
 - .2 Mapei, Kerapoxy.
 - .3 TEC, AccuColor EFX, 100% Solids Epoxy Mortar and Grout
 - .4 CEG-IG 100% Solids Epoxy Grout by Custom Building Products
- .5 Dry Curing Unsanded Grout for glazed ceramic wall tile to ANSI 118.6. Acceptable Products:
 - .1 Laticrete PermaColor Unsanded Grout
 - .2 Mapei, Keracolor U - Unsanded Polymer Modified Portland Cement Tile Grout
 - .3 TEC, AccuColor Premium Unsanded Grout.
 - .4 Prism Ultimate Performance Grout by Custom Building Products
- .6 Water: Potable and free of materials which may discolour mortar or grout.
- .7 Primers where required shall be as recommended by the manufacturer of the setting system.

2.3 TILE ACCESSORIES

- .1 Materials, Colours and Finishes listed below are for pricing purposes ONLY. Final colours will be selected from complete catalogue of samples, including coated and textured finishes, during submittal process. Where less expensive trim materials/finishes are selected by the Architect during the submittal process, a credit will be provided by this trade.
- .2 Outside corners of wall tile, vertically or horizontally all areas:
 - .1 Schluter-QUADEC c/w connectors and in/out corner 90 deg as required.
 - .2 Material: Stainless Steel / Finish: Brushed
- .3 Wall tile capping and base capping and floor tile to resilient tile or resilient sheet flooring horizontal transition and service wells:
 - .1 Schluter SCHIENE size to suit tile thickness.
 - .2 Material: Stainless Steel / Finish: Brushed
- .4 Cove-shaped profile for inside wall corners and floor/wall transitions:
 - .1 Schluter DILEX-AHK size to suit tile thickness.
 - .2 Material: Brushed Nickel Anodized Aluminum
- .5 Expansion joint trim over floor expansion joints:
 - .1 Schluter DILEX-KSN size to suit tile thickness.
 - .2 Material: Stainless Steel / Finish: Brushed
- .6 Tile connection to precast terrazzo service well basins in custodial closets:
 - .1 Schluter DILEX-AS.
 - .2 Material: White PVC
- .7 Floor tile to VCT resilient floor transition strip:
 - .1 Schluter SCHIENE. Coordinate strip with flash-patching trade to create flush condition and OADA-Compliant installation.
 - .2 Material: Stainless Steel / Finish: Brushed

2.4 EXPANSION AND CONTROL JOINTS

- .1 Expansion Joints and Control Joints comprised of the following products/material:

- .1 Interior Tile Field: SCHLUTER – DILEX-AKWS
- .2 Exterior (Where shown)– Use SCHLUTER - KSN

2.5 MARBLE STOOLS & THRESHOLDS

- .1 Marble work for windows sills to be:
 - .1 Polished flat surfaces and all exposed sides. Group N.
 - .2 Colour/Type: “White Carrera”, or “Travertine”; Italian marble, 20 mm thick.
 - .3 Quality: Provide matching of pieces where needed to cover long lengths. Grey to white veining not acceptable.
 - .4 Edges: All exposed edges shall be polished round 2 mm including sides where marble protrudes from adjacent surfaces.
 - .5 Contractor to furnish samples including above fabrications to show type of edge, colour and quality/thickness.

3.0 EXECUTION

3.1 GENERAL

- .1 Installation shall be according to manuals prepared by the Terrazzo, Tile & Marble Association of Canada.
- .2 Ambient air temperature and structural base temperature should not be less than 13 deg.C. during application of work and throughout curing period.
- .3 Neatly cut tile around fitments, fixtures and drains. Form intersections, corners and returns accurately.
- .4 Joints shall be uniform in width. Joints shall be watertight without voids, cracks, excess mortar or grout.
- .5 All internal angles of base shall be square.
- .6 Sound work after setting and remove and replace hollow backed work.
- .7 Allow minimum 24 hours after setting prior to grouting.
- .8 Do not permit foot traffic for a minimum of 48 hours or as recommended by the setting system manufacturer.
- .9 Complete work shall be free of broken, damaged or faulty materials.
- .10 Tile will be laid to patterns as selected by the Architect. Refer to drawings.

3.2 SURFACE PREPARATION

- .1 Concrete sub-floors must be properly cured for a minimum of 28 days or dried to a maximum moisture content of 16%. A minimum floor temperature of 50 degrees F. is to be maintained throughout the installation cycle.
- .2 The sub-floor must be free of dirt, oil, soap, grease, membrane curing agents, etc. A caustic wash for the removal of such foreign matter followed by a thorough rinse to be used to remove any of the above.

3.3 TILE FLOORS, WALLS & BASES

- .1 Inspect all tiles before placing on bond coat. All tile shall be free from imperfections in colour and shape which will impair the aesthetic quality and service of the installation.
- .2 Before commencing tile installation obtain colour schedule from the Architect. Confirm pattern for layout of tiles.
- .3 All tile shall be installed using thin set method of application and in accordance to the manufacturer's written specifications. Maximum surface tolerance: 1:800.
- .4 Prepare existing structural slab where required. Fill low spots with mortar thin set before preparing to install tile.
- .5 Fit units around corners, fitments and other built-in items to maintain joint appearance. All edges to be smooth, even and free from chipping.
- .6 Confirm joint size for each type of tile with Architect prior to commencement of any work. Joints to be uniform in size, straight and even with adjacent units.
- .7 Use shims to space tiles on walls where necessary.
- .8 Layout perimeter tiles are minimum half size.
- .9 Use specified ceramic accessories.
 - .1 Install metal trim between tile and other flooring materials.
 - .2 Install outside corner trim on all external wall corners with ceramic tile.
 - .3 Install capping to bases where wall tile is not installed above or pre-manufactured base is not specified.
- .10 Set tiles into bed and pound with rubber mallet to ensure full contact.
- .11 Allow minimum 24 hours after installation of tiles before grouting.
- .12 Clean installed tile after grouting has cured.
- .13 Setting systems installed in accordance with listed TTMAC details:

- .1 Tile to structural slab - 311F-2016-2017 All Details as applicable.
- .2 Tile to concrete or masonry wall - 303W-2016-2017 (Interior / Exterior).
- .3 Tile to gypsum board - 304W-2016-2017 and 305W-2016-2017.
- .4 Floor tile to structural slab 311F-2016-17 Detail B with epoxy grout where specified and noted.

3.4 EXPANSION AND CONTROL JOINTS

- .1 Unless noted on the drawings, the recommended spacing and sizes for expansion joints and control joints (301MJ-2012-2014) are as follows:
 - .1 Interior floor and wall tile – create tile panels such that spacing of control joints is between 4800 mm to 6100 mm in each direction - minimum 6 mm width. Areas exposed to moisture or direct sunlight – between 2400 mm to 3700 mm in each direction - minimum 6 mm width. Above-grade concrete slab substrates – between 2400 mm to 3700 mm in each direction- minimum 6 mm wide. Additionally, provide control joints at every building column line and/or sawcut. Coordinate control joints locations with cold joints as determined by General Contractor.

3.5 MARBLE WINDOW STOOLS & THRESHOLDS

- .1 Marble must be set level and true to line with slabs fitting properly between wall openings as detailed; joints to be minimized; make sill of one piece where practical. Piecing of any marble or wide joints will not be acceptable. Field check all opening sizes before cutting marble.
- .2 Follow mullions in curtain wall for joints in marble stools at curtain wall framing.
- .3 Where two pieces join, match pieces to create similar colouration and veining. Coordinate during fabrication and prior to installation.
- .4 Set marble with specified bond coat used for floors and walls.
- .5 Grout all joints with white medusa cement.

3.6 PROTECTION OF WORK

- .1 Prior to leaving the project site, ensure that the General Contractor has provided sufficient protection for all finished products such that subsequent work will not damage, soil, break or stain finished work of this section.

3.7 CLEAN UP

- .1 Before final acceptance of the work all damaged work of this sub-division shall be made good, joints re-pointed as required, protection removed and the entire work

cleaned and in an approved manner so that it shall be turned over in perfect condition in all respects.

- .2 Remove all debris and excess material not required by the contract promptly from site.

END OF SECTION

09 51 13-Acoustical Ceilings

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT LIMITED TO

Supply all labour, material and equipment necessary for the installation of all acoustic ceiling work as indicated on the drawings and schedules including the following:

- .1 Metal suspension and framing systems.
- .2 Acoustic tile ceilings as called for on Room Finish Schedule and indicated on Reflected Ceiling Plans.
- .3 Accessory items.
- .4 Co-ordination with Mechanical, Sprinkler and Electrical disciplines.
- .5 Cleaning.

1.2 RELATED WORK

- .1 Refer to Section 09 21 16: Gypsum Board Assemblies

1.3 QUALIFICATIONS

- .1 Acoustic work shall be executed using skilled, experienced mechanics. Install suspension system in accordance with A.S.T.M. C635 Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings and C636, Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.4 SUBMITTALS

- .1 Submit samples of acoustic material to be used in accordance with Section 01 33 00, Submittals.
- .2 Test reports showing qualifications of materials shall be submitted on request.
- .3 Shop drawings in accordance with 01 33 00 Submittals:
 - .1 Reflected ceiling plans of specialty ceiling system layouts to indicated ceiling modules, assembly components, accessory attachments and related trim members.

- .2 Submit manufacturer's catalogue cuts or standard drawings showing details of the system.
- .3 Submit manufacturer's standard colour chart for selection of colour.

1.5 ENVIRONMENTAL CONDITIONS

Ensure temperature of surrounding areas is within the recommended range.

- .1 For acoustic work, minimum 16 deg. C., maximum 30 deg. C, with a relative humidity of no more than 70%. All windows and doors are to be in place and the heating system operable where necessary to maintain proper temperatures before, during and after installation of acoustical materials.
- .2 Ensure proper ventilation to eliminate excessive moisture.
- .3 Building shall be enclosed with all windows and exterior doors in place and glazed, and the roof watertight before installation of suspension system.
- .4 Store materials in building for 48 hours prior to installation.

1.6 PROTECTION

- .1 Protect work of this section against damage by others.
- .2 Protect work of other sections against damage resulting from work of this section.

1.7 JOB CONDITIONS

- .1 Verify all conditions and dimensions at the building.
- .2 Ensure that surrounding areas are maintained within the recommended temperature range and have proper ventilation to eliminate excessive moisture.
- .3 Report any unsatisfactory conditions in writing to the Architect. Start no work until conditions are satisfactory. Commencement of work shall imply acceptance of conditions.

1.8 PRODUCT HANDLING

- .1 Deliver to site and store material in original containers with manufacturer's seals and labels intact. Prevent damage during handling and storage. Keep materials under cover and free from dampness.
- .2 Handle in such manner to ensure against racking, distortion or physical damage.
- .3 Store in such a manner to prevent warpage, scratches or damage of any kind.

1.9 MAINTENANCE MATERIALS

- .1 Leave 10 packages of tile type(s) wrapped and unopened with the Owner for replacement purposes. Clearly mark the containers for identification purposes. Materials shall be from the same production run as the material installed.
- .2 Maintenance tile shall not be used for replacement tile during any part of the construction phase of the project before occupancy by the Owner.

1.10 WARRANTY

- .1 Provide the building Owner manufacturer's ceiling system warranty for tile and suspension system supplied by one source manufacturer for a period of 15 years from date of installation.
 - .1 Acoustical Panels: Sagging and warping.
 - .2 Grid System: Rusting and manufacturer's defects.
- .2 Warranty covers manufacturer's agreement to repair or replace grid and panels that fail during the warranty period.

2.0 PRODUCTS

2.1 CEILING TILE

- .1 ACT-1: Ceiling tile shall conform to CAN2-92.1-M77, Acoustical Units, Pre-fabricated with white textured face. Mineral Fibre composition. Noise Reduction Coefficient .75 or better as specified. Class A. Flame Spread Rating 25 or under. Smoke Developed 50 or under. Fuel Contributed 25 or under. Colour White. Ceiling tile to be nominal 24" x 48" x 3/4" of one of the following:
 - .1 Armstrong, Fine Fissured-High NRC, square lay-in, Humi-Guard, White
 - .2 Certainteed Fine-Fissured High NRC, square lay-in, humidity -resistant, White.
 - .3 Use fire-rated where required.
- .2 ACT-2: Ceiling tile shall conform to CAN2-92.1-M77, Acoustical Units, Pre-fabricated with white textured face and foil back (helps sound blocking / CAC backer). Fibreglass, non-shedding composition with binders. Noise Reduction Coefficient 0.95 or better as specified. Class A. Flame Spread Rating 25 or under. Smoke Developed 50 or under. Fuel Contributed 25 or under. Colour White. Ceiling tile to be nominal 24" x 48" x 1" of one of the following:
 - .1 Armstrong, Optima

2.2 CEILING TILE SUSPENSION SYSTEM

- .1 Mechanical suspension system for acoustic tile ceilings shall be:
 - .1 Donn Canada Ltd. DXL Fast-Loc Fire Rated

- .2 Equivalent to above by one of the following manufacturers:
 - .1 Bailey Metal Products Ltd.
 - .2 Armstrong
 - .3 Chicago Metallic
- .3 System comprised of Main Ties, Cross-Ties and Wall Moulding in intermediate duty type, spaced as shown on drawings. All members to be off-white baked enamel finish.
- .4 Systems shall be suspended to depths as indicated on drawings and be complete with all accessories required to install, brace and support systems.
- .5 Wire hangers shall be No. 12 S. W. G. galvanized wire.
- .6 Carrier channels, standard 1-1/2" cold rolled, 18 gauge steel.
- .7 All edges of tiles abutting all walls to have zinc coated steel wall mouldings around perimeter of tile. Mouldings to have faces painted in baked enamel matching colour of main grid. Provide moulding corner pieces for bullnosed block conditions, Bailey BA 37 Bullnose, Armstrong 7866 or CGC Interiors JH/JB bullnose corners.
- .8 Retaining clips shall be used on all acoustic tile in vestibule entrances or 10'-0" all directions from exterior doors.
- .9 Wire hanger carriers to composite deck and concrete decks, Powers Tie-Wire Spikes. Hole size and embedment depth in accordance with manufacturer's requirements.

3.0 EXECUTION

3.1 ACOUSTIC CEILING & SUSPENSION INSTALLATION

- .1 Do not install acoustical panels until work above ceiling has been inspected by Consultant. Install acoustical tiles according to manufacturer's recommendations
- .2 Install supporting hangers of suspended ceiling system from supporting steel joist roof system or metal deck. Refer to structural drawings for type of deck.
- .3 Install acoustic ceilings using tradesman skilled in this class of work, in strict accordance with manufacturer's instructions and as specified herein.
- .4 Neatly and symmetrically install suspended ceiling to true lines, evenly balanced to pattern shown on drawings.
- .5 Centre ceiling system on room axis unless otherwise shown or directed leaving equal border tiles or panels not less than ½ a full width.
- .6 Recessed items shall replace or be centered on acoustical panels, except where shown otherwise. Consult with Mechanical and Electrical Divisions to co-ordinate

work. Provide additional support where required. Do all cut-out required to install penetrating items such as sprinkler heads.

- .7 Space hangers for suspended ceilings to support grillage independent of walls, columns, pipes and ducts, main grid inter-sections, at 4'-0" centers along support grillage and not more than 6" from ends.
- .8 Attach hangers suspended from carrying channels or direct from structural steel with purpose made hanger/anchors. Bend top of wire hangers at right angles, turn down and securely fasten. Turn bottom of hangers upwards and securely wrap three times.
- .9 Run main tees at right angles to length of light fixtures.
- .10 Space main tees 24" o.c. in one direction and securely tie to hangers or structure. Reinforce where specialty ceiling systems are suspended below main grid. See Reflected Ceiling Plans.
- .11 Space cross tees to suit tile sizes at right angles to main tees.
- .12 Space intermediate tees 24" o.c. at right angles to cross tees and properly lock at intersections.
- .13 Level suspended systems with a maximum tolerance of 1/8" over 12'-0" and 1/4" overall.
- .14 Use longest practical lengths of tees, furring and running channels to minimize joints. Make joints square, tight, flush and reinforced with concealed splines. Assemble framework to form a rigid and interlocking system.
- .15 Design suspension system to accommodate movement caused by thermal expansion or contraction.
- .16 Design and space hangers and carrying members to support entire ceiling system, including lighting fixtures, diffusers and equipment openings in locations shown on drawings.
- .17 Use edge moulding where ceiling abuts vertical surface. Use purpose manufactured mouldings for bullnosed block conditions.
- .18 Install all products to manufacturer's printed instructions.

3.2 CLEAN UP

- .1 Following erection, remove and replace all ceiling tiles that are chipped, cracked or have other imperfections. Clean dirty or discoloured units.
- .2 Promptly remove all debris and excess material not required by contract from the site.

END OF SECTION

09 95 66-Resilient Athletic Sheet Flooring

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 The work required under this section of the specifications shall include all labour, equipment and materials necessary to complete all Resilient Athletic Sheet Flooring and Bases. See drawings for locations requiring this system. Work to include the following:
 - .1 Supply and installation of the indoor resilient athletic sheet flooring identified on the drawings:
 - .2 Rubber bases at sheet flooring.
 - .3 All accessories and transition strips.
 - .4 Cleaning and prep for use of athletic flooring.
 - .5 Independent laboratory report on moisture content of concrete slabs to receive resilient sheet flooring.

1.2 RELATED SECTIONS

- .1 Refer to Section 03 30 00: Concrete Floor Slabs
- .2 Refer to Section 09 65 19: Resilient Flooring, Bases
- .3 Refer to Section 09 30 13: Tile and Marble
- .4 Refer to Section 10 58 00: Gymnasium Equipment

1.3 RELATED STANDARDS AND GUIDELINES

- .1 ASTM F2170 -- "Standard Test Method for Determining Relative Humidity In Concrete Floor Slabs Using In-Situ Probes"
- .2 ASTM F710 -- "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring"
- .3 ACI 302.2R-06 -- "Guideline for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials"

1.4 SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00, Submittals. Identify samples with project number, date and name of Contractor. Materials used in building shall correspond to approved samples for quality, colour, texture and finish.
- .2 Submit a detailed seam diagram showing seams and grain orientation prior to installation. Installation of sheet flooring shall minimize cross seams.
- .3 Manufacturer Certifications:
 - .1 Provide certification that accurately identifies the Original Equipment Manufacturer (OEM) of flooring furnished for this project including manufacturer's name, address and factory location.
 - .2 Suppliers of private label flooring for this project must identify themselves as such and fully disclose the OEM information listed above.
 - .3 All manufacturer requirements in these specifications must be complied with by the OEM, including warranties, certifications, qualifications, product data, test results, environmental requirements, performance data, etc.
- .4 Installer Certifications: Refer to Quality Assurance.
- .5 Samples:
 - .1 Submit for selection and approval one set of resilient sheet flooring actual colour samples and textures, manufacturer's brochures, MSDS sheets, environmental information and ASTM data.
 - .2 Submit color samples of all accessories, bases and transition strips colours for review selection by Architect.
 - .3 Obtain from the general contractor a certificate of compliance with floor level requirements identified below. Submit prior to start of any work.

1.5 MAINTENANCE MATERIALS

- .1 Provide the following extra materials for maintenance:
 - .1 Five percent of each sheet flooring type used on project.
- .2 Clearly mark the containers for identification purposes. Materials shall be from the same production run as material installed.
- .3 Closeout Submittals
 - .1 Submit three (3) copies of the indoor resilient sheet surfacing and manufacturer's maintenance instructions.
 - 2. Submit three (3) copies of the material and installation warranties as specified.

- .4 Submit maintenance materials and warranty in accordance with Section 01 77 00, Project Closeout.

1.6 DELIVERY STORAGE AND HANDLING

- .1 Deliver materials in original containers with manufacturer's seals and labels intact. Maintain temperature of storage area at 20° C. for 48 hours prior to installation. Store all roll material on end and protect edges from damage.
- .2 Delivery: Material shall not be delivered until all related work is in place and finished and/or proper storage facilities and conditions can be provided and guaranteed stable.
- .3 Storage: Store the material in a secure, clean and dry location. Store the indoor resilient sheet surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to jobsite. Rolls shipped in rigid protective cardboard containers can be laid horizontally prior to unpacking and installation.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain a minimum 20° C. air temperature at flooring installation area during installation and for 72 hours prior to and for 48 hours after installation.
- .2 To facilitate installation it is recommended to store sheet flooring material at a temperature of at least 18°C for a period of 24 hours in an upright position.
- .3 Avoid static loads, rolling loads and heavy fast traffic on newly installed floor covering until adhesive has thoroughly set.

1.8 JOB CONDITIONS

- .1 It is the responsibility of the general contractor to maintain project/site conditions acceptable for the installation of the indoor resilient sheet flooring.
- .2 The area in which the indoor resilient sheet surfacing will be installed shall be dry and weather tight. Permanent heat, light and ventilation shall be installed and operable.
- .3 All other trades shall have completed their work prior to the installation of the resilient athletic flooring. The general contractor shall maintain a secure and clean working environment before, during and after the installation. Suspension of other trades' work may be authorized providing their work will not damage the new flooring.
- .4 Maintain a stable room temperature of at least 65°F for a minimum of one (1) week prior to, during and thereafter installation.
- .5 An effective low-permeance vapor barrier is placed directly beneath the concrete subfloor. For "on" or "below grade" installations, it is recommended to provide a permanent vapor barrier resistant to long term hydrostatic pressure/moisture exposure. Protrusions should be sealed to prevent moisture migration into the

slab. Moisture should not be allowed to enter the slab after the completed construction.

- .6 Concrete subfloor surface pH level within the 7 to 10 range depending upon installation type.
- .7 Concrete subfloor should be no greater than 3mm (1/8") within a 3m (10ft) diameter. This tolerance can be measured in accordance with ASTM E1155. A specified (FF) of 50 and an (FL) of 30 should reach this degree of floor flatness and floor level. There is no numerical correlation between F numbers and the deviation from the straight edge, however the above specified numbers should achieve a flat floor with minimal deviation in the slab. Reference ACI 117 and ACI 302.1R. The general contractor should provide a certificate of compliance with the above recommendations.
- .8 Concrete subfloor must be clean and free of all foreign materials or objects including, but not limited to, curing compounds and sealers.
- .9 Fill cracks, grooves, voids, depressions, and other minor imperfections. Follow the manufacturer's directions. Moveable joints must be treated utilizing specific transitioning joint devices depending upon the architect's recommendations. Follow current ASTM F710 guidelines for the preparation of concrete slabs to receive sheet flooring.
- .10 Refer to ACI 302.2R "Guidelines for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials" for concrete design and construction.
- .11 Concrete slab shall be fortified with continual steel reinforcement. Fiber reinforcement alone shall not be considered adequate fortification.

1.9 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 The resilient sheet surfacing shall have been actively marketed for a minimum of ten (10) years.
 - .2 The resilient sheet surfacing shall be manufactured in an ISO 9001 and 14001 certified plant.
 - .3 The resilient sheet surfacing supplier shall be an established firm, experienced in the field, and appointed as a distributor by the manufacturer of the indoor resilient sheet surfacing.
 - .4 The installer of the resilient sheet surfacing shall have a minimum of five (5) years experience in the field installing indoor resilient sheet surfacing and have worked on at least five (5) projects of similar size, type and complexity.
- .2 Certifications:
 - .1 Prior to start of any work on this section, installer to submit the resilient sheet flooring manufacturer's certification attesting that they are an approved installer of the resilient sheet surfacing.

- .2 The resilient sheet surfacing manufacturer to submit official ISO 9001 and 14001 certification for the facility in which the resilient sheet surfacing is manufactured.
- .3 Testing:
 - .1 Tests shall be relative to multi-purpose use with certificates from independent testing resources to be made available upon request. Test results shall be no more than 5 years old and performed according to ASTM standard testing procedures.

1.10 WARRANTY

- .1 The indoor resilient sheet flooring shall be covered by the manufacturer against product defect for:
 - .1 25-years for wear-through of wear layer;
 - .2 25-years for moisture vapour tolerance, and;
 - .3 2-years for installer's warranty from date of substantial performance.
- .2 Warranties shall not be prorated during the life of the warranty period.

1.11 JOB START-UP MEETING

- .1 Hold a pre-installation start-up meeting arranged at a date appropriate to the progress of work and prior to start of any work of this section. Present shall be the General Contractor project manager and site supervisor, the concrete slab pouring trade, the resilient sheet flooring manufacturer representative, the installer's representative, the Owner's representative, the Consultant and any other individuals deemed necessary by the manufacturer. Record notes of meeting and provide follow-up with all parties as required.

2.0 PRODUCTS

2.1 MATERIALS

- .1 RAF: Tarkett Sports Indoor/Advantage Sports - Omnisports "Multiuse"– Fully-Adhered installation System, prefabricated sport surface with wood flooring design and slightly textured embossed surface. Varying embossing or surface textures will not be allowed. Printing of wood design shall closely resemble standard wood strip flooring in size, color, board length, and grain appearance. The wood design shall be protected by a clear layer of pure PVC (Polyvinyl Chloride) and Top Clean, a factory applied UV cured urethane treatment. Intermediate layers shall be fortified with a non-woven fiberglass grid for increased dimensional stability. The foam force reduction layer shall be high-density closed cell PVC foam with honeycomb embossing, and is applied in one continuous manufacturing process. Laminated or adhered foam layers will not be allowed. Field constructed products will not be accepted.
 - .1 Physical properties of the resilient sheet flooring shall conform to the following minimum requirements:

Width		6'-6" (2m)
Length		85' (25.9m) approx.
Total Thickness		6.5 mm
Vertical Deformation	PASSED	ASTM F2772
Rolling Load	PASSED	0.30 (EN 1569 {11/1999})
Surface Finish Effect	PASSED	ASTM F2772 (80 – 110)
Allergy and Asthma Friendly	ASP: 05-01/101	Certified Compliant
Abrasion Resistance	PASSED	0.10 (EN ISO 5470-1 {06/1999})
Sound Insulation	Excellent	+/- 19 dB (ISO 717/2)
In Room Sound Insulation	Excellent	61dB (NF S31-074)
Ball Rebound	PASSED	ASTM F2772 > 90%
Shock Absorption	PASSED	ASTM F2772 Class 2
Fire Rating	PASSED	ASTM E648 Class 1

- .2 Colours: Hardwood Design Series: A wood look design as available from the resilient sheet flooring manufacturer's standard range will be used. Final colour selected by Architect.
- .3 Texture: Texture to remain consistent between sheets.
- .4 Welding Rod: As supplied by the resilient sheet flooring manufacturer or supplier. Colour to blend with the resilient sheet flooring colour. All seams shall be welded to create a monolithic and impermeable surface.
- .5 Adhesive: As approved by the resilient sheet flooring manufacturer.
- .2 All other installation accessories and related components must be either made or approved by the resilient sheet flooring manufacturer. Other products may be approved as equal if deemed qualified and submitted in accordance with these specifications. Test reports confirming compliance from an Independent Sports Laboratory must be provided along with samples, technical data, installation, maintenance, and warranty prior to acceptance as an alternative product.
- .3 The choice of manufacturer and colours selected shall remain with the Architect.
- .4 RB: Rubber base conforming to ASTM F1861 Type TP-Rubber Thermoplastic, Style B-Cove. The choice of manufacturer and colours selected shall remain with the Architect. Rubber base shall be Flexco, Johnsonite, Roppe or Armstrong.
- .5 Flash patch: provide flash patch material and installation as required under Part 3 and as compatible with flooring systems used.

3.0 EXECUTION

3.1 SYSTEM

- .1 Full-Adhered Installation System. Follow manufacturer's printed instructions.

3.2 INSPECTION AND TESTING

- .1 The contractor will make sure all structures and areas to be covered are in a condition to sustain the work described in this section.
- .2 The contractor will hire the services of an accredited laboratory, at their own expense, to test the moisture and alkalinity content of the concrete slabs to be covered with any and all flooring systems herein specified. Conduct Moisture and Alkalinity Content Test in accordance with the latest ASTM F1869 'Standard Test Method for Measuring Moisture Vapour Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride'. Moisture content of subfloor must be within range recommended by the flooring manufacturer. The flooring material supplier shall inspect the floor prep, approve the moisture and alkalinity content of the substrate and issue a certificate of compliance regarding the installation of materials. This certificate shall be issued prior to acceptance of the work and a copy included within the maintenance manual submission.
- .3 Test floors for alkalinity before installation of resilient flooring. The allowable reading to be as recommended by the floor system.

3.3 EXAMINATION

- .1 Review work progress including slab pours and finishing done by other trades as required prior to installation. Communicate regularly with the General Contractor to stay in abreast of scheduling and quality of work.
- .2 It is the responsibility of the general contractor manager to ensure that project/site conditions are acceptable for the installation of the resilient sheet flooring. However, additional minor surface preparation may be required by this contractor/installer. Flash patch work is required by this installer.
- .3 Verify that the area in which the resilient sheet flooring will be installed is dry and weather tight. Verify that permanent heat, light and ventilation is installed and operable.
- .4 Verify that all other work that could cause damage, dirt and dust or interrupt the normal pace of the resilient sheet flooring installation is completed or suspended.
- .5 Verify that there is a stable room temperature of at least 65°F.
- .6 Verify that there are no foreign materials or objects on the subfloor and that the subfloor is clean and ready for installation.
- .7 Adhere to Concrete Subfloor: moisture content must be less than 92 % RH when tested per ASTM F2170. Follow manufacturer's installation recommendations.
- .8 Do not average the results of the tests. Report all field test results in writing to the General Contractor and Architect prior to installation.

- .9 Verify that the concrete subfloor surface pH level is within the 7 - 10 range.
- .10 Document the results indicating the slab is within manufacturer's tolerances for slab deviation.

3.4 PREPARATION OF SURFACES

- .1 Sand the entire surface of the concrete slab.
- .2 Sweep the concrete slab so as to remove all dirt and dust. If a sweeping compound is to be used it must be a sweeping compound that does not contain oil or other items that may inhibit the adhesive bond.
- .3 Slab must be dust free. In the event that dust impairs adhesive bond, priming the slab prior to application of adhesive may be necessary. Follow installation guidelines.

3.5 INSTALLATION

- .1 The installation area shall be closed to all traffic and activity for a period to be set by the resilient sheet flooring installer. The resilient sheet flooring installation shall not begin until the installer is familiar with the field conditions.
- .2 All necessary precautions should be taken to minimize noise, smell, dust, the use of hazardous materials and any other items that may inconvenience others.
- .3 Install the resilient sheet flooring in strict accordance with the resilient sheet flooring manufacturer's written instructions.
- .4 Install appropriate resilient thresholds or transition strips where necessary.

3.6 PROTECTION

- .1 If required, protect the resilient sheet flooring from damage using coverings approved by the manufacturer until acceptance of work by the customer or their authorized representative.

3.7 INSTALLATION - BASE

- .1 Set base in adhesive tightly by using a 3 kg. hand roller against wall and floor surfaces. Space joints uniformly.
- .2 Install straight and level to variation of plus or minus 3mm (1/8") over 3m (10ft) straight edge. Scribe and fit to door frames and other obstructions. Miter internal corners. Use pre-moulded sections for external corners and exposed ends. Tightly bond base to vertical substrate with continuous contact.

3.8 CLEANING FLOORING

- .1 Remove excess adhesive from floor, base and wall surfaces without damage.

- .2 Remove all unused materials, tools, and equipment and dispose of any debris properly. Clean the resilient sheet flooring in accordance with the manufacturer's instructions.

END OF SECTION

09 66 13-Portland Cement Terrazzo

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

Supply all labour, equipment and materials necessary to complete all Terrazzo Tile Work as indicated on the drawings and specified herein, including the following briefly described:

- .1 Terrazzo materials and accessories.
- .2 Preparation of new or existing poured floor slab surfaces to receive new terrazzo.
- .3 All bonding and grouting materials and additives.
- .4 Terrazzo tile or cove base to suit conditions.
- .5 Samples to be provided for matching existing terrazzo.

1.2 RELATED WORK

- .1 Refer to Section 03 30 00: Cast-in-Place Concrete

1.3 QUALIFICATIONS

- .1 The Contractor shall use only mechanics skilled in this trade having not less than 10 years experience in the installation of terrazzo flooring.
- .2 Installing Contractor to be an active member of the TTMAC.

1.4 SUBMITTALS

- .1 Prepare samples of terrazzo to instructions of the Architect and submit same for approval in accordance with Section 01 33 00, Submittals. Note: The floor will be one (1) colour only. Base as scheduled matching floor.
- .2 Provide copies of Terrazzo Tile and Marble Association of Canada, Maintenance Guide for Maintenance Manuals in accordance with Section 01 77 00, Project Close-out.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Products shall be delivered, stored and handled in a manner to prevent damage. All aggregate shall be stored at the work site in a manner which will prevent deterioration or contamination by foreign matter. Any material which has

deteriorated or has been contaminated shall not be used for terrazzo topping and shall be removed from site.

1.6 JOB CONDITIONS

- .1 Take all required measurements at the building before commencing work.
- .2 Examine the areas in which the work of this section is to be applied and determine the limitations, criteria and co-ordination required to relate to the physical and environmental conditions which will be existing at the time the work is scheduled.
- .3 Immediately prior to proceeding with the application, examine the conditions including temperature of structural base and general area of work affecting the proper installation of the work of this Section. Improper conditions shall be reported to the General Contractor and work shall not proceed until conditions are satisfactory. Installation of this Contractor's work shall constitute acceptance of the base surface.
- 4 Protect the work of this section and the work of others during installation and curing period and until such time as traffic will not affect the installation. Walls, dados and trim shall especially be covered during operations to minimize final cleaning. Any stained or damaged work shall be removed and replaced or made good to the satisfaction of the Architect.
- .5 Co-ordinate the work with the schedules prepared for the project and co-operate with other trades working on the project.
- .6 Examine all drawings and specifications for all trades throughout the building for information affecting the work of this trade.
- .7 Notify all other trades when materials to be supplied by them to be set in the work of this trade will be required and shall also notify all other trades when and where the exact locations of openings, chases, etc. to be located by them will be necessary.

2.0 PRODUCTS

2.1 THIN SET EPOXY BONDED TERRAZZO

- .1 Marble Chips: Marble chips for terrazzo finish shall be Canadian or imported marble of best quality size No. 1 & 2. Terrazzo aggregate to be in accordance with CSA Standard A194.1.
- .2 Epoxy bonding agent for terrazzo floors shall be Monobond as manufactured by Master Builder Technologies, Toronto, Ontario or Architect's approved equal.
- .3 Epoxy bonding agent for terrazzo divider strips shall be Morricite or Chemset Grouting Compound as manufactured by Master Builder Technologies. or Architect's approved equal.
- .4 Cement: White Portland Cement to CAN 3-A5 Type 10.

- .5 Sand: Sharp, screened sand to CAN 3-A23.1-94.
- .6 Water: Clean drinkable water, free from oil, acids, alkali or organic matter.
- .7 Colour Pigments: Non fading mineral pigments to British Standard 1014.
- .8 Non-slip Aggregate: Slip resistant chips: aluminum oxide of size and colour to match marble chips. Finished floors shall contain 10% non-slip aggregate.
- .9 Divider Strips: T-shape or angle strip to suit required depth with 1/8" wearing surface, zinc alloy. Expansion type strips or double 'L' at all sawcut joints on floor slab.
- .10 Curing Compound: Type II non staining to CGSB 90-GP-1. Moisture retention shall not exceed 0.015 grams.
- .11 Cleaners, Sealers & Floor Finish: Terrazzo, Tile & Marble Association of Canada types 1001 liquid cleaner, 2001 sealer and 3001 finish. Floors to receive two coats of finish.
- .12 Mixes & Proportions: Standard terrazzo topping: 40 kg. bag of cement and 90 kg. of chips, mixed dry. Chip sizes 70% No. 2 and 30% No. 1. For floors use no more than 18 liters of water per bag of cement. Non-slip abrasive aggregate to be installed with topping.
- .13 Terrazzo tile base colour same as floor to be 100 mm (4") high x 600 mm (24") minimum shop manufactured by this contractor.

3.0 EXECUTION

3.1 GENERAL

- .1 Installation shall be according to by the Terrazzo, Tile & Marble Association of Canada.
- .2 Ambient air temperature and structural base temperature should not be less than 13 Deg C during application of work and throughout curing period.
- .3 All internal angles shall be square.

3.2 SURFACE PREPARATION

- .1 Concrete sub-floors must be properly cured for a minimum of 28 days or dried to a maximum moisture content of 16%. A minimum floor temperature of 10 deg C is to be maintained throughout the installation cycle.
- .2 The sub-floor must be free of dirt, oil, soap, grease, membrane curing agents, etc. A caustic wash for the removal of such foreign matter followed by a thorough rinse to be used to remove any of the above.

- .3 Steel-trowel floors should be acid-etched, using commercial muriatic acid (28%), diluted 2 parts water to 1 part acid. A bubbling action will be evident on the floor, and once this action has ceased, the acid will be neutralized by a reaction with the concrete. The entire area should then be rinsed thoroughly, using clean water. Following the rinsing, all surface water should be removed. It is not necessary for the floor to be completely dry prior to the application of epoxy matrix, however, no free water should be left on the surface.
- .4 Existing concrete surfaces to be cleaned to remove all sealers, waxes, dirt, oil, adhesives, grease, etc. utilizing a caustic soda wash followed by a thorough rinse. Grind surfaces with a 24 grit Carborundum stone, followed by a thorough sweeping to remove all loose grit, followed with a thorough wash.

3.3 TERRAZZO METAL DIVISION STRIPS

- .1 All strips shall be in as long lengths as practicable.
- .2 Dividing strips shall be provided throughout all terrazzo work to form squares or rectangles. Furnish and install metal division strips at junction of terrazzo borders and other flooring materials. Include for stripping in squares not less than four lin. ft. and not more than nine square feet in area.
- .3 Strips shall be in long, straight lengths with joints only where necessary inserted in the fill before the concrete sub-bed has set or to existing structural slab with epoxy bonding agent. All joints and intersections neatly filled and all runs level and true to finish flush with the terrazzo finish.
- .4 Provide metal division strips at junction of terrazzo finish and other floor finishes and if such occurs at a door opening, division strips shall occur under door.
- .5 Install terrazzo expansion joint strips in locations shown on the drawings or maximum 36" o/c each way.

3.4 APPLICATION OF MONOBOND TERRAZZO

- .1 Monobond is a two-component system. The Monobond should be stirred to disperse any settled ingredients. The curing agent (hardener) is then added to the Monobond and mixed thoroughly in the recommended ratio as it appears on the label. Monobond should be mixed in quantities that will be applied in approximately 4 hours.
 - .1 The mixed Monobond is quite fluid and may be applied by spray, stiff brush or steel trowel. The spray application is most practical for a large area. If a low pressure garden type spray is used it may be necessary to thin the adhesive by adding a maximum of 1 pint of Acetone to 1 gallon of mixed Monobond. (Thinning ratio 1 part solvent to 8 parts adhesive). For brush or trowel application do not thin, simply pour monobond on floor and spread.
 - .2 Coverages are as follows:

- .1 Imperial Gallons: 150-200 sq. ft. per gallon
- .2 Application over very rough or irregular surfaces will reduce coverage.
- .3 The Monobond should be allowed to dry until it is no longer wet but still tacky. This will take approximately 1 hour, depending upon the temperature. The material will remain tacky for approximately 4 hours.
- .4 Prior to placing the terrazzo mix, it is suggested that the floor be "seeded" or sprinkled with dry marble chips. These chips will allow tradesmen to walk on the floor without coming into contact with the Monobond, and will also result in a better mechanical bond of the mix.
- .5 The terrazzo mix is then poured over the Monobond while it is still tacky.
Note: Care must be taken that the Monobond has not lost its tack before applying the terrazzo mix. If Monobond loses its tack, it is necessary to apply another coat.
- .6 The above application procedures are based on an average room temperature of 70 Deg F. Lower temperatures will result in longer setting cycles; higher temperatures will shorten the cycle. The terrazzo is installed using standard mixes and conventional procedures.

.2 CURING AND FINISHING

- .1 After the terrazzo has taken its initial set and as soon as conditions permit, the surface should be coated with "Curite", manufactured by MacNaughton-Brooks to allow a slow and proper cure, and to protect against staining. As an alternative to this method proper curing can be attained by thoroughly wetting the surface with clean water and then covering with polyethylene sheeting.
- .2 After a few days of protected curing the terrazzo is then ground, grouted and finished using conventional methods.

.3 GENERAL NOTES (HANDLING & CLEANING)

- .1 Normal precautions must be taken when handling the curing agent or mixed Monobond, to avoid contact with the skin. (The use of rubber gloves is recommended.) Monobond can be removed from the skin with soap and water if washed immediately but becomes increasingly difficult to remove when allowed to dry. The use of solvents such as Acetone, Toluol, etc. will assist the cleaning up operation.
- .2 Proper ventilation should be supplied during the installation and signs should be posted indicating that sparks or open flames in the area are not permissible.

- .3 Monobond becomes slightly thicker when cold and should be stored and applied at normal room temperatures.

.4 GRINDING

- .1 After the terrazzo has set sufficiently hard the surface shall be rubbed by machine using a No. 24 grit or finer abrasive block. Use plenty of water during grinding. Immediately following initial grinding, flush terrazzo surfaces thoroughly using water only and apply grout to fill all voids. Mix grouts in the same proportions as used in topping.
- .2 Allow grouted surface to cure for at least 48 hours and then re-surface by machine rubbing using No. 120 grit abrasive blocks and plenty of water.
- .3 Following removal of grout scrub terrazzo thoroughly using machine scrubbers and ample clean water. Rinse terrazzo with clean water and then dry thoroughly. Apply coat of sealer soon after cleaning as possible.

3.5 TERRAZZO SEALER

- .1 Application shall be in strict accordance with the manufacturer's printed instructions.
- .2 Clean and wash finished terrazzo as recommended in the Maintenance Guide of the Terrazzo, Tile & Marble Association of Canada for this type of terrazzo application.
- .3 Floors to receive sealer and two coats of finish.

3.6 CLEAN UP

- .1 Before final acceptance of the work all damaged work of this sub-division shall be made good, joints re-pointed as required, protection removed and the entire work cleaned and in an approved manner so that it shall be turned over in perfect condition in all respects.
- .2 Remove all debris and excess material not required by the contract promptly from site.

END OF SECTION

| **09 68 00-Carpeting**

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work required under this section of the specifications shall include all labour, equipment and materials necessary for the supply and installation of all new carpeting as indicated on the drawings and called for on Room Finish Schedule including the following briefly described:

- .1 All carpet shown on the drawings.
- .2 Adhesives and Accessories.

1.2 RELATED WORK

- .1 Refer to Section 03 30 00 - Concrete

1.3 QUALIFICATIONS

- .1 Work shall be executed by mechanics skilled in this trade.

1.4 SUBMITTALS

- .1 Submit minimum 12" x 12" samples of entire carpet colour range for selection by Architect prior to order of any material.

1.5 DELIVERY & INSTALLATION

- .1 Material shall not be delivered to the site until the portion of the building in which it is to be installed is completely ready for carpet installation. This Contractor shall install all portions of his work in close co-operation with all trades concerned.

1.6 JOB CONDITIONS

- .1 Report any unsatisfactory conditions in writing to the Architect. Start no work until conditions are satisfactory. Commencement of work shall imply acceptance of conditions.

1.7 WARRANTY

- .1 The carpet supplier shall provide the Owner with carpet warranties as follows:

- .1 Carpet products are warranted against manufacturing defects resulting in excessive surface wear, edge ravel, backing separation, shrinking, stretching, cupping, doming, and static electricity.
- .2 Warranty: 15 Year Standard Warranty

2.0 PRODUCTS

2.1 GENERAL

- .1 CPT
Carpet: Interface Carpet Tile – World Woven Collection WW870
Carpet shall be tile goods for fully adhered installation.

Pile Fibre Content	100% Recycled Content Nylon
Dye System	100% Solution Dyed
Construction	Tufted Textured Loop
Pile Weight	23.0 oz/sy
Pile Height	0.16"
Primary Backing	Woven Polypropylene
Secondary Backing	Woven Synthetic
- .2 Final carpet colour selection for room(s) shall be chosen by the Architect.

3.0 EXECUTION

3.1 FLOOR PREPARATION

- .1 The installation of carpet shall proceed only after floors have been brought up to an acceptable standard for installation to proceed. Carpet is not to be laid in any area where dampness remains in the sub floor. Moisture emissions must not exceed 3 pounds per 1,000 square feet for 24 hours. If the concrete test is higher than 3 pounds, do not proceed with the installation.
- .2 All work shall be in strict accordance with manufacturer's printed instructions.

END OF SECTION

09 90 00-Painting

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 The work in this division consists of furnishing all materials, accessories, equipment, tools, transportation and performing all services and labour required to complete the Painting & Finishing Work as indicated on the drawings and specified herein.
- .2 Refer to drawings, including Room Finish Schedule, and to specifications for work of other trades requiring Painting & Finishing for information as to locations, extent, kinds and types of surfaces and materials required to be painted and/or otherwise finished.
- .3 A complete job (in every respect) of Painting & Finishing is required regardless of whether every item is specifically mentioned herein or not. The number of coats of paint or other finish specified herein are in addition to any shop or prime coat specified under other divisions and are the minimum requirements for a complete job.

EXTERIOR – New and/or existing surfaces within the Place of the Work as follows:

- .1 Hollow metal doors and frames.
- .2 All exposed steel lintels.
- .3 All exposed ferrous metals.

INTERIOR – New and/or existing surfaces within the Place of the Work as follows:

- .1 All exposed new and/or existing block masonry and poured concrete throughout.
- .2 All hollow metal doors, frames, sidelight frames and borrowed light frames.
- .3 Exposed metal lintels, etc. exclusive of aluminum and stainless steel.
- .4 All drywall surfaces exposed below ceiling line including walls, ceilings and bulkheads.
- .5 All exposed to view mechanical piping, ductwork wall fin enclosures, electrical panels, etc.
- .6 Exposed steel joists, steel trusses, metal deck, acoustical deck and beams.

- .7 Seal all edges of wood doors.
- .8 Sealants/caulking required to be painted
- .9 Corridor side of walls of the affected area of the work.

1.2 PRIME COATING BY OTHERS

The following work will be prime coated by the contractor furnishing same:

- .1 All sheet metal exclusive of ductwork.
- .2 All structural miscellaneous steel and iron work.
- .3 Convactor covers, wall fin enclosure covers and electrical panels.

1.3 PRE-FINISHED ITEMS

- .1 This Contractor to refer to all other sections of the specifications for factory pre-finished items or finishing of items by others not requiring painting by this Section, including the following:
 - .1 Architectural Woodwork. Refer to Section 06 40 00.

1.4 QUALIFICATIONS

- .1 The Contractor shall use only mechanics skilled in this trade. Quality workmanship is required.

1.5 PRODUCT HANDLING

- .1 Deliver materials to the site in original containers with manufacturer's seals and labels intact. Prevent damage to materials during handling and storage.
- .2 Protect concrete floors and other surfaces from damage due to spillage and drippings in areas where paints are mixed, stored and applied.
- .3 Remove all oil, rags and waste from building every night and exercise every precaution to avoid danger of fire.
- .4 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.6 PLANT & SCAFFOLDING

- .1 This Contractor shall provide all plant and scaffolding necessary for the proper and efficient performance of the work.

1.7 JOB CONDITIONS

- .1 At time of application all surfaces which are to be painted or otherwise finished shall be dry, clean and free from dust, loose particles and/or foreign substances. Where there is any question as to dryness of surface this contractor shall test same with an approved dampness indicating machine in the presence of the Architect or authorized representative.
- .2 Before commencing work examine all surfaces, spaces and items which are indicated on the drawings and/or herein specified to be painted or otherwise finished. Report to Architect immediately any necessary corrections. Do not proceed until corrections (if any required) have been made. Commencing work implies this contractor's acceptance to said surfaces, spaces and items.

1.8 GENERAL REQUIREMENTS

- .1 Number of coats specified for all work hereafter shall not relieve the contractor from installing additional coats at his expense over any work deemed unacceptable for finished surfaces to various materials to be painted.
- .2 All access doors, grilles, convectors, exposed ductwork and piping generally will be painted same colour and texture as adjacent walls. Paint access doors in open position, do not allow flanges to become clogged with paint.
- .3 Do not apply paint finish in areas where dust is being generated.
- .4 Materials shall conform to Master Painters Institute (MPI) Approved Products Listing.
- .5 Work to comply with, but not limited to all applicable standards, for applications to steel exposed to weather, galvanized steel, stucco, masonry and brick surfaces and plaster and wallboard, but not limited to, the following standards.

1.9 STORAGE OF MATERIALS

- .1 Store materials used on the job in single space designated by Construction Manager. Keep storage place neat, clean, rectify damage thereto or to its surroundings.
- .2 Remove all oil, rags and waste from building every night, take precautions to avoid danger of fire.
- .3 Provide CO2 fire extinguisher of minimum 20 lbs. capacity in storage area.

1.10 PROTECTION

- .1 This Contractor shall protect the work of other trades from all damage due to the work and operations and shall replace any materials damaged to such an extent that cannot be restored to their original condition.

1.11 COMPATIBILITY & COORDINATION

- .1 Provide finish coats which are compatible with prime paints used. Review other sections of the specifications in which primed paints are to be provided to ensure compatibility of the total coatings system for the various substrates.
- .2 Upon requests from other subcontractors, furnish information on the characteristics of the specified finish materials, to ensure that compatible prime coat is used.
- .3 Provide barrier coats over incompatible primers or remove and re-prime as required.
- .4 Notify Architect in writing of any anticipated problems using the coating systems specified with substrates primed by others.

1.12 COLOUR SCHEDULES

- .1 The Architect will prepare and issue a colour schedule approved by the Owner.
- .2 This Contractor shall obtain colour schedule from Architect, through the General Contractor, before commencing work.
- .3 Commencing work before obtaining an approved colour schedule is at the Contractor's risk and any correction work will be at own expense.

1.13 SUBMITTALS

- .1 Prior to commencement of the work the painting contractor shall submit paint draw-downs, the product names, numbers for the top line products for each substrate to be painted using the specified acceptable manufacturer for review and approval by the Architect. No work is to commence until submittals have been made and products approved.
- .2 Submit two sets of Material Safety Data Sheets (MSDS) prior to commencement of work for review and for posting at job site as required.
- .3 At project completion provide an itemized list complete with manufacturer, paint type and colour coding for all colours use for Owner's later use in maintenance.

1.14 COLOUR ACCENTS

- .1 Some rooms will have one wall painted an accent colour.
- .2 Ceilings will be painted accent colours which differ from the base colour.

2.0 PRODUCTS

2.1 MATERIALS GENERAL

- .1 Certain materials are specified by name in order to establish quality and suitability. Products of reputable manufacturers which are similar, comparable and equal in all respects to materials specified will be considered subject to the Architect's approval. Acceptable manufacturers are Pratt & Lambert, Benjamin Moore,

Pittsburg Paints, Sherwin Williams, General Paint, Dulux and PPG Architectural Coatings. Use only manufacturer's top line products. The Architect will select all colours.

- .2 All paints shall be of best quality produced by manufacturer approved by the Architect and their use and application shall be in strict accordance with manufacturer's instructions. Each container shall bear an identifying label.
- .3 Undercoats shall be of the same manufacturer as the finish coats.
- .4 Putty, where needed, shall be as approved by paint manufacturer.
- .5 Use products compatible with each other and only as recommended by the coating manufacturer.

2.2 MATERIALS EXTERIOR

- .1 Exterior hollow metal doors, frames, pipe bumpers, ladders, lintels, gas line and other exposed ferrous metals shown on the exterior elevations and drawings, 3 coats consisting of one of the following waterborne acrylic interior/exterior systems.
 - .1 Dulux Paints:
 - .1 Primer, one (1) coat Pitt-Tech Plus 4020 waterborne metal primer as required.
 - .2 Finish coats, two (2) Pitt-Tech Plus 90-1310 waterborne acrylic, semi-gloss enamel.

2.3 MATERIALS INTERIOR

- .1 Masonry Surfaces and Exposed Poured Concrete Walls
 - .1 Block masonry surfaces shall be painted one of the following waterborne catalyzed epoxy finish systems except as specified otherwise following:
 - .1 Dulux Paints:
 - .1 Block filler Dulux X-pert 36250.
 - .2 Finish coats, two (2) PPG Aquapon WB Water-based Epoxy #98-1 Series (98-100 Semi-Gloss)
 - .2 Gloss Levels: Semi-gloss all locations.
 - .2 Metal Surfaces
 - .1 This Contractor shall paint all exposed ferrous metal work throughout including hollow metal doors and frames, borrowed light frames, lintels, stair railings, guard railings, stringers, risers, steel channel frames, beams, girts, sag rods, metal deck, etc.

- .2 Generally the above work will have been given a prime coat under other sub-divisions of the contract but where this has not been done, the Contractor shall give the work a coat of rust resistant metal primer. If the prime coat by other trades is found to be damaged, this Contractor shall make good such portions of touching-up with prime coat.
- .3 Hollow metal doors, frames, borrowed light frames interior lintels, etc:
 - .1 Dulux Paints:
 - .1 Primer, Multiprime 4360 Alkyd Metal Primer
 - .2 Finish coats, two (2) Pitt-Tech Plus 90-1310 waterborne acrylic enamel
- .4 Exposed Open Ceilings:
 - .1 Exposed steel joists, beams and metal deck and ductwork
 - .2 Sherwin Williams – Pro Industrial, Waterborne Acrylic Dryfall Flat
 - .3 Apply at a film thickness necessary to achieve hiding and uniform coverage / lustre. Surface preparation and application in conformance with manufacturer's printed instructions.
- .3 GWB - Gypsum Wallboard (Drywall) Surfaces
 - .1 Gypsum Wallboard ceilings and bulkhead surfaces shall receive one coat of latex wall primer and two coats of acrylic latex enamel satin finish.
 - .2 Wallboard wall surfaces:
 - .1 Dulux, Lifemaster, 59311 Eggshell, two (2) coats over primer where required.
- .4 EPOXY - Decorative Epoxy Multicoloured Slip-Resistant Floor Finish.
 - .1 Acceptable Products: Sikafloor Quartzite Broadcast System
 - .2 Provide seamless, sealed epoxy floor composed of aggregates with transparent top coat. Provide all system components (from one manufacturer) for a slip-resistant epoxy floor finish. Thickness: 3mm.
 - .3 This contractor shall apply the system on the floor proper and as a continuous 100mm base at all housekeeping pads and walls within mechanical rooms.
 - .4 System shall be complete with all accessories and materials to bridge cracks or vertical/horizontal conditions.
- .5 Concrete Floor and Wall Sealant (Where applicable).

- .1 Provide two coats: Ultra Seal EF (Earth Friendly), water-based acrylic sealer as manufactured by Dayton Superior Chemical & Cement Products or approved equal.
- .2 Work to be in strict conformance with manufacturer's printed instructions.
- .3 Apply to floor and wall within storage space continuous to underside of stage floor (deck).
- .6 Wood Surfaces: For woodwork to receive stained finish, apply one coat paste filler, one coat pigmented stain, one coat sanding sealer and two coats satin varnish.
- .7 Insulation Covering: For insulation covering apply one coat tinted enamel undercoat and one coat of semi-gloss alkyd enamel. Do not paint insulation with PVC jacketing.

2.4 MECHANICAL & ELECTRICAL EQUIPMENT

- .1 This Contractor shall paint all exposed conduit, piping, insulation, hangers and mechanical and electrical equipment including stands and all other accessories.
- .2 Exposed piping, ductwork and equipment shall be generally painted the same colour as adjacent surroundings of background surfaces with two coats of paint.
- .3 Suitable heat resisting paint, subject to approval of Architect, shall be used on hot surfaces.
- .4 Equipment, piping and ductwork occurring above ceilings or in pipe spaces or otherwise concealed in the building structure will not require painting. (Note: Where exposed materials continue into concealed (above ceiling areas) painting may stop where it is no longer visible).
- .5 Wall surface behind wall fin enclosures is to be painted by this contractor prior to installation of enclosure.
- .6 Refer to instructions on painting mechanical and electrical work and do such work under supervision of respective Mechanical and Electrical Divisions.
- .7 Finish paint primed mechanical equipment: heaters, convectors, radiators, wall fin perimeter induction units and similar items.
- .8 Prime and paint exposed, unfinished electrical raceways, fittings, outlet boxes, junction boxes, pull boxes and similar items.
- .9 Replace identification markings on mechanical and electrical work when painted over or spattered.
- .10 Remove grilles, covers, access panels for mechanical and electrical systems from installed location and paint separately, if these items are not factory finished to final requirements.

- .11 Paint work to match surfaces they are seen against unless directed otherwise.
- .12 Paint interior surfaces of air ducts visible through grilles and louvres, with one coat of flat black metal paint to limit of sight line.
- .13 Keep sprinkler heads free of paint.

3.0 EXECUTION

3.1 INSPECTION

- .1 Examine the work of others prior to the application of any paint or finishing material. If any surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding and puttying operations, notify the General Contractor immediately in writing.
- .2 Do not proceed with finishing until surface is acceptable. Application of paint or finish to the surface constitutes acceptance of the surface.

3.2 WORKMANSHIP GENERAL

- .1 The contractor shall protect the work at all times and shall protect all adjacent work and materials by suitable covering or other method during progress of the work. Upon completion of the work remove all paint and varnish spots from floors, glass and other surfaces.
- .2 Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave the work in clean, orderly and acceptable condition.
- .3 Remove and protect hardware, accessories, device plates, lighting fixtures, factory finished work and similar items or provide ample in-place protection. Upon completion of each space, carefully replace all removed items.
- .4 All materials shall be applied under adequate illumination, evenly spread and flowed-on smoothly to avoid runs, sags, brush marks, air bubbles and excessive roller stipple.
- .5 Coverage and hide shall be complete. When colour, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, colour, appearance and coverage, at no additional cost to the Owner.
- .6 All coats shall be dry to manufacturer's recommendations before applying succeeding coats.
- .7 All suction spots or "hot spots" in plaster and/or cement after the application of the first coat shall be touched up before applying the second coat.
- .8 Apply all finishes in accordance with MPI Architectural Painting Specification Manual Chapter 4 and manufacturer's instructions.

3.3 PREPARATION OF SURFACES

.1 General

- .1 Surfaces shall be clean, dry and adequately protected from dampness.
- .2 Surfaces shall be free of any foreign materials which will adversely affect adhesion or appearance of applied coating.
- .3 Mildew shall be removed and the surface neutralized per the coating manufacturer's recommendations.
- .4 Efflorescence on any area will be corrected before painting.
- .5 Remove doors if necessary to finish bottom edge or pre-finish before installation.
- .6 Do all necessary puttying of nail holes and cracks after first coat.
- .7 Clean all mortar from surfaces of block masonry. Block surfaces are to be reviewed after priming with the Masonry Contractor and General Contractor before commencement of finish coats.
- .8 Sand smooth wood surfaces to be painted, stained and/or varnished. Clean surfaces from all sanding dust before applying first coat, sand and clean between succeeding coats.
- .9 Apply wood paste filler to nail holes and fissures. Tint to match stain for woodwork.

.2 Drywall

- .1 Remove dust, wax and grease prior to painting.
- .2 Fill all minor irregularities with spackling paste and sand to a smooth, level surface. Exercise care to avoid raising nap of paper on gypsum board. Ensure all joint treatment has thoroughly cured.
- .3 Prepare wallboard surfaces to ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

.3 Concrete & Masonry

- .1 Brush surfaces with a stiff brush to remove loose particles, giving particular emphasis to mortar splatter.
- .2 Patch small openings and holes and finish flush with adjacent surface. After priming, fill any remaining small holes with prepared patching material.

- .3 Remove form oil from poured-in-place concrete by washing concrete with xylol or exempt-type form oil solvent, or as required for complete removal.
- .4 Painting shall conform latest, applicable standard.
- .4 Ferrous Metal Surfaces
 - .1 Remove dirt and grease with mineral spirits and wipe dry with clean cloths.
 - .2 Remove rust, mill scale and defective paint down to sound surfaces or bare metal using scraper, sandpaper or wire brush as necessary. Grind, disc sand, etc., if necessary to remove shoulders at edge of sound paint to prevent them from photographing through finish coats.
 - .3 Touch up all bare metal and damaged shop coats with specified shop coat primer.
 - .4 For ferrous surfaces with shop coats touched up, as above required, the first coat as listed in the following schedule will be applied to the dry mil film thickness specified.
 - .5 Painting shall conform latest, applicable standard.
- .5 Galvanized Metal Surfaces
 - .1 Remove dirt and grease with mineral spirits and wipe dry with clean cloths.
 - .2 Painting shall conform to latest, applicable standard.
- .6 Concrete Sealed Floor Surfaces
 - .1 Preparation:
 - .1 Caulking and patching to be complete by Section 03 30 00 before application of sealer.
 - .2 Surface must be clean and dry. Pressure wash existing surfaces as necessary to ensure a clean surface for application.
 - .3 Surface, air and material temperatures must be 4 deg C or higher during application.
 - .4 Comply with latest, applicable standard.
 - .2 Application:
 - .1 Comply with written manufacturer's instructions.
 - .2 Stir thoroughly before using. Apply a continuous, uniform film by low-pressure spray, short-nap roller, or lamb's wool applicator. Low pressure hand-pump sprayer is recommended for best results.

- .3 To seal and dustproof, 2 coats must be applied at the recommended rates. Apply the second application when all trades are completed and the site is ready for occupancy.

.3 Drying Time:

- .1 At 25 °C and 50% relative humidity. The drying time of water-based materials is directly influenced by temperature and relative humidity. Low concrete or air temperatures or high relative humidity will extend drying time.

Light foot traffic or between coats: 4 hours

Normal traffic: Overnight

Maximum hardness: 7 days

3.4 WORKMANSHIP FOR EXTERIOR PAINTING

- .1 Exterior painting shall not be done when the surface temperature is below 50deg F., while the surface is damp, or during cold, rainy or frosty weather. The substrate temperature must be 5deg F. or more above the dew point temperature while painting and during the coatings cure. Avoid painting surfaces while they are exposed to hot sun.
- .2 Paint tops, edges and bottoms of doors the same as exterior faces.

3.5 WORKMANSHIP FOR INTERIOR PAINTING

- .1 Enamel finish applied to metal or wood shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.
- .2 Interior doors shall have tops, bottoms and edges finished. (Note: Wood and hollow metal doors shall be inspected for painted edges or sealed edges prior to installation).

3.6 PAINTING APPLICATION

- .1 Painting and finishing materials shall be mixed and applied in strict accordance with the manufacturer's directions for the particular materials and coat to be applied. Reducing when required shall also be done in strict accordance with the recommendation of the manufacturer for the particular materials and coat.
- .2 Employ skilled mechanics to ensure the very best workmanship. Materials to be applied by craftsmen experienced in the use of the specified product involved.
- .3 Apply all material under adequate illumination. Spread evenly and flow on smoothly without runs or sags.
- .4 All coats must be thoroughly dry before applying succeeding coats.

- .5 Cover surfaces to be stained with a uniform coat and wipe off, if required.
- .6 Between coats, sand enamel and varnish finish applied to wood or metal with fine sandpaper and clean to produce an even, smooth finish.
- .7 Apply filler sealer and finish coats with roller to wall surfaces.

3.7 CLEANING

- .1 Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces.
- .2 Remove from the premises all rubbish and accumulated material or whatever nature not caused by others and leave work in clean, orderly and accepted condition.

END OF SECTION

10 11 00-Visual Display Surfaces

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 The work required under this Section of the specifications shall include all labour, equipment and materials necessary to complete the following items and any items shown on drawings and not specifically assigned to any sub-trade section of these specifications. The Contractor may, at his option, purchase and install these items himself or assign them to any of the before mentioned sub-trades.

1.2 SUBMITTALS

- .1 Prepare and submit shop drawings of items specified in this Section in to the Architect for review in accordance with Section 01 33 00, Submittals.
- .2 Where products require colour selection, submit manufacturer's colour selection in accordance with Section 01 33 00, Submittals.

2.0 PRODUCTS

2.1 WHITE BOARD AND TACKBOARD

- .1 Supply and install all whiteboards (communication boards) and tackboards used as a separate unit or in combination with one another throughout the facility to the sizes and locations shown on drawings complete with all aluminum trim members.
- .2 Drawing code examples:
 - .1 Metric Code:
 - .1 TB 2400/1200 – refers to millimeter tackboard size
 - .2 WB 2400/1200 - refers to millimeter whiteboard size
 - .2 Imperial Code:
 - .1 TB 10/4 – refers to feet tackboard size (10'-0" x 4'-0")
 - .2 WB 10/4 - refers to feet whiteboard size (10'-0" x 4'-0")
- .3 The following specifications are based on ASI Visual Display Surfaces products (formerly Architectural School Products Ltd. or ASP as indicated herein). Subject to meeting the specifications herein, the following manufacturers are acceptable:
 - .1 Shanahan's Manufacturing Ltd.
 - .2 Global School Products
 - .3 Martack Specialties Ltd.

- .4 Provide shop drawings showing dimensional layouts together with fabrication and installation details based on site conditions. Confirm adjacent installations that may affect this work and confirm adjacent furniture, fittings and equipment that may be supplied by the Owner prior to shop drawing work.
- .5 Prior to commencement of erection, all surfaces to be checked for irregularities, trueness and rigidity and projections and defects to be reported immediately to the General Contractor for correction.
 - .1 On completion of the installation all materials and workmanship to be inspected for proper operation, rigidity and appearance, and any defective materials to be replaced with new materials prior to final inspection.
- .6 The General Contractor to be responsible for providing a dry, warm storage area capable of being locked for the storage of all materials. The Contractor shall unload all materials at the site and place in aforementioned storage room.
- .7 During installation utmost care to be taken by workers to ensure the protection of the work from damage by other trades until the building is ready for occupation and handed over to the Owner.
 - .1 Protection of all materials during the painting operation shall be carried out by the use of polyethylene covering which shall be the responsibility of the painting contractor.
- .8 Upon completion of all work - clean down, remove all stains, loose dirt and excessive adhesive, and leave all elements in a first-class condition at the point of handing over to the Owner.
- .9 Maintenance
 - .1 A label stating instructions for the care and maintenance of white boards to be affixed to the upper right hand corner of all white board elevations for the use of the facility's maintenance staff.
- .10 Installation of all materials to be warranted for a period of one year. This warranty covers both labour and material for replacement of defective materials.
 - .1 Whiteboards and tackboards to be warranted for a period of 10 years against defects due to normal usage and wear. Submit written warranty at Substantial Performance.
- .11 White Board
 - .1 Facings: 0.55mm white porcelain enameled steel.
 - .2 Core: 11mm fiberboard to ASTM D1037.
 - .3 Backing sheet: 0.5mm zinc coated steel sheet.
 - .4 White marker boards to sizes and locations shown on the drawings.

.12 Tackboards

- .1 General: Tackboards shall be classified as to surface burning characteristics in accordance with CAN4-S102 as follows:

Material Composition	Flame Spread	Smoke Developed	Fuel Contributed
Krommenie	25	25	20
Cork	55	55-70	20
Backing	135-150	200	140

- .2 Cork Tackboards: To be factory laminated 6mm (1/4") thick natural cork laminated to 6mm (1/4") particle board or masonite substrate under mechanical pressure. Bonding of materials by a waterproof adhesive that will not delaminate or rupture at the contact surfaces. Refer to distribution.
- .3 Krommenie Tackboard: To be linoleum-based factory faced prelaminate consisting of 6mm (1/4") thick natural krommenie by Forbo laminated to 6mm (1/4") particle board or masonite substrate under mechanical pressure. Bonding of materials by a waterproof adhesive that will not delaminate or rupture at the contact surfaces. Refer to distribution. Colour of tackboards will be as selected by the Architect from manufacturer's standard colour range. Refer to distribution.
- .4 Distribution of Tackboards:
- .1 Natural Cork (unfaced) Tackboards: all locations except where noted below.
- .2 Krommenie Tackboard:
- .1 Display Cases, Staff Room, Office and Work Room.

.13 Aluminum Trim

- .1 Architectural School Products Architectural Series 400. Aluminum to be 6063T5 alloy with clear etched and anodized 0.051 mm (.002") stain finish free from extruding draw marks and surface scratches.
- .2 Perimeter - Architectural School Products No. 405 trim for all tackboards and vertical jams of white boards and chalkboards 19 mm (3/8") exposed face.
- .3 Divider Bar - Architectural School Products No. 407 trim for adjacent white board/tack board panels and adjacent tack board/tack board panels of elevations greater than 8'-0" - 12.7 mm (1/2") exposed face and weight of approximately 113g (.25 lbs.) per lineal foot.
- .4 Maprail: ASP No. 406 trim – install at all chalkboard and white board only complete with integral tan Krommenie cork insert, end stops (ASP No.

200ES) and two (2) combination roller map hooks per 1824 mm (6 lineal ft.).

.1 Additionally, allow for (10) – 10'-0" lengths complete with end caps to be supplied and installed in locations as directed by the owner/consultant at the time of installation.

.5 All Marker Trays:

.1 ASP No. 212 with cast ends with 100mm (4") projection at all locations except at locations noted below.

.2 ASP No. 264 with plastic end caps for locations where board is directly above millwork.

.3 ASP No. 461 recessed marker trays at gym walls and Kindergarten boards which are 12" above floor.

.6 ASP to ASI Comparison Chart:

Component Name	ASP #	ASI #
Main Perimeter Rail	405	544205-size
Divider Bar	407	544207-size
2" Map Rail	406	544074-size
End Caps	200-ES	850402
Map Hooks	?	850302
Marker Tray at top of millwork (w/ plastic ends	264	844264-size
Marker Tray (4" protruding) with cast ends	212	DISCONTINUED
Recessed Chalk Tray	461	544261-size (RUNOUT ITEM)

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.

3.2 INSTALLATION

.1 Installation of materials to be carried out by competent craftsmen supervised by a foreman with at least 2 years experience in this specialized field.

.2 Overhead work such as ceiling grids, plumbing, electrical services, communication systems, painting, etc. to be at an advanced stage of completion in order not to

impede this installation. Millwork units forming integral part of the chalk board and tack board installation to be located and affixed to the walls before commencing chalk board/tack board installation.

- .3 Erection of materials to be carried out in a substantial manner to ensure a rigid, straight, square, plumb and horizontal lines level.
- .4 All aluminum trims to be attached in such a manner that all fastenings shall be concealed. Fastening to be accomplished by the use of #10 x 1" (25 mm) steel wood screws attached to walls by use of rawl plugs.
- .5 Tackboards to be adhered to wall surface by the use of adhesive as recommended by the supplier applied in egg-size blobs at approximately 8" (200 mm) centres. Tackboards to be pressed firmly into this adhesive to ensure proper adhesion. VOC content of adhesive not to exceed 50g/L.
- .6 White boards and tackboards to be jointed together by the use of 198 x 25 mm (14 gauge by 1") wide steel spline and an extruded polyvinyl slotted insert to ensure a flush butt joint with a hairline appearance.
- .7 Refer to interior elevations for all mounting heights.
- .8 Install display case tackboards and tack strips as designated locations.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.
- .3 Clean aluminum with a damp rag and approved non-abrasive cleaner.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

10 21 13-Toilet Partitions - Euro

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 Supply all labour, material and equipment necessary for the installation of Phenolic, Euro-Style, full height Toilet Partitions at Washrooms as indicated on the drawings and as required by actual conditions at the building. The toilet partition shall include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields and all other devices necessary for the proper installation and application of the system.
- .2 Intent of work is to create a no sight-line privacy system installation.

1.2 RELATED SECTIONS

- .1 Refer to Section 04 80 00: Masonry Assemblies
- .2 Refer to Section 06 10 10: Wood blocking and backing within wall assemblies.
- .3 Refer to Section 09 30 13: Tile work.
- .4 Refer to Section 10 01 10: Miscellaneous Purchases.

1.3 REFERENCES

- .1 ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- .2 ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
- .3 ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .4 ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
- .5 ASTM D6578 / D6578M - Standard Practice for Determination of Graffiti Resistance
- .6 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 Can/CSA-B651, latest edition, Barrier Free Design.

- .8 All Toilet Partitions must be scheduled, supplied and installed in accordance with: Local building Code, CGSB (Canadian Government Specification Board), CSA (Canadian Standards Association), ANSI (American National Standards Institute), ADA (American Disabilities Act). In all these cases the above references shall be taken to mean the latest edition of that particular standard including all revisions.

1.4 SUBMITTALS

- .1 Comply with Section 01 30 00 - Submittals
- .2 Submit manufacturer's product data sheets of typical panel, pilaster, door, colour charts, hardware and fastenings.
- .3 Submit duplicate 150mm x 150mm (6" x6") samples of panel showing actual colour and texture selected with two finished edges in accordance with Section 01 30 00 - Submittals for verification purposes.
- .4 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.
- .5 Submit shop drawings in accordance with Section 01 30 00 Submittals.
- .6 Clearly indicate fabrication details, plans, elevations, hardware and installation details.
- .7 Field measure as required and verify for appropriate size, etc. of compartments prior to submitting shop drawings.
- .8 All work to comply with latest accessibility codes or Architectural drawings – whichever is more stringent.

1.5 MAINTENANCE DATA

- .1 Provide maintenance data for maintenance of toilet partitions and hardware for incorporation into Maintenance Manual specified in Section 01 77 00 - Project Closeout.

1.6 QUALITY ASSURANCE

- .1 Components of toilet partitions shall be sourced from one single source manufacturer who certifies that materials meet or exceed specifications.
- .2 Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum five (5) years' experience in the manufacture of toilet compartments.
- .3 Supplier / Installer Qualifications: Execute the work of this section only by a Subcontractor who has adequate plant, equipment, and skilled tradesmen to perform it expeditiously and is known to have been responsible for satisfactory installations similar to that specified during the period of at least the immediate past five (5) years.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Materials shall be delivered to site in original, unopened cartons or other packaging materials necessary to protect structure and finishes. Materials shall be stored in manufacturer's packaging until installation.
- .2 Partitions shall be stored in horizontal position with adequate support to ensure flatness and to prevent damage to finished surfaces.
- .3 Toilet partitions must be delivered in an amount of time deemed appropriate by the Architect / Owner.

1.8 WARRANTY

- .1 The Toilet Partition Manufacture shall guarantee all Toilet Partitions by written certification, for a period of five (5) years from the date of certified substantial performance of the project, against any defects in design, delamination of materials and workmanship. Any defects as described will be made good by the manufacturer.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1 Basis of Design: Bradley Euro Style, Phenolic HighRise Series, floor to ceiling, no-sight-line system.
- .2 Provided all systems match at a minimum the above design system, for following are acceptable manufacturers:
 - .1 ASI Global Partitions
 - .2 Mills Partitions
 - .3 Hadrian
 - .4 Scranton Products

2.2 DESIGN AND MATERIAL

- .1 Standard Height.
 - .1 Door/Panel Height: Full Height or standard height with Transom panel.
 - .2 Floor Clearance: 1 inch (25mm).
 - .3 Maximum height of 109.6 inches (2785 mm).
 - .4 Door Width: 24 inches (610 mm), minimum; at ADA accessible compartments 38 inches (965 mm) minimum.
- .2 Panel Face Sheets: 1/8 inch (3 mm) decorative Phenolic sheets.
 - .1 Phenolic materials shall be impact and scratch resistant. Anti-bacterial coating and non-porous surface to reduce spread of germs.
 - .2 Surface Burning: Class B.
 - .3 Impact Resistant: ASTM D2794.
 - .4 Scratch Resistant: ASTM D6578.

- .3 Panel Core: face sheets laminated to a foam core, and edge banded with extruded aluminum profiles.
- .4 Stainless Steel Castings: ASTM A 743/A 743M.
- .5 Aluminum: ASTM B 221.

2.3 CONSTRUCTION

- .1 No-Sight rabbeted edge detail on hinge and latch side of door and pilasters.
- .2 Door, Panel, and Pilaster Construction, General:
 - .1 Provide Phenolic face sheets free of pitting, visible seams and fabrication marks, stains, telegraphing of core material, or other imperfections. Aluminum edge banding.
- .3 Door Construction: 1.4 inches (36 mm) thick.
 - .1 Rebated aluminum profile at lock side of door and pilaster with aluminum edge banding.
- .4 Panel Construction: 1.4 inches (36 mm) thick.
- .5 Pilaster Construction: 1.4 inches (36 mm) thick.
- .6 Fittings: Continuous U brackets at wall, ceiling and floor.
- .7 Urinal-Screen Construction: Matching toilet compartment panel construction.
- .8 Privacy Screen Type: Matching toilet compartment panel design and construction.

2.4 FINISH

- .1 Colour to be selected by Architect from standard colour range.

2.5 HARDWARE

- .1 Hardware: Manufacturer's standard stainless steel castings, including corrosion-resistant, tamper-resistant fasteners:
- .2 Hinges: Shall be full height piano hinge.
- .3 Standard Accessories: Provide Individual stainless steel coat hook and rubber bumper where door abuts wall.
- .4 Door Latch: Stainless steel door handle. ADA compliant stainless steel door handle in an L-shape with ADA compliant locking mechanism on the inside. White/red indication latch and emergency release feature is integrated on the outside of the door handle. The emergency release uses a 5/32 inch (4 mm) Allen key that is inserted into the center of the door latch from the outside to unlock the door.

3.0 EXECUTION

3.1 EXAMINATION

- .1 Examine areas to receive toilet partitions for correct height and spacing of anchorage/blocking and plumbing fixtures that may affect the installation of compartments. Report any discrepancies to the Architect.
- .2 Take complete and accurate measurements of complete toilet compartment locations.
- .3 Commencement of work constitutes acceptance of project conditions.

3.2 INSTALLATION

- .1 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - .1 Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
 - .2 Verify location does not interfere with door swings or use of fixtures.
 - .3 Use fasteners and anchors suitable for substrate and project conditions.
 - .4 Install units rigid, straight, plumb, and level.
 - .5 Conceal evidence of drilling, cutting, and fitting to room finish.
 - .6 Test for proper operation.

3.3 PARTITION ERECTION

- .1 Install compartments in a rigid, straight, plumb, square and level manner, with components laid out as shown on shop drawings and manufacturer's installation instructions.
- .2 Clearances at all vertical edges shall be uniform top to bottom.
- .3 Attach fixing brackets securely to masonry surfaces using screws and shields: to hollow walls using bolts and toggle type anchors.
- .4 All doors and panels shall be mounted at 350 mm (1") above finished floor unless otherwise required by this system.
- .5 Secure pilasters to floor with pilaster supports anchored with 50 mm (2") penetration into structural floor.
- .6 Level, plumb and tighten installation with leveling device.
- .7 No evidence of cutting, drilling or patching shall be visible on the finished work. All finished edges to be free of sharp edges or burrs.

3.4 FIELD QUALITY CONTROL

- .1 Inspection: After installation has been completed, provide for a site inspection of all Toilet Partitions to determine that all items have been supplied and installed as per the manufacturer's printed instructions and details. Also, check the operation and adjustment of all Toilet Partitions. Any discrepancies, or malfunctioning product, must be reported to the Architect immediately.

3.5 ADJUSTMENT AND CLEANING

- .1 At final completion, toilet partitions shall be left clean and free from disfigurement. Make all final adjustments. Where toilet partitions are found defective, repair or replace or otherwise correct as directed by Architect.
- .2 All rubbish and cartons generated by installer shall be removed and the area left broom clean.

3.6 PROTECTION

- .1 The Contractor shall provide for the proper protection of all toilet partitions until the Owner accepts the project as complete.

END OF SECTION

10 28 10-Toilet and Bath Accessories

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 The work required under this Section of the specifications shall include all labour, equipment and materials necessary to complete the following items and any items shown on drawings and not specifically assigned to any sub-trade section of these specifications.

1.2 RELATED SECTIONS

- .1 Section 04 80 00: Masonry Assemblies
- .2 Refer to Section 06 10 10: Wood blocking and backing within wall assemblies.
- .3 Refer to Section 06 40 00: Millwork
- .4 Refer to Section 09 30 13: Tile and Marble
- .5 Refer to Section Toilet Compartments

1.3 SUBMITTALS

- .1 Prepare and submit shop drawings of items specified in this Section to the Architect for review in accordance with Section 01 33 00, Submittals. Include locations of installations.
- .2 Where products require colour selection, submit manufacturer's colour selection in accordance with Submittals.

2.0 PRODUCTS

2.1 ACCEPTABLE PRODUCTS

- .1 Where specific installation details/locations are not shown on the drawings, install items below to meet Ontario Building Code requirements and to Owner's and Architect's approved locations. Ensure this is reviewed prior to any work. Coordinate and facilitate process with use of submittals (shop drawings, etc) as needed.
- .2 The listed products are equally acceptable. Do not inter-mix products of different manufacturers unless the chosen manufacturer cannot provide the required product or product item listed does not give the option for alternatives. Provide products manufactured in North America.

.1 Toilet Tissue Dispensers

Install Owner-supplied toilet tissue dispensers in Washrooms at a rate of one unit for each toilet.

.2 Sanitary Napkin Disposal

Supply and install for each female watercloset, one sanitary napkin disposal of one of the following manufacturer's models.

ASI (Waltrous) - Model No. W-0852
Frost - Model No. 622
Bobrick - Model No. B270
Bradley - Model No. 4748-15

.3 Fixed Grab Bars

Supply and install behind and to the side of each handicap accessible watercloset, at both sides of urinals and on walls in barrier free accessible showers, grab bars of one of the following manufacturer's models as noted below.

- minimum 24" and 'L' shaped at back and side of toilets
- minimum 30" and 40" at barrier-free shower locations
- minimum 24" vertically each side at minimum one urinal
- minimum 48" at change table/bench

ASI (Waltrous) - 3700 Series
Frost - 1000 Series
Bobrick - B6800 Series
Bradley - 832 Series

All units to have knurled/peened finish (grip).

Refer to typical washroom elevations and CSA Standard B651, latest edition and Ontario Building Code, latest edition, for locations and sizes and secure to meet required loading.

.4 Folding (Fold-Up) Grab Bars

Supply and install each side of watercloset in handicap accessible Washrooms as indicated on drawings where wall is not adjacent to toilet, fold-up height adjustable grab bars.

Bobrick B-4998
Bradley 8372-108
Frost 1055-FTS

Units to consist of the following components:
-Min 30" Long Hinged Arm Support
-Console

- Toilet Roll Holder
- Finish: stainless steel.
- Signage

.5 Soap Dispensers

Install Owner-supplied soap dispensers in all Dressing Rooms and Washrooms at a rate of one unit for each lavatory unless noted otherwise.

.6 Tilting Mirrors

Supply and install one tilting mirror over a lavatory in each washroom having a Handicap Accessible stall or in a designated Barrier-Free/Handicap Accessible washroom.

ASI (Waltrous) - Model No. 0535-1836
Frost - Model No. 941-FT-1836
Bobrick - Model No. B-293-1836
Bradley - Model No. 740

.7 Fixed Mirrors

Supply and install over each lavatory at all washrooms (less tilting mirror locations) mirrors of one of the following manufacturer's models.

ASI (Waltrous) - Model No. W0620-A-1836
Frost - Model No. 941-1836
Bobrick - Model No. B-290-1836
Bradley - Model No. 781-1836

.8 Mop & Broom Holders

Supply and install in each Custodial Closet or mopsink location, one mop and broom holder to Owner's final location of one of the following manufacturer's models.

ASI (Waltrous) - Model No. W-8215-A
Frost - Model No. 1113
Bobrick - Model No. B-223 - 600mm
Bradley - Model No. 9953

.9 Paper Towel Dispensers

Supply and Install paper towel dispensers in all Washrooms at rate of one per washroom unless noted otherwise:

ASI (Waltrous) – Model 0245-55
Bobrick – Model B-263
Bradly – Model 251-15
Frost – Model – 103-1

.10 Coat Hooks - Fixed

Supply and install one in every single-toilet washroom, shower and shower stall:

ASI (Waltrous) - Model 7340 S
Bobrick - Model B-7671
Bradley - Model 9114

.11 Coat Hooks – Break-Away

Supply and install one in every single-toilet washroom, shower and shower stall:

Frost – 1150-SS

.12 Shelf

Supply and install one per washroom to Owner's final location:

ASI Watrous - Model 20692-618
Bobrick – no equal
Bradley – no equal

2.2 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal with 0.06" radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop assemble components and ship complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

3.0 EXECUTION

3.1 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry, marble, stoner or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet/shower compartments: use male/female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer and/or to withstand shear, tension or pull-out and torsion loads generated by maximum loading.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies immediately before final occupancy by Owner.
- .5 Install mirrors plumb and level.
- .6 Where installation has cracked wall finish or back-up wall construction – remove accessories, replace back-up wall patch and match wall and re-paint or re-tile per finish required.

END OF SECTION

10 57 13-Hat and Coat Racks

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

- .1 Furnish all hat and coat rack units complete with all accessories in areas as indicated on the drawings.

1.2 RELATED SECTIONS

- .1 Refer to Section Masonry Assemblies;
- .2 Refer to Section Rough Carpentry;
- .3 Refer to Section Gypsum Board Assemblies.

1.3 SUBMITTALS

- .1 Submit manufacturer's product data sheets of typical units with accessories and fastenings.
- .2 Submit sample showing actual colour and finish of all items.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 30 00 Submittals.
- .2 Clearly indicate fabrication details, plans, elevations, hardware and installation details.
- .3 Field measure as required and verify for appropriate size, etc. of compartments prior to submitting shop drawings.

1.5 MAINTENANCE DATA

- .1 Provide maintenance data for maintenance of units and hardware for incorporation into Maintenance Manual specified in Section 01 77 00 - Project Closeout.

1.6 QUALITY ASSURANCE

- .1 Subcontractor Qualifications: Execute the work of this section only by a Subcontractor who has adequate plant, equipment, and skilled tradesmen to perform it expeditiously and is known to have been responsible for satisfactory installations similar to that specified during the period of at least the immediate past five (5) years.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Materials shall be delivered to site in original, unopened cartons or other packaging materials necessary to protect structure and finishes. Materials shall be stored in manufacturer's packaging until installation.

1.8 WARRANTY

- .1 The racks shall be warranted for a period of two (2) years from the date of substantial performance of the project, against any defects in design, materials and workmanship. Any defects as described will be made good by the manufacture.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- .1 ASI Visual Display Products (Architectural School Products) - Student Line STL1001
- .2 Acceptable alternates: Refer to Section: Submittals.

2.2 COLOURS

- .1 To be selected from standard range by Architect.

2.3 MATERIALS

- .1 SHELF: to consist of four 3/4" (19mm) OD square 18 gauge steel tubes closed and protected with form fitting black plastic end caps.
- .2 BRACKETS: two-piece heavy duty die cast designed with an integral backplate that provides a positive grip fastening. All screw fastenings shall color match bracket finish.
- .3 DOVETAIL: mounting shall be heavy duty extruded aluminum engineered for a slide fitting vertical adjustment of one full shelf and a length of 13" (330mm). Spacing as per manufacturer's standard but not to exceed 40" (1016mm).
- .4 FINISH: for shelf tubes, brackets, and dovetails is a high performance electrostatically applied powder coating, baked on to provide a uniform, smooth protective finish. Color as selected by architect from manufacturer's standard color range (STL-Black or STL-Gray).
- .5 COAT HOOKS: manufacturer's standard double prong molded ABS high-impact plastic formed to be non-turning, positive gripping and laterally adjustable. Architect to select from manufacturer's standard color range - Black, Red, and Yellow. Hooks to be arranged on 2nd and 4th tubes with spacing to be 6" (152mm) on center.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Installation of materials to be carried out by competent craftsmen supervised by a foreman with at least 2 years' experience in this specialized field.
- .2 Erection of materials to be carried out in a substantial manner to ensure a rigid, straight, square, plumb and horizontal lines level.
- .3 Refer to interior elevations for all mounting heights and re-verify mounting heights through shop drawing process with Architect prior to commencement of any work.
- .4 Install coat hooks on the second and fourth shelf tubes, spaced at 150mm (6") o.c.

3.3 CLEANING

- .1 Perform cleaning and clean-up after installation to remove construction and accumulated environmental dirt. Clean surfaces after installation using manufacturer's recommended cleaning procedures.

END OF SECTION

10 95 00-Miscellaneous Specialties

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO:

- .1 The work required under this Section of the specifications shall include all labour, equipment and materials necessary to complete the supply and installation of the following items.
- .2 The contractor shall review the drawings and account for products and materials having specifications outlined on the drawings that will not be included in other specification sections.

1.2 SUBMITTALS

- .1 Comply with Submittals section 01 33 00.
- .2 Prepare and submit drawings, cut sheets, product data of contractor-reviewed shop drawings for items specified herein to the Consultant for review.
- .3 Where products require colour selection, submit manufacturer's colour selection.

2.0 PRODUCTS

2.1 ARCHITECTURAL FENCING

- .1 Provide fencing and gates complete at Kindergarten play area. Refer to drawings for locations and fence heights.
- .2 Product: Iron Eagle Industries, Aluminum commercial grade fence system Model – “Elegant Eagle II” with 20 year warranty. Entire system to have tamper-proof hardware.
- .3 Post size: 3” x 3” (75mm x 75mm)
- .4 Post flanges: 6” x 6” x ¼” (150mm x 150mm x 6mm)
- .5 Post cap: Pyramid (low profile)
- .6 Finish: Seven Stage architecturally pretreatment, electrostatically-applied powder coat. Minimum thickness is 2.5 mils. Colour: Black.

2.2 BOLLARDS and SLEEVES

- .1 Assume steel, concrete filled bollards. Total number is 9 to Owner's final location of bollard placement.
- .2 Supply and install ULINE Bollard Sleeves Model H-9231 – Marlex™ HHM 5502 BN High Density Polyethylene Dome Top Cover with 6 year warranty at all above noted steel bollards. Assume colour: Red.

2.3 CLASSROOM MODULES

- .1 Classroom modules to be surface mounted School Classroom Control Modules as manufactured by Olympic Tool & Die Inc. Tel 1-647-466-0062. 1107 Westport Crescent, Mississauga, ON, L5T 1E8.
 - .1 Size: 406mm (16") wide by 102mm (4") deep.
 - .2 6063 T5 Alloy satin anodized aluminum frame
 - .3 Decorative Filler Panels: Fire Core MCP (TFL) decorative fill panels finished both sides between devices
 - .4 Vandal Resistant and Removable for service access.
- .2 Refer to plans and interior elevations for locations and components of all modules. Classroom modules to be set 4" (100mm) above finished floor and extend full height to ceilings.
- .3 Panels to have all openings, mounting hardware for service and wiring access for installation of electrical, communication, security services, etc. by Division 15 and 16.
- .4 Finish decorative Laminate selections by Architect. Assume Uniboard TFL "Hard Rock Maple" for pricing purposes.

2.4 CORNER GUARDS

- .1 Provide at twenty (20) locations at gypsum wallboard wall corners:
 - .1 2" (50) x 2" (50) x 90° Surface mounted stainless steel corner guard with 1/8" (3) radius corner and 10 deg end bends to accommodate surface irregularities. Adhere with low VOC polyurethane adhesive in accordance with manufacturer's printed instructions. No screws or fasteners allowed. Stainless Steel: Type 304 (ASTM A240), 16 gauge, with #4 finish (grain parallel to length. No edge burrs.
- .2 Acceptable Manufacturer: Pawling Corporation Architectural Products.
- .3 Provided these specifications are matched at a minimum, the following alternate manufacturer's are acceptable:
 - .1 Construction Specialties
 - .2 InPro Corporation

- .4 Size: From top of floor base to ceiling in one-piece lengths unless noted and dimensioned on the drawings. (Product comes in 12'-0" lengths and is to be spliced only where ceilings exceed 12'-0").
- .5 Final locations to be confirmed by Owner.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL PROVISIONS

- .1 This section applies to all sections of Mechanical Division.
- .2 This section shall conform to all requirements under Division 00, (Procurement and Contracting Requirements Group), and Division 01, (General Conditions).
- .3 Furnish all materials, equipment and labour as required for completion of work as outlined in contract documents.
- .4 Unless otherwise specified, all materials and equipment shall be new and manufactured in the project year.

1.2 INTENT

- .1 Mentioned herein or indication on Drawings of articles, materials, operations or methods requires; supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for all mechanical work.
- .2 Where used, the words “Section” and “Division” shall also include other Subcontractors engaged on site to perform all work to make building and site complete in all respects.
- .3 Where used, the word “supply” shall mean furnishing to site in location required or directed complete with all accessory parts.
- .4 Where used, word “install” shall mean secured in place and connected for operation as noted or directed.
- .5 Where used, word “provide” shall mean supply and install as each is described.

1.3 REGULATIONS, PERMITS AND FEES

- .1 All materials and quality of work shall meet all current and latest Provincial and Municipal requirements, regulations, codes and by-laws in force in the area of the project.
- .2 Each contractor shall give all necessary notices, obtain all necessary permits, and pay all fees in order that the work shown or specified may be completed. Each contractor shall furnish any certificates necessary as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.
- .3 If changes or alterations are required on completed work by authorized inspectors, these changes shall be made at the contractor’s expense.
- .4 Special equipment which does not have a standard CSA label shall be inspected by the local electrical authority having jurisdiction and the Approval Certificate shall be submitted to the Consultant. All costs and fees for inspections shall be borne by this contractor.
- .5 Submit a copy of all final project certificates in the maintenance manuals.

1.4 DRAWINGS

- .1 Mechanical Drawings do not include structural and related details, information involving accurate measurements of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to runs of piping, conduits and ducts to accommodate structural, electrical or building conditions. Location of pipes, ducts, conduits and other equipment may be altered

by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

- .2 As work progresses and before installing piping, ductwork, heating units, registers, diffusers, fixtures and any other fittings and equipment which may interfere with interior treatment and use of building, contractor shall provide detail drawings or obtain directions for exact location of such equipment and fitments.
- .3 Mechanical Drawings indicate general locations and routing of pipes, ducts and conduits which are to be installed. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Follow building lines, conceal piping, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.
- .4 Install piping and ductwork to clear structural elements and any fireproofing. Locate mechanical work to permit installation of specified insulation. Do not remove or damage structural fireproofing. Leave space to permit fireproofing and insulation to be inspected and repaired.
- .5 Before commencing with any work, check and verify all sizes, locations, grade and invert elevations, levels and dimensions to ensure proper and correct installation. Verify existing/municipal services.
- .6 Locate mechanical and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.
- .7 Where there is space indicated as reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.
- .8 Relocate equipment and/or such material installed but not co-ordinated with work of other Sections and/or installed incorrectly as directed, without extra charge.
- .9 Where drawings are done in metric units and product not available in metric units, the corresponding imperial trade size shall be utilized.

1.5 INTERFERENCE AND CO-ORDINATION DRAWINGS

- .1 Prepare interference and equipment placing drawings to ensure that all components on site will be properly accommodated within the constructed spaces provided.
- .2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are co-ordinated on site.
- .3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are maintained.
- .4 Upon consultant's request submit copies of interference drawings for review.
- .5 Due to the nature of the building and the complexity of the building systems provide the following:
 - .1 Interference drawings, showing coordination of architectural, structural, mechanical and electrical systems for the consultant's review prior to any work or fabrication.
 - .2 Detailed layout drawings, clearly showing fasteners and hangers for all mechanical work.
- .6 Provide CAD drawings (minimum release AutoCAD 2010) in addition to hard copies.

1.6 QUALITY ASSURANCE

- .1 Perform work in accordance with applicable provisions of the Plumbing Code, Gas Ordinances, and adoptions thereof for all mechanical systems. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
- .2 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall apply. Promptly notify Consultant in writing of such differences.

1.7 ALTERNATES AND SUBSTITUTIONS

- .1 Throughout Mechanical Division are lists of “Alternate Equipment” manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment. Submitted Bids shall be based on the supply of named articles and/or products as specified in the Bid Documents.
- .2 Each bidder may elect to use “Alternate Equipment” from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as “Separate Price”. Complete the Supplementary Tender Form provided.
- .3 When two or more suppliers/manufacturers are named in the Bid Documents, only one supplier/manufacturer of the products named will be acceptable; however, it is the responsibility of this Division to ensure “Alternate Equipment” fits space allocated and gives performance specified. If an “Alternate Equipment” nor “equal” specified product unit is proposed and does not fit space allotted in Consultant’s opinion, supply of specified described equipment will be required without any change in Contract amount.
- .4 Should electrical characteristics for “alternate” or “equal” equipment differ from equipment specified it shall be the responsibility of the contractor and equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.
- .5 If any item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.
- .6 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge to contract.

1.8 EXAMINATION

- .1 Site Inspection
 - .1 Examine the premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.
 - .2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine all site conditions.
- .2 Drawings:
 - .1 Mechanical Drawings show a general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - .2 Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of the building. These drawings take precedence over Mechanical Plumbing and HVAC Drawings and specifications.
 - .3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate all structural and finish conditions affecting this

work and arrange work accordingly, providing such fittings, valves, and accessories required to meet site conditions.

- .3 Ensure that items to be furnished fit within the space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit in the available space.

1.9 SEQUENCING SCHEDULING AND COORDINATION

- .1 While Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with any work.
- .2 Coordinate work of all trades in installing interrelated work. Before installation of mechanical items, make proper provision to avoid interferences in a manner approved by Consultant. Each Contractor shall refer to all sections of the specifications for their responsibilities with other trades. Changes required in work specified in Mechanical Division caused by neglect to do so shall be made at no cost to owner.
- .3 Arrange all pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.
- .4 Furnish and install inserts and supports required by Mechanical Division unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate all items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by Mechanical Division.
- .5 Be responsible for required excavation, backfilling, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant and owner. Cut carefully to minimize necessity for repairs to existing work or site conditions. Do not cut beams, columns, or trusses.
 - .1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
 - .2 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
 - .3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
- .6 Adjust pipes, ducts, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.
 - .1 Make offsets, transitions, and changes in direction of pipes, ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - .2 Furnish and install traps, air vents, sanitary vents, pull boxes, etc, as required to effect these offsets, transitions, and changes in direction.
- .7 Slots and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.10 CONTRACT BREAKDOWN

- .1 Provide breakdown of contract exclusive of HST to acceptance of consultants prior to first draw submission.
- .2 Provide labour and material cost for each item.
- .3 Breakdown shall indicate total contract amount.
- .4 Contract breakdown shall be as follows as a minimum.
 - .1 Mobilization and shop drawings (max. \$2000.00)
 - .2 Inside buried plumbing and drainage
 - .3 Above grade rough-in plumbing and drainage
 - .4 Roof drainage system
 - .5 Plumbing Fixtures
 - .6 Sprinkler system and heads
 - .7 Boilers
 - .8 Air Terminal Units
 - .9 Water Softener System
 - .10 Freestanding Runtal Radiation
 - .11 Circulation pumps
 - .12 Heating piping
 - .13 Piping Insulation
 - .14 Ductwork
 - .15 Duct Insulation
 - .16 Grilles & Diffusers
 - .17 Fire Stopping
 - .18 Fans & Equipment
 - .19 Building Automation Systems
 - .20 Testing Adjusting and Balancing
 - .21 HVAC system commissioning
 - .22 Mechanical contractor closeout requirements (min. of 3% but not less than \$5,000.00)
- .5 Progress claims, when submitted are to be itemized against each item of the contract breakdown, this shall be done in table form showing contract amount, work complete to date, previous draw, amount this draw and balance.

1.11 COMMISSIONING CONTRACT BREAKDOWN

- .1 This contractor shall work with the HVAC system commissioning contractor as specified elsewhere. The following commissioning breakdown shall be indicated on the contract breakdown draw.

1.12 SHOP DRAWINGS AND PRODUCT DATA

- .1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 30 days after award of Contract.
- .2 Provide a complete list of shop drawings to be submitted prior to first submission.
- .3 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 drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.

- .4 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.
- .5 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.
- .6 Submit all shop drawings for the project as a package. Partial submittals will not be accepted.
- .7 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or his Engineer shall not supersede Contract Documents.
- .8 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- .9 Check work described by catalog data with Contract Documents for deviations and errors.
- .10 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. e.g. access door swing spaces.
- .11 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify as to current model production.
 - .5 Certification of compliance to applicable codes.
- .12 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.
- .13 Shop drawings shall be submitted by an electronic submission as per the following directions.
 - .1 Electronic Submissions:
 - .1 Electronically submitted shop drawings shall be prepared as follows:
 - .2 Use latest software to generate PDF files of submission sheets.
 - .3 Scanned legible PDF sheets are acceptable. Image files are not acceptable.
 - .4 PDF format shall be of sufficient resolution to clearly show the finest detail.
 - .5 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".
 - .6 Submissions shall contain multiple files according to section names as they appear in Specification.
 - .7 File names shall include consultant project number and description of shop drawing section submitted.

- .8 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.
- .9 On the shop drawing use an “electronic mark” to indicate what is being provided.
- .10 Each file shall bear an electronic representation of the “company stamp” of the contractor. If not stamped the file submission will not be reviewed.
- .2 Email submissions shall include subject line to clearly identify the consultants project number and the description of the shop drawings submitted.
- .3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.
- .4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.
- .5 On site provide one copy of the “reviewed” shop drawings in a binder as noted above.
- .6 Contractor to print 3 copies of “reviewed” shop drawings and compile into maintenance manuals.

1.13 OPERATION AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual as in submittals’ requirements.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection.
- .3 Operation data to include:
 - .1 Control schematics for each system including environmental controls.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .8 Spare parts equipment list.
 - .9 Manufacturers standard or extended warranty information.
- .4 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
 - .4 Testing, adjusting and balancing reports as specified in Testing, Adjusting and Balancing Section.

- .6 Miscellaneous data to include:
 - .1 Letter of contractor's warranty and guarantee.
 - .2 Index sheet.
 - .3 Tabbed format for each section.
 - .4 Manufacturers approved shop drawings.
 - .5 Spare parts list and source.
 - .6 List of Manufacturers and suppliers address for each piece of equipment.
- .7 Approvals:
 - .1 Submit 1 copy of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless so directed by Consultant.
 - .2 Make changes as required and re-submit as directed by Consultant.
 - .3 Provide two (2) copies of final operation maintenance manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one USB stick is to be provided containing both the approved manual and Record drawings.
- .8 Additional data:
 - .1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.14 RECORD DRAWINGS

- .1 Site records:
 - .1 Contractor shall provide 2 sets of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducible, revising reproducible's to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 Record drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of record drawings.
- .3 Identify each drawing in lower right-hand corner in letters at least 3 mm (1/8") high as follows: -
"RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .1 TAB to be performed using record drawings.
 - .1 Submit hard copy to Consultant for approval. When returned, make corrections as directed.
 - .2 Once approved, submit completed reproducible paper record drawings as well as a scanned pdf file copy on USB stick with Operating and Maintenance Manuals.

1.15 WARRANTIES

- .1 In addition to guarantee specified in General Conditions, guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

- .2 Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation & Maintenance Manual.
- .3 If mechanical sub-contractor with offices located more than 80 km (50 miles) from Project site is used, provide service/warranty work agreement for warranty period with local mechanical sub-contractor approved by Consultant. Include copy of service/warranty agreement in warranty section of Operation & Maintenance Manual.
- .4 Warranty period shall start from date of substantial completion.

1.16 SUBSTANTIAL PERFORMANCE

- .1 Complete the following to the satisfaction of the consultant prior to request for submission of substantial performance.
 - .1 Record Drawings.
 - .2 Maintenance Manuals
 - .3 System Start up
 - .4 TAB Reports
 - .5 HVAC System Commissioning
 - .6 Instructions to Owners
 - .7 Final Certificates (required prior to consultant's release of conformance letter).
 - .1 Potable Water Test (Refer to domestic water piping Specification)
 - .2 Mandatory TSSA Gas Pressure Test (CSA B149.1)
 - .3 Backflow Test Certificate (for all testable devices)

1.17 OCCUPANCY REQUIREMENTS

- .1 The contractor shall provide the following documentation to the consultant prior to receiving occupancy. Failure to provide the proper documentation will result in the occupancy not being granted. List of required documentation:
 - .1 Final Certificates (required prior to consultant's release of conformance letter).
 - .1 Potable Water Test (Refer to domestic water piping Specifications)
 - .2 Mandatory TSSA Gas Pressure Test (CSA B149.1)
 - .3 Backflow Test Certificate (for all testable devices)

1.18 REVISION TO CONTRACT

- .1 Provide the following:
 - .1 Itemized list of material with associated costs.
 - .2 Labour rate and itemized list of labour for each item.
 - .3 Copy of manufacturers/suppliers invoice if requested.

1.19 DELIVERY STORAGE & HANDLING

- .1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials.
- .2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

1.20 TSSA INSPECTION

- .1 Prior to final completion of the project, this contractor shall make application, arrange, and pay for a TSSA inspection of all piping systems and equipment installations, including, but not limited to medical gasses, refrigeration, fuel piping, compressed air, heating plant, cooling plant, and associated equipment installed under the contract.
- .2 Provide a copy of the TSSA report in the maintenance manuals for each system.

1.21 ENERGY EFFICIENCY

- .1 The mechanical systems of this building must achieve the energy efficiency levels by conforming to ANSI/ASHRAE/IESNA 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” and Chapter 2 of Division 3 of SB-10 prescriptive method from the Ontario Building Code.
- .2 All equipment, products, and installations must conform to the Codes and Standards.

END OF SECTION

Part 1 GENERAL

1.1 TESTS

- .1 Give 48 hours written notice of date for tests.
- .2 Insulate or conceal work only after testing and approval by Consultant.
- .3 Conduct tests in presence of Consultant.
- .4 Bear costs including retesting and making good.
- .5 Piping:
 - .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
 - .2 Hydraulically test steam and hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
 - .3 Test natural gas systems to CSA-B149.1-00, TSSA requirements and requirements of authorities having jurisdiction.
 - .4 Test fuel oil systems to CSA B139 1976, CSA B139S1-1982 and authorities having jurisdiction.
 - .5 Test drainage, waste and vent piping to Ontario Building Code and authorities having jurisdiction.
 - .6 Test domestic hot, cold and recirculation water piping at 1-1/2 times system operating pressure or minimum 860 kPa (124.8 psi), whichever is greater.
 - .7 Test fire systems in accordance with authorities having jurisdiction and as specified elsewhere.
- .6 Equipment: test as specified in relevant sections.
- .7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.2 SYSTEM START UP

- .1 Provide adjusting testing and startup of all equipment prior to testing and balancing (TAB) specified elsewhere.
- .2 Provide consultant with written notice verifying all equipment operation and installation is complete.
- .3 Startup shall be in presence of the following: owner or representative, contractor, building automation systems (BAS) contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.
- .4 Simulate system start up and shut down and verify operation of each piece of equipment.
- .5 Arrange with all parties and provide 72 hours' notice for startup procedure.
- .6 Arrange with building automation systems contractor to sequence all components and ensure system operation.

1.3 COMMISSIONING

- .1 Co-ordinate and direct each step of the commissioning process, and recommend acceptance or non-acceptance to the Owner/Owner's Representative.
- .2 Prepare, in writing, documentation of any deficiencies discovered during the commissioning process. Submit to consultant and Owner/Owner's Representative.

- .3 The Commissioning Process is detailed in ASHRAE Guideline 1-1996 HVAC Commissioning Process. The commissioning plan may be modified to reflect the actual construction schedule and design.
- .4 Provide a pre-functional test of all HVAC mechanical system and sub-system elements, including control devices, shall be checked for the following:
 - .1 Verify that each element has been properly installed, properly identified, and that all connections (including electrical) have been made correctly.
 - .2 Verify that each element has been checked for proper lubrication, drive rotation, belt tension, control sequence, flow direction, or other conditions which may cause damage or reduce system performance.
 - .3 Verify that tests, meter readings, and specific mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.
 - .4 Controls calibration to be completed in accordance with the specification.
 - .5 The TAB shall be done in accordance with the specifications.
- .5 A functional performance testing shall be done during two separate periods – one during the cooling season and one during the heating season. The first (cooling) testing period shall occur as soon after completion of installation as practical. The heating testing period shall occur as soon as weather conditions make it practical to test warm-up, zone heating and economizer functions. These tests ensure that all equipment and systems operate in accordance with design intent. The tests are dynamic tests and test the systems through all possible modes of operation.
- .6 Reports:
 - .1 The contractor shall be responsible for recording, documenting, and maintaining detailed inspection and testing data on the test documentation reports. The data record shall be comprehensive and concise.
 - .2 All data must be recorded as soon as possible during the course of the inspection and testing.
 - .3 All documentation shall have the date, time, and names of persons participating in the inspection and testing.
 - .4 All test instruments shall be documented for valid calibration.
 - .5 The recording work sheets, inspection check lists, and Performance Testing plans must all be approved by the Engineer and the owner's representative prior to the start of the testing.
 - .6 Include all commissioning documentation in the maintenance manuals.
- .7 Mechanical System Execution:
 - .1 Operate equipment and systems shall be tested in the presence of the owner's representative and the consultant to demonstrate compliance with specified requirements. To minimize the time of Commissioning Team members, testing shall be done in four seasonal single blocks of time insofar as possible.
 - .2 Notify the consultant, in writing, fourteen (14) days prior to tests scheduled under requirements of this Section.
 - .3 Testing shall be conducted under specified design operating conditions as recommended or approved by the consultant.
 - .4 All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by any inter-ties of other major systems.
 - .5 All special testing materials and equipment shall be provided by the appropriate contractor.
 - .6 Provide three copies of all test reports and records to the consultant.

.8 The verification testing procedures shall address all operating characteristics of all mechanical equipment and systems, including:

- .1 Equipment Checklist
- .2 System Checklist
- .3 Boiler(s)
- .4 Chiller(s)
- .5 Rooftop Heating/Cooling Unit(s)
- .6 Humidifiers
- .7 Fan Coil Units
- .8 Air Handling Units
- .9 Exhaust Fans
- .10 Heat Recovery Unit(s)
- .11 Air Handling Unit(s)
- .12 Pumps
- .13 Heat Recovery Unit(s)
- .14 Pumps
- .15 Controllers
- .16 Valves
- .17 Dampers

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTION

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Mechanical contractor to schedule and coordinate the demonstration all on the same day, starting at a pre-approved time and continuing consequently until complete.
- .3 Where specified elsewhere in Mechanical Division, qualified manufacturers' representatives who are knowledgeable about the project to provide demonstrations and instructions.
- .4 Use operation and maintenance manual, record drawings, audio visual aids, etc. as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.5 TRIAL USAGE

- .1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 HVAC
 - .2 Exhaust air
 - .3 Domestic water
 - .4 Plumbing, and drainage.

1.6 DEFICIENCIES

- .1 During construction, the consultants will monitor construction and provide written reports of work progress, discussions, and instruction to correct work.
- .2 Instruction to correct work shall be done within the work period before the next review.
- .3 The contractor shall not conceal any work until inspected.
- .4 The contractor shall expedite 100% complete rough-in work and have inspected prior to concealing services and equipment especially above ceiling.
- .5 Upon completion of the project the consultant will do a final review. Upon receiving the final inspection report, the contractor must correct and sign back the inspection report indicating the deficiencies are completed. A re-inspection will only be done once consultant receives this in writing.

1.7 EQUIPMENT INSTALLATIONS

- .1 Unions or flanges: provide for ease of maintenance and disassembly.
- .2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.
- .3 Equipment drains: pipe to floor drains.
- .4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

1.8 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install mechanical equipment at following heights unless indicated otherwise.

.1	Standard water closets	350 (14") to top of bowl
.2	Barrier-free water closets	400 (16") to top of bowl
.3	Barrier-free water closets	450 (18") to top of seat lid
.4	Wall hung lavatory	787 (31") to rim
.5	Barrier-free wall hung lavatory	840 (33") max to top of rim
		737 (29") min underside of rim front
.6	Urinals (Senior Elementary)	475 (19") to rim
.7	Urinals (Junior Elementary)	425 (17") to rim
.8	Hose bibbs	+/- 600 (24")
.9	Barrier-free drinking fountains	Not more than 915 mm (36") to rim
		Not less than 735 (29") under unit
.10	Hydronic heating elements	200 mm (8") to bottom of cabinet
.11	Backflow preventors	900 – 1200 (3'- 4') to centerline of unit
.12	Thermostats: Barrier Free (operable)	1200 mm (47.25")
.13	Non-Barrier Free	1500 mm (59")

Also follow direction of architectural drawings and where discrepancies occur clarify prior to rough-in.

1.9 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation by other divisions.

1.10 PROTECTION OF OPENINGS

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

1.11 ELECTRICAL

- .1 Electrical work to conform to Electrical Division including the following:
 - .1 Supplier and installer responsibility and related mechanical responsibility is indicated in Equipment Schedule on mechanical and/or electrical drawings
 - .2 Control wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Division. Refer to Electrical Division for quality of materials and workmanship.
 - .3 Electrically operated equipment shall be C.S.A. approved label. Special Inspection Label of Provincial Authority having jurisdiction will be accepted in lieu of C.S.A. approval. Each motor shall have an approved starter. Starter will be supplied and installed by Electrical Division unless otherwise indicated.

1.12 MOTORS

- .1 Provide high efficiency motors for mechanical equipment as specified.
- .2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Consultant for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .3 Motors under 373 W, (1/2 hp): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, voltage as indicated.
- .4 Motors 373 W, (1/2 hp) and larger: EEMAC Class B, Totally Enclosed Fan Cooled (TEFC) induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, voltage as indicated.

1.13 BELT DRIVES

- .1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.
- .3 For motors under 7.5 kW 10 hp: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 For motors 7.5 kW 10 hp and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Motor slide rail adjustment plates to allow for centre line adjustment.
- .7 Provide sheave changes as required for final air balancing for all belt driven motors.

1.14 GUARDS

- .1 Provide guards for unprotected devices.
- .2 Guards for belt drives:
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm (18 gauge) thick sheet metal tops and bottoms.

- .3 40 mm (1 1/2") diameter holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
- .5 Guard for flexible coupling:
 - .1 "U" shaped, minimum 1.6 mm (16 gauge) thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.
- .6 Unprotected fan inlets or outlets:
 - .1 Wire or expanded metal screen, galvanized, 20 mm (3/4") mesh.
 - .2 Net free area of guard: not less than 80% of fan openings.
 - .3 Securely fasten in place.
 - .4 Removable for servicing.
- .7 Duct Openings in Floor / Roof
 - .1 Provide reinforced expanded mesh grating, style 3 (3 lbs/sq.ft.) cover on accessible unprotected duct openings over 300 mm (12") wide and as indicated. This includes all ductwork terminating in air handling units and plenums.
 - .2 Securely Fasten in place.
 - .3 Removable for servicing.

1.15 PIPING AND EQUIPMENT SUPPORTS

- .1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Mechanical Division.
- .2 Piping and equipment support not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings.
- .3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around.
- .4 Concrete specified elsewhere.
- .5 Where housekeeping pads incorporate existing pads provide 10 mm dowels into existing pads. New pad height shall match existing.

1.16 ROOF MOUNTED PIPE SUPPORT

- .1 Provide zero penetration pipe support on roof where indicated.
- .2 Base shall be made of high-density polypropylene with UV protection. Maximum loading shall be 50 lb/sq.ft.
- .3 Frames shall be galvanized. All fastenings, rods, nuts, washers, hangers, etc. shall be stainless steel.
- .4 Provide shop drawings as specified. Install to manufacturers recommendations.
- .5 Acceptable material:
 - Portable pipe hanger
 - Bigfoot systems
 - Miro rooftop supports

Trikon Systems

1.17 SLEEVES

- .1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated. Grout sleeves in place.
- .2 Schedule 40 steel pipe.
- .3 Sleeves with annular fin continuously welded at midpoint:
 - .1 Through foundation walls.
 - .2 Where sleeve extends above finished floor.
 - .3 Through fire rated walls and floors.
- .4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.
- .6 Fill voids around pipes:
 - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
 - .2 Where sleeves pass through walls or floors, provide space for firestopping.
 - .3 Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
 - .4 Ensure no contact between copper tube or pipe and ferrous sleeve.
 - .5 Fill future-use sleeves with lime plaster or other easily removable filler.
 - .6 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.
- .7 Provide minimum 20 gauge duct sleeves where ducts pass through masonry concrete or fire rated assemblies. Maintain minimum 25 mm clearance all around or to the requirements of the authority having jurisdiction. Seal at wall as indicated.

1.18 FIRE STOPPING

- .1 This contractor shall work with all other contractors on the project in providing one common method of fire stopping all penetrations made in fire rated assemblies.
- .2 Approved fire stopping and smoke seal material in all fire separations and fire ratings within annular space between pipes, ducts, insulation and adjacent fire separation and/or fire rating.
- .3 Do not use cementious or rigid seals around penetrations for pipe, ductwork, or other mechanical items.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barrier at fire separation.
- .5 Provide materials and systems capable of maintaining effective barrier against flame, smoke and gases. Ensure continuity and integrity of fire separation.
- .6 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.
- .7 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide "fire wrap" blanket around services penetrating fire walls. Extent of blanket must correspond to ULC recommendations.

- .8 The fire stopping materials are not to shrink, slump or sag and to be free of asbestos, halogens and volatile solvents.
- .9 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.
- .10 Fire stop materials are to be capable of receiving finish materials in those areas which are exposed and scheduled to receive finishes. Exposed surfaces are to be acceptable to consultant prior to application of finish.
- .11 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.
- .12 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.
- .13 Submit product literature and installation material on fire stopping in shop drawing and product data manual. Maintain copies of these on site for viewing by installers and consultant.
- .14 Manufacturer of product shall provide certification of installation. Submit letter to the consultant.
- .15 Acceptable Manufacturer:
Minnesota Mining and Manufacturing
- .16 Acceptable Alternate Manufacturers to approval of local authority:
Fryslieve Industries Inc.
General Electric
Pensil Firestop Systems
International Protective Coatings Corp.
Rectorseal Corporation (Metacaulk)
Proset Systems
3M
AD Systems Hilti
- .17 Ensure firestop manufacturer representative performs on site inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.19 ESCUTCHEONS

- .1 On pipes and ductwork passing through walls, partitions, floors and ceilings in exposed finished areas and on water and drain pipes inside millwork and cabinets.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.

1.20 PAINTING

- .1 Refer to Section Interior Painting and specified elsewhere.
- .2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .3 Apply two coats of paint to exposed piping service in mechanical room, base colour as specified in Mechanical Identification Section.
- .4 Prime and touch up marred finished paintwork to match original.
- .5 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.21 SPARE PARTS

- .1 Furnish spare parts in accordance with general requirements and as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One head gasket set for each heat exchanger.
 - .4 One glass for each gauge glass.
 - .5 One set of belts for each type or each size of machinery.
 - .6 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide list of equipment in maintenance manuals indicating corresponding spare parts required. List of spare parts to be signed off by receiving personnel.

1.22 SPECIAL TOOLS

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Maintenance Materials Special Tools and Spare Parts.

1.23 ACCESS DOORS

- .1 Provide access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- .2 Flush mounted 600 x 600 mm (24" x 24") for body entry and 300 x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- .3 Material:
 - .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
 - .2 Remaining areas: use prime coated steel.
 - .3 Fire rated areas: provide ULC listed access doors
- .4 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.
- .5 Acceptable materials:
 - Le Hage
 - Zurn
 - Acudor
 - Nailor Industries Inc.

1.24 DIELECTRIC COUPLINGS

- .1 General:
 - .1 To be compatible with and to suit pressure rating of piping system.
 - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes NPS 50 mm (2") and under: isolating unions.
- .3 Pipes NPS 65 mm (2 1/2") and over: isolating flanges.

1.25 DRAIN VALVES

- .1 Locate at low points and at section isolating valves unless otherwise specified.
- .2 Minimum NPS 20 mm (3/4") unless otherwise specified: bronze, with hose end male thread and complete with cap and chain.
- .3 Drain valves on potable water systems shall be complete with vacuum breaker.

1.26 REPAIRS, CUTTING, AND RESTORATION

- .1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
- .2 Each Section of this Division shall bear expense of cutting, patching, and repairing to install their work and/or replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
- .3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
- .4 All patching, painting and making good of the existing walls, floors, ceilings, partitions and roof will be at the expense of this Contractor, but performed by the Contractor specializing in the type of work involved unless otherwise noted.

1.27 EXISTING SYSTEMS

- .1 Connections into existing systems to be made at time approved by Consultant. Request written approval of time when connections can be made.
- .2 Be responsible for damage to existing plant by this work.

1.28 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units prior to turn over to owner.
- .2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

1.29 DISCONNECTION AND REMOVAL

- .1 Disconnect and/or remove equipment, piping, ductwork, etc. as indicated.
- .2 Cap and conceal all redundant and obsolete connections.
- .3 Provide a list of equipment to be removed to the owner, for his acceptance of same.
- .4 Remove all equipment from site, which the owner does not retain.
- .5 Store equipment to be retained by owner on site where directed by consultant.

1.30 OWNER SUPPLIED EQUIPMENT

- .1 Connect to equipment supplied by the owner and make operable.

1.31 VIDEO RECORDING OF NEW UNDERGROUND SERVICES

- .1 Prior to final acceptance of the new underground plumbing system and prior to pouring the floor this contractor shall retain a qualified contractor to video tape the new, sanitary and storm drainage piping and branch piping. Transfer all videotape information to DVD.

- .2 This contractor shall flush the new storm and sanitary system to remove all debris prior to final video taping of systems.
- .3 Provide 3 copies of DVD.
- .4 Identify video routing on Record drawings.

1.32 EXCAVATING AND BACKFILLING

- .1 Provide all excavating and backfilling inside and outside the building for plumbing pipes, drains and equipment. All backfilling shall be new clean granular 'A' fill brought in specifically for the purpose of backfilling to the underside of floor slab. All backfilling shall be compacted at intervals not more than 150 mm (6") layer to the satisfaction of the Consultant.
- .2 Provide excavating and backfilling outside the building with granular A brought in specifically for backfilling to a minimum of 450 mm (18") over the pipe. Backfilling outside building over and above the 450 mm (18") backfill as previously specified herein shall be by the Mechanical Contractor as specified under Division 2. Where backfilling outside the building is not specified under Division 2 the mechanical contractor shall provide new clean granular 'A' fill to grade level.
- .3 Bottoms of trenches shall be excavated so that the pipe will be supported on a 150 mm (6") compacted bed of clean granular 'A' fill. Provide all necessary pumping to maintain excavation free of water.
- .4 Should water be encountered during excavation, the mechanical contractor shall provide all labour and material, including all equipment required for dewatering the excavation. After the water has been removed, this Contractor shall install a 300 mm (12") base of compacted 50 mm (2") clear stone covered with filter cloth before installing backfill as detailed and/or as specified.
- .5 Be responsible for all weather protection required to install piping and/or equipment to the satisfaction of the Consultant.

Be responsible for providing all clear stone or granular 'A' material suitable for application to replace existing soil not suitable for backfilling above the 450 mm (18") bedding material.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 American Society for Testing and Materials
 - .1 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc- Coated Welded and Seamless.
 - .2 ASTM A105/A105M, Specification for Carbon Steel Forgings for Piping Applications.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate for each item as applicable:
 - .1 Manufacturer, model number, line contents, pressure and temperature rating.
 - .2 Movement handled; axial, lateral, angular and the amounts of each.
 - .3 Nominal size and dimensions including details of construction and assembly.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit maintenance data in accordance with general requirements.
- .2 Data to include:
 - .1 Servicing requirements, including any special requirements, stuffing box packing, lubrication and recommended procedures.

Part 2 PRODUCTS

2.1 SLIP TYPE EXPANSION JOINTS

- .1 Application: for axial pipe movement, as indicated.
- .2 Repacking: under full line pressure.
- .3 Body and packing housings: Class 150, 1Mpa carbon steel pipe to ASTM A53/A53M, Grade B. Wall thickness to match pipe and with raised face slip-on flanges to match pipe.
- .4 Slip or traverse sleeves: carbon steel pipe to ASTM A53/A53M, Grade B, [hard chrome plated].
- .5 Anchor base: construction steel, welded to body.
- .6 Guides (internal and external): embody into packing housing with concentric alignment of slip or traverse sleeve with packing housing.
- .7 Extension limit stop: stainless steel, to prevent over-extension with accessible and removable pins.
- .8 Packing rings: 6 minimum, teflon or graphite impregnated asbestos.
- .9 Thermal plastic packing: teflon or graphite impregnated asbestos slug supplied loose.
- .10 Lubricating fittings: pet cocks with grease nipple.
- .11 Plunger body and plunger:
 - .1 Plunger body: heavy wall carbon steel welded to body.

- .2 Plunger: carbon steel with hex head for use with socket wrench.
- .12 Lubricant: to manufacturer's recommendations.
- .13 Lubricant gun: complete with hose assembly.
- .14 Drip connection: 20 MPa (2900 psi) forged steel to ASTM A105. Include half coupling with drain plug.

2.2 BELLOWS TYPE EXPANSION JOINTS

- .1 For axial, lateral or angular movements, as indicated.
- .2 Maximum operating pressure: 1034 kPa (150 psi).
- .3 Maximum operating temperature: 200°C (392°F).
- .4 Type A: free flexing, factory tested to 1½ times maximum working pressure. Furnish test certificates.
- .5 Type B: externally pressurized, constant volume, pressure balanced, designed to eliminate pressure thrust, factory tested to 1.5 times maximum working pressure. Furnish test certificates.
- .6 Bellows:
 - .1 Multiple bellows, hydraulically formed, two ply, austenitic stainless steel for specified fluid, pressure and temperature, water treatment and pipeline cleaning procedures.
- .7 Reinforcing or control rings:
 - .1 2 piece nickel iron.
- .8 Ends:
 - .1 Slip-on flanges to match pipe.
- .9 Liner:
 - .1 Austenitic stainless steel in direction of flow.
- .10 Shroud:
 - .1 Carbon steel, painted.

2.3 FLEXIBLE CONNECTION

- .1 Application: to suit motion.
- .2 Minimum length in accordance with manufacturer's recommendations to suit offset.
- .3 Inner hose: stainless steel corrugated.
- .4 Braided wire mesh stainless steel outer jacket.
- .5 Diameter and type of end connection: as indicated.
- .6 Operating conditions:
 - .1 Working pressure: 1034 kPa (150 psi).
 - .2 Working temperature: 250°C (482°F).
 - .3 To match system requirements.

2.4 ANCHORS AND GUIDES

- .1 Anchors:
 - .1 Provide as indicated.

- .2 Alignment guides:
 - .1 Provide as indicated.
 - .2 To accommodate specified thickness of insulation.
 - .3 Vapour barriers, jackets to remain uninterrupted.

2.5 EXPANSION COMPENSATORS (EXP)

- .1 Packless guided construction complete with multi ply stainless steel bellows.
- .2 Operating temperature (750°F).
- .3 Provide model H3 for steel pipe and model HB for copper pipe.
- .4 Material to match piping system.
Acceptable materials: Senior Flexonics

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install expansion joints with cold setting, as indicated as instructed by Consultant. Make record of cold settings.
- .2 Install expansion joints and flexible connections in accordance with manufacturer's instructions.
- .3 Install pipe anchors and guides as indicated. Anchors to withstand 150% of axial thrust.

3.2 APPLICATION

- .1 Provide on all vibration isolated equipment.
- .2 Provide where requested by equipment manufacturers installation manuals.
- .3 Install in accordance with manufacturer's recommendations.
- .4 Provide expansion compensators (exp.) on radiation heating element exceeding 3.6 M (12' – 0") in length. Provide one expansion compensators on each length of return piping in cabinet.

3.3 THERMAL EXPANSION

- .1 Provide in long runs of heating mains exceeding 100 ft. in length.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/ASME B40.100, Pressure Gauges and Gauge Attachments.
- .3 CAN/CGSB-14.4, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.
- .4 CAN/CGSB-14.5, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with general requirements.
- .2 Submit manufacturer's product data for following items:
 - .1 Thermometers.
 - .2 Pressure gauges.
 - .3 Stop clocks.
 - .4 Syphons.
 - .5 Wells.

Part 2 PRODUCTS

2.1 GENERAL

- .1 Design point to be at mid point of scale or range.
- .2 Ranges: suitable for application.

2.2 DIRECT READING THERMOMETERS

- .1 Industrial, variable angle type, liquid filled, 225 mm (9") scale length: to CAN/CGSB 14.4.
 - .1 Acceptable materials:
 - Trerice
 - Winters
 - Wiess

2.3 THERMOMETER WELLS

- .1 Copper pipe: copper or bronze.
- .2 Steel pipe: brass or stainless steel.

2.4 PRESSURE GAUGES

- .1 115 mm (4 1/2"), dial type: to ANSI/ASME B40.100, Grade 2A, stainless steel phosphor bronze bourdon tube having 0.5% accuracy full scale unless otherwise specified.
 - .1 Acceptable materials:
 - Winters
 - Trerice
 - Wiess

- .2 Provide:
 - .1 Siphon for steam service.
 - .2 Snubber for pulsating operation.
 - .3 Diaphragm assembly for corrosive service.
 - .4 Gasketed pressure relief back with solid front.
 - .5 Bronze stop cock.

Part 3 EXECUTION

3.1 GENERAL

- .1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.
- .2 Install between equipment and first fitting or valve.

3.2 THERMOMETERS

- .1 Install in wells on all piping. Provide heat conductive material inside well.
- .2 Install in locations as indicated and on inlet and outlet of:
 - .1 Water heating and cooling coils.
 - .2 Water Boilers
 - .3 DHW tanks.
 - .4 Boiler Room HWS and HWR.
 - .5 In other locations indicated.
- .3 Install wells as indicated only for balancing purposes.
- .4 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

- .1 Install in following locations:
 - .1 Suction and discharge of pumps.
 - .2 Upstream and downstream of PRV's.
 - .3 Upstream and downstream of control valves.
 - .4 Inlet and outlet of coils.
 - .5 Outlet of boilers.
 - .6 Inlet and outlet of water meters.
 - .7 Inlet and outlet of backflow prevention.
 - .8 In other locations as indicated.
- .2 Install gauge cocks for balancing purposes, elsewhere as indicated.
- .3 Use extensions where pressure gauges are installed through insulation.

3.4 NAMEPLATES

- .1 Install engraved lamacoid nameplates as specified in elsewhere identifying medium.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping, (SI Edition).
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.

1.2 DESIGN REQUIREMENTS

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP- 58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with general requirements.
- .2 Submit shop drawings and product data for following items:
 - .1 All bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.

1.4 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

1.5 PRODUCTS

1.6 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS- SP-58.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

1.7 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: to ANSI & ULC requirements
 - .2 Ensure steel hangers in contact with copper piping are copper plated.
- .2 Upper attachment structural: Suspension from upper flange of I-Beam or joist.
 - .1 Cold piping NPS 50 mm (2") maximum: Ductile iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
 - .1 Rod: 10 mm (3/8") UL listed
 - .2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed & FM approved.
- .3 Upper attachment structural: Suspension from upper flange of I-Beam.
 - .1 Cold piping NPS 50 mm (2") maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.
 - .2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron top-of- beam jaw-clamp with hooked rod, spring washer, plain washer and nuts.
- .4 Upper attachment to concrete.
 - .1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm (1/4") minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate ULC listed. Note: Rapidex and Siporex are not considered concrete. Should one of these systems be encountered, piping/ductwork and/or equipment shall be supported from adjacent walls or from supplemental steel provided by this contractor attached to the adjacent walls/structure.
- .5 Shop and field-fabricated assemblies.
 - .1 Trapeze hanger assemblies: ASME B31.1.
 - .2 Steel brackets: ASME B31.1.
- .6 Hanger rods: threaded rod material to MSS SP-58.
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .7 Pipe attachments: material to MSS SP-58.
 - .1 Attachments for steel piping: carbon steel.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for all piping.
 - .4 Oversize pipe hangers and supports to accommodate thermal insulation. Provide 1.5 mm (16 gauge) saddles.
- .8 Adjustable clevis: material to MSS SP-58 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.

1.8 RISER CLAMPS

- .1 Steel or cast iron pipe: black carbon steel to MSS-SP-58, type 42, UL listed.

- .2 Copper pipe: carbon steel copper plated to MSS-SP-58, type 42.
- .3 Bolts: to ASTM A 307.
- .4 Nuts: to ASTM A 563.

1.9 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m² (13.12 lbs/ft²) density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m (10') span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm (12") long, with edges turned up, welded-in centre plate for pipe sizes NPS 300 mm (12") and over, carbon steel to comply with MSS SP- 58.

1.10 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of miscellaneous metals, specified herein. Submit calculations with shop drawings.

1.11 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

1.12 ROOF MOUNTED EQUIPMENT

- .1 Install as per manufacturers' instructions on roof curbs provided by manufacturer as indicated.
- .2 Provide all necessary continuous pressure treated wood blocking and 24 gauge metal liner on all exposed wood as required to install roof curb level.

1.13 OTHER EQUIPMENT SUPPORTS

- .1 From structural grade steel meeting requirements of structural steel section specified herein.
- .2 Submit structural calculations with shop drawings.

1.14 MANUFACTURER

- .1 Acceptable materials:
 - Grinnell
 - Crane
 - Anvil
 - Unistrut

Part 2 EXECUTION

2.1 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.

- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to be to industry standards.
 - .3 Steel pipes: Install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: Install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or

2.2 HANGER SPACING

- .1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 15 mm (1/2"): every 1.8 m (6').
- .4 Copper piping: up to NPS 15 mm (1/2"): every 1.5 m (5').
- .5 Within 300 mm (12") of each elbow and:

Maximum Pipe Size (NPS)	Maximum Spacing Steel	Maximum Spacing Copper
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	
200 mm (8")	5.7 m (19')	
250 mm (10")	6.6 m (22')	
300 mm (12")	6.9 m (23')	

- .6 Pipework greater than NPS 300 mm (12"): to MSS SP-69.

2.3 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.
- .4 Do "NOT" support piping, ductwork and equipment from roof deck, on bottom chord of floor and/or roof joist and/or from OWSJ bridging. Provide structural member between joist.

2.4 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4mm (5/32") from vertical.

- .2 Where horizontal pipe movement is less than 15 mm (1/2"), offset pipe hanger and support so that rod hanger is vertical in the hot position.

2.5 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 GENERAL

1.1 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Provide separate shop drawings for each isolated system complete with performance and product data.

Part 2 PRODUCTS

2.1 GENERAL

- .1 Size and shape of bases type and performance of vibration isolation to be as indicated.
- .2 To be of the same manufacturer for all isolation.
- .3 Acceptable materials:
Korfund
Vibro-Acoustics
Vibron

2.2 ELASTOMERIC PADS

- .1 Type EP1 - neoprene waffle or ribbed; 10 mm (3/8") minimum thick; 50 durometer; maximum loading 350 kPa (50.8 psi).
- .2 Type EP2 - rubber waffle or ribbed; 10 mm (3/8") minimum thick; 30 durometer natural rubber; maximum loading 415 kPa (60.2 psi).
- .3 Type EP3 - neoprene-steel-neoprene; 10 mm (3/8") minimum thick neoprene bonded to
- .4 1.5 mm (16 gauge) steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa (50.8 psi).
- .5 Type EP4 - rubber-steel-rubber; 10 mm (3/8") minimum thick rubber bonded to 1.5 mm (16 gauge) steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa (60.2 psi).
- .6 Acceptable materials:
Korfund
IAC Acoustics
Vibro-Acoustics
Vibron

2.3 ELASTOMERIC MOUNTS

- .1 Type M1 - colour coded; neoprene in shear; maximum durometer of [60]; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.
- .2 Acceptable materials:
Vibro-Acoustics
Korfund
IAC Acoustics, Vibron

2.4 SPRINGS

- .1 Design stable springs so that ratio of lateral to axial stiffness is equal to or greater than times the ratio of static deflection to working height. Select for 50% travel beyond rated load. Units to be complete with levelling devices.
- .2 Ratio of height when loaded to diameter of spring to be between 0.8 to 1.0.
- .3 Cadmium plate for all installations.
- .4 Colour code springs.

2.5 HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.
- .2 Type H1 - neoprene - in-shear, molded with rod isolation bushing, which passes through hanger box.
- .3 Type H2 - stable spring, elastomeric washer, cup with molded isolation bushing which passes through hanger box.
- .4 Type H3 - stable spring, elastomeric element with pre-compression washer and nut [with deflection indicator].
- .5 Performance as indicated.
- .6 Acceptable materials:
 - Vibron
 - IAC Acoustics
 - Korfund
 - Vibro-Acoustics

2.6 ROOF CURB ISOLATION RAIL

- .1 General: complete factory assembled without need for sub-base.
- .2 Lower member: continuous extruded aluminum channel.
- .3 Upper member: continuous extruded aluminum channel to provide continuous support for equipment, complete with all-directional neoprene rubber bushings 6 mm (1/4") thick to resist wind [and seismic] forces.
- .4 Springs: steel, adjustable, removable, selected for 25 mm (1") maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.
- .5 High frequency isolation: 6 mm (1/4") minimum thick [continuous gasket on top and bottom of complete assembly] [or] [pads on top and bottom of each spring]. Material: closed cell neoprene.
- .6 Weatherproofing: continuous flexible counterflashing to curb and providing access to springs. Material: [aluminum] [neoprene].
- .7 Hardware: cadmium plated or galvanized.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

- .2 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .3 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm (1") minimum static deflection as follows:
 - .1 Up to NPS 100 mm (4"): first 3 points of support. NPS 125 mm (5") to NPS 200 mm (8"): first 4 points of support. NPS 250 mm (10") and Over: first 6 points of support.
 - .2 First point of support shall have a static deflection of twice deflection of isolated equipment, but not more than 50 mm (2").
- .4 Where isolation is bolted to floor use vibration isolation rubber washers.
- .5 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.2 SITE VISIT

- .1 Manufacturer to visit site and provide written certification that installation is in accordance with manufacturer's instructions and submit report to Consultant.
- .2 Provide Consultant with notice 24 h in advance of visit.
- .3 Make adjustments and corrections in accordance with written report.

3.3 TESTING

- .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Testing Adjusting and Balancing Section.
- .2 Vibration measurements shall be taken for equipment-listed below:
- .3 Provide Consultant with notice 48 h in advance of commencement of tests.
- .4 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations including sound curves.
- .5 Submit complete report of test results including sound curves.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3, Identification of Piping Systems.
- .3 Canadian Standards Association (CSA).
 - .1 Natural Gas and Propane Installation Code CSA B149.1.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with General Requirements.
- .2 Product data to include paint colour chips, all other products specified in this section.

1.3 PRODUCT LITERATURE

- .1 Submit product literature in accordance with General Requirements.
- .2 Product literature to include nameplates, labels, tags, lists of proposed legends.

Part 2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic lamicoid nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: Manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm (1/8") thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

Conform to following table:

Size	No. of Sizes (mm)(")	Height of line (mm)(")	Letters (mm)(")
1	10 x 50 (3/8" x 2")	1 (3/64")	3 (1/8")
2	15 x 75 (1/2" x 3")	1 (3/64")	6 (1/4")
3	15 x 75 (1/2" x 3")	2 (5/64")	3 (1/8")
4	20 x 100 (3/4" x 4")	1 (3/64")	10 (3/8")
5	20 x 100 (3/4" x 4")	2 (6/64")	6 (1/4")
6	20 x 200 (3/4" x 8")	1 (3/64")	10 (3/8")
7	25 x 125 (1" x 5")	1 (3/64")	15 (1/2")
8	25 x 125 (1" x 5")	2 (5/64")	10 (3/8")
9	32 x 200 (1 1/4" x 8")	1 (3/64")	20 (3/4")

.4 Use maximum of 25 letters/numbers per line.

.5 Locations:

- .1 Terminal cabinets, control panels: Use size #5.
- .2 Equipment in Mechanical Rooms: Use size #9.
- .3 Roof top equipment: use size #9.
- .4 Equipment above ceiling: use size #1 riveted to ceiling suspension system.

2.3 FIRE DAMPER/FIRE STOP FLAP NAMEPLATES

.1 Colours:

- .1 Black letters, yellow background.

.2 Construction:

- .1 Self adhesive 50 mm x 25 mm, matte finish, with round corners.

.3 Locations:

- .1 Install on adjacent ceiling grid. Where fire stop flap is installed in gypsum ceiling install on diffuser/grille frame. Where fire damper is installed above gypsum ceiling install on adjacent wall.

2.4 PIPING SYSTEMS GOVERNED BY CODE

.1 Identification:

- .1 Natural and propane gas: To CSA B149.1-00 and authority having jurisdiction and as indicated elsewhere.
- .2 Sprinklers: To NFPA 13.
- .3 Standpipe and hose systems: To NFPA 14.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Legend:

- .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.

.3 Arrows showing direction of flow:

- .1 Outside diameter of pipe or insulation less than 75 mm (3"): 100 mm (4") long x 50 mm (2") high.
Outside diameter of pipe or insulation 75 mm (3") and greater: 150 mm (6") long x 50 mm (2") high.
- .2 Use double-headed arrows where flow is reversible.
- .4 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .5 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm (3/4") and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 All other pipes: Pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C (300°F) and intermittent temperature of 200°C (395°F).
- .6 Colours and Legends:
 - .1 Where not listed, obtain direction from Consultant.
 - .2 Colours for legends, arrows: To following table:

Background colour:	Legend: Arrows:
Yellow White Black	
Green White Black	
Red White Black	

- .7 Background colour marking and legends for piping systems:

BACKGROUND COLOUR

CONTENTS	BACKGROUND COLOUR MARKING	LEGEND
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HW recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS Domestic
tempered supply	Green	DOM. TEMPERED
Trap Primer	Green	TRAP PRIMER
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Condensate	Green	CONDENSATE
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Natural gas	Yellow	NATURAL GAS
Gas regulator vents		to Codes
Conduit for low voltage		
Control wiring	White	CONTROL WIRING / VOLTS

2.6 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm (2") high stencilled letters and directional arrows 150 mm (6") long x 50 mm (2") high.

- .2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

- .1 Brass tags with 15 mm (1/2") stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.
- .3 Provide adhesive coloured tab (max. size 15 mm) indication on ceiling to locate valves/equipment above. Same applies to grid. Colour to be approved by consultant.

2.8 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.
- .3 Provide equipment identification and/or indication on ceiling to locate devices/equipment above ceiling. Install identification on grid. Colours to be approved by contractor.

2.9 LANGUAGE

- .1 Identification to be in English.

Part 3 EXECUTION

3.1 TIMING

- .1 Provide identification only after all painting specified has been completed.

3.2 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and/or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

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

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels not more than 1.7 m (5'-8") intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.

- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively. Where existing numbering system is installed start new numbering system at 100.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL

- .1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section including all air handling systems and equipment, all plumbing systems and equipment and all temperature controls system, building automation systems and equipment.

1.2 QUALIFICATIONS OF TAB AGENCIES

- .1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by Consultant within 30 days of start of work.
- .2 Provide documentation confirming qualifications and successful experience.
- .3 The following NEBB (National Environmental Balancing Bureau) TAB contractors to be used:
- .1 Air Audit Inc.
110 Turnbull Court, Unit 11 Cambridge, Ontario
N1T 1K6
(519) 740-0871
 - .2 Air Velocities Control Ltd.
100 Premium Way Mississauga, Ontario
L5B 1A2
(905) 279-4433
 - .3 Flowset Balancing Ltd.
431 Willis Dr. Oakville, Ontario
L6L 4V6
(416) 410-9793
 - .4 Dynamic Flow Balancing Ltd.
1200 Speers Road, Unit 36 Oakville, Ontario
L6L 4V6
(905) 338-0808
 - .5 Air Adjustments & Balancing Inc.
P.O. Box 176, Schomberg, Ontario L0G 1T0
(416) 254-3004
- .4 Alternative testing agency is acceptable upon Consultant review and approval of qualifications

1.3 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average (95% design) and low (75% of design) loads using actual or simulated loads. TAB contractor to perform equipment evaluation upon start up and once during each season in the first year of operation.
- .2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions. Confirm all equipment interlocks and functions of associated systems.

- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges and temperatures. Refer to BAS for system operating functions.

1.4 EXCEPTIONS

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

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems. Co-ordinate with other trades to ensure all systems are interlocked as indicated elsewhere prior to TAB.

1.6 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.
- .4 During construction indicate all tolerances of piping, ductwork etc conforms to specifications.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in the Mechanical Division.

1.8 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.9 START OF TAB

- .1 Notify Consultant in writing 3 days prior to start of TAB.
- .2 Start TAB only when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weather-stripping, sealing, caulking.
 - .3 All pressure, leakage, other tests specified elsewhere in the Mechanical Division.
 - .4 All provisions for TAB installed and operational.
 - .5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.

- .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 All outlets installed, volume control dampers open.
- .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.
 - .7 Control valves are properly piped.
 - .8 Coils and radiation are properly piped.
 - .9 BAS in operation.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 10%, minus 5%.
 - .2 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

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

1.12 INSTRUMENTS

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

1.13 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
 - .1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.15 TAB REPORT

- .1 Format to be in accordance with NEBB, AABC, or SMACNA.
- .2 TAB report to show all results in SI or imperial units as indicated on plans and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit 3 copies of TAB Report to consultant for verification and approval, in English in D-ring binders, complete with index tabs.

1.16 VERIFICATION

- .1 All reported results subject to verification by Consultant.
- .2 Provide manpower and instrumentation to verify up to 30% of all reported results.
- .3 Number and location of verified results to be at discretion of Consultant.
- .4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.17 SETTINGS

- .1 After TAB is completed to satisfaction of Consultant, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings. Replace all ceiling tile etc.
- .2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

- .1 TAB to be considered complete only when final TAB Report received and approved by Consultant.

1.19 AIR SYSTEMS

- .1 Standard: TAB to be to most stringent of TAB standards of NEBB, AABC, SMACNA, ASHRAE.
- .2 Do TAB of all systems, equipment, components, controls specified in the Mechanical Division including but not limited to following:
 - .1 Air handling systems and equipment
 - .2 Duct testing to SMACNA standards.
- .3 Qualifications: personnel performing TAB to be current member in good standing of NEBB.
- .4 Quality assurance: Perform TAB under direction of qualified supervisor.

- .5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of each damper, filter, coil, humidifier, fan, and other equipment causing changes in conditions.
At each controller, controlled device.
- .7 Locations of systems measurements to include, but not be limited to, following as appropriate: Each main duct, main branch, sub-branch, grille, register or diffuser.

1.20 HYDRONIC SYSTEMS

- .1 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water, condenser water, glycol systems.
- .2 Standard: TAB to be the most stringent of TAB standards of [NEBB] [AABC] [SMACNA] [ASHRAE].
- .3 Do TAB of all systems, equipment, components, controls specified in Mechanical Division including but not limited to hydronic equipment testing.
- .4 Qualifications: personnel performing TAB to be current member in good standing of NEBB.
- .5 Quality assurance: perform TAB under direction of qualified supervisor.
- .6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power voltage, noise, vibration.
- .7 Locations of equipment measurement: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of each heat exchanger (primary and secondary sides), boiler, chiller, coil, humidifier, cooling tower, condenser, pump, PRV, control valve, other equipment causing changes in conditions.
 - .2 At each controller, controlled device.
- .8 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of each primary and secondary loop (main, main branch, branch, sub-branch of all hydronic systems, inlet connection of make-up water.

1.21 DUCT LEAKAGE TESTING

- .1 Co-ordinate leakage testing with the sheet metal contractor. TAB contractor will be responsible for all duct testing.
- .2 Duct to be tested in accordance with SMACNA HVAC Duct Leakage Test Manual and as indicated.

1.22 OTHER TAB REQUIREMENTS

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

- .2 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions [during [winter] [summer] design conditions] [at all times].
TAB procedures:
Positive Negative
Corridors Washrooms
Cafeteria Cafeteria Kitchen
- .4 Provide duct testing as specified.
- .5 Provide AHU testing as specified.
Provide plenum testing as specified.
- .6 Changing of air handling equipment sheave and belts as required for specified air flow sheaves and belts supplied by unit manufacturer. Retest equipment after sheave change.

END OF SECTION

Part 1 GENERAL

1.1 General

- .1 The Mechanical Contractor shall provide the labour and material to conduct the closeout process as outlined in this specification section.
- .2 The mechanical contractor shall perform the closeout requirements specified in conjunction with the independent commissioning consultant (CC) retained by the owner.

Part 2 PRODUCTS

2.1 GENERAL

- .1 The mechanical contractor and manufacturers shall provide all instrumentation and equipment necessary to conduct the tests specified. The Mechanical Contractor shall advise the Mechanical Consultant of instrumentation to be used and the dates the instruments were calibrated.

Part 3 EXECUTION

3.1 THE CONTRACT CLOSE OUT PROCESS

- .1 The mechanical contractor close out process shall consist of:
 - .1 Shop Drawings and Record Drawings
 - .2 Installation inspection and equipment verification
 - .3 Plumbing and drainage system testing
 - .4 Testing of piping systems
 - .5 Independent contractor balancing of water systems
 - .6 Testing of air systems
 - .7 Independent contractor balancing of air systems
 - .8 Testing of equipment and systems
 - .9 BAS Commissioning
 - .10 Commissioning Consultant performance testing
 - .11 Commissioning meetings
 - .12 Operating and maintenance manuals
 - .13 Training
 - .14 Systems Demonstration and turnover
 - .15 Testing forms
 - .16 Warranties
 - .17 Contractor to provide list of equipment maintenance including schedule of maintenance parts, quantities, and model fixtures, etc.

3.2 SHOP DRAWINGS AND RECORD DRAWINGS

- .1 Conform to General Requirements Section for shop drawings and record drawings requirements.

3.3 INSTALLATION INSPECTION AND EQUIPMENT VERIFICATION

- .1 The Mechanical Contractor shall co-ordinate with the Consultant who will inspect the mechanical installation.

- .2 The Mechanical Contractor shall complete the equipment verification forms for each piece of equipment. The forms shall be included in the operating and maintenance manual. The equipment data shall include:

- .1 Manufacturers name, address and telephone number
- .2 Distributors name, address and telephone number
- .3 Make, model number and serial number
- .4 Pumps - RPM, impeller sizes, rated flow
- .5 Fans - belt type and size, shive type and size
- .6 Electrical - volts, amps, fuse size, overload size
- .7 Any other special characteristics.

3.4 PLUMBING AND DRAINAGE SYSTEM TESTING

- .1 The plumbing and drainage system shall be tested in accordance with the Plumbing Code under the Ontario Water Resources Act and the specification.
- .2 The Mechanical Contractor shall notify the Building Inspector when systems are available for testing. The Mechanical Contractor shall document all tests performed and shall arrange for the Building Inspector to sign for tests completed. The forms shall be forwarded to the Consultant.

3.5 THE CONTRACTOR'S TESTING OF PIPING SYSTEMS

- .1 Test all piping systems in accordance with all applicable plumbing codes and General Requirements section.
- .2 All tests for the systems shall be performed in the presence of the Consultant or Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.6 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF WATER SYSTEMS

- .1 Conform with the specification section, Testing, Adjusting and Balancing.
- .2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.7 THE CONTRACTORS TESTING OF AIR SYSTEMS

- .1 Conform with the specification section, Testing, Adjusting and Balancing.
- .2 All tests shall be performed in the presence of the Mechanical Consultant or the Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.8 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF AIR SYSTEMS

- .1 Conform with specification section, Testing, Adjusting and Balancing.
- .2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.9 TESTING OF EQUIPMENT AND SYSTEMS

- .1 General:
 - .1 The Mechanical Contractor shall hire the services of the manufacturers technicians to test the equipment and associated systems. The technician shall record the results of the tests on the testing forms. The tests shall be witnessed by the Consultant or Owners representative. When the tests have been completed satisfactorily the technician and witnessing authority shall sign

the forms. A copy of the forms shall be forwarded to the Consultant. The original shall be inserted into the operating and maintenance manual.

- .2 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional tests shall be witnessed.
- .3 Tests which have not been witnessed shall not be accepted and shall be repeated.
- .4 The equipment and systems to be tested shall include:
 - .1 Condensing Units
 - .2 Boilers and Pumps
 - .3 Air Handling Units
 - .4 Water Treatment Systems
 - .5 Building Automation Systems (BAS)

3.10 BAS Testing:

- .1 The BAS Contractor shall test the system.
- .2 Co-ordinate with the Consultant and submit completed test forms monthly.
- .3 Demonstrate to the Owner and Consultant the operation of the BAS when all tests have been completed.

3.11 CLOSEOUT SCHEDULE

- .1 The Mechanical Contractor shall include the schedule for all tests and equipment start- up tests in the construction schedule.
- .2 All testing forms and reports associated with the mechanical systems shall be directed to the Consultant with copies to the Owner and Consultant.
- .3 The forms and reports to be issued shall include:
 - .1 Shop drawings, issued and accepted
 - .2 Equipment verification forms
 - .3 Testing forms
 - .4 Reports resulting from tests
 - .5 Testing schedule
 - .6 Equipment Start-up Forms

3.12 OPERATION AND MAINTENANCE MANUAL

- .1 Conform to General Requirements section for the Operating and Maintenance Manual requirements.

3.13 OPERATOR TRAINING

- .1 Conform to General Requirements section for requirements for Instruction to Operating Staff.
- .2 The training shall be conducted in a classroom and at the equipment or system.
- .3 Training will begin when the operating and maintenance manuals have been delivered to The Owner and approved by the Consultant.
- .4 Each training session shall be structured to cover:
 - .1 The operating and maintenance manual
 - .2 Operating procedures
 - .3 Maintenance procedures
 - .4 Trouble-shooting procedures
 - .5 Spare parts required
 - .6 Submit a course outline to the Mechanical Consultant before training commences.

- .7 Provide course documentation for up to eight people.
- .5 The training sessions shall be scheduled and co-ordinated by the Mechanical Contractor.
- .6 Training shall be provided for the following systems:

System	Minimum Training Times	Boilers	2
Boilers	2 hours		
Air Handling Units	2 hours		
Water Treatment Systems	2 hours		
The Mechanical System	8 hours		
- .7 The minimum training for the BAS shall be 16 hours. The training shall include:
 - .1 A walk through of the installation for the Building Owner to review the installation and equipment
 - .2 Operation of the central computer
 - .3 Operation of portable terminals
 - .4 Control sequences
 - .5 Report set-up and generation
 - .6 Managing the system
 - .7 Maintenance requirements
 - .1 Refer to Controls specification section for further information.
- .8 The training requirement for the mechanical system shall include a walk-through of the building by the Mechanical Contractor. During the walk through the Mechanical Contractor shall:
 - .1 Identify equipment
 - .2 Identify starters associated with equipment
 - .3 Identify valves and balancing dampers
 - .4 Identify access doors
 - .5 Review general maintenance of equipment
 - .6 Review drain points in pipework systems
 - .7 Identify maintenance items
- .9 When each training session has been completed The Owner shall sign the associated form to verify completion.

3.14 MECHANICAL SYSTEM DEMONSTRATION AND TURNOVER

- .1 Refer to General Requirements section, Mechanical Project Completion.
- .2 The system demonstration and turnover to The Owner shall occur when:
 - .1 The installation is complete
 - .2 The acceptance test conducted by the Mechanical Consultant has been completed successfully
 - .3 The Commissioning Consultant system performance testing has been completed successfully
 - .4 Training has been completed
 - .5 Operating and Maintenance Manuals have been accepted
 - .6 Shop-drawings have been updated
 - .7 As-built drawings have been completed
- .3 The systems demonstration shall be conducted by the Mechanical Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

3.15 TESTING FORMS

- .1 The Mechanical Contractor and manufacturers shall provide forms for testing. The forms must be approved by the Consultant and The Owner before they are used.

3.16 WARRANTIES

- .1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by The Owner.
- .2 The Mechanical Contractor shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.
- .3 Refer to the general condition's specification section for the requirements during the warranty period.

3.17 CLOSEOUT PROCESS ALLOCATION

- .1 The mechanical contractor closeout process shall be allocated a value equal to 3% or \$5,000.00 minimum.
- .2 The Mechanical Contractor shall submit all test and verification forms. The Consultant will use these forms to calculate percentage complete.
- .3 The monies shall not be paid out until the performance testing, O & M manuals, systems demonstration, and training including all required paperwork have been completed to the satisfaction of the consultant. Refer to General Requirements section for contract breakdown.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes, standards, etc. to be in accordance with the latest edition.
- .2 ASTM International (ASTM)
 - .1 ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C701, Standard for Cold Water Meters-Turbine Type for Customer Service.
 - .3 ANSI/AWWA C702, Standard for Cold Water Meters-Compound Type.
- .4 CSA Group (CSA)
 - .1 CSA-B64, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .5 Efficiency Valuation Organization
 - .1 International Performance Measurement and Verification Protocol (IPMVP).
 - .1 IPMVP.
- .6 National Research Council Canada
 - .1 National Plumbing Code of Canada.
- .7 Plumbing and Drainage Institute
 - .1 PDI-WH201-[R2010], Water Hammer Arresters Standard.

1.2 SUBMITTALS

- .1 Submit in accordance with submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's product literature, specifications, installation instructions and datasheets. Include product characteristics & performance criteria.
 - .2 Submit WHMIS Safety Data Sheet (SDS).
- .3 Shop Drawings:
 - .1 Submit digital drawings of all equipment & materials in accordance with general requirements.
 - .2 Certificates: When requested, submit manufacturer's certificates certifying that materials comply with specified performance characteristics and physical properties.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data manuals in the closing documents and handbooks.
- .2 To include but not limited to:

- .1 All plumbing specialties, devices and accessories. To include manufacturers name, models and operating parameters.
- .2 Requirements for operation and maintenance.
- .3 Spare parts list.

Part 2 PRODUCTS

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79
- .2 Type 1: General duty; cast iron body round, square or as indicated, adjustable head, sediment basket nickel bronze strainer, integral seepage pan, and clamping collar.
- .3 Type 2: Heavy duty; cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan and clamping collar.
- .4 Type 3: Combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.

2.2 ROOF DRAINS

- .1 Type 1: Controlled flow; Aluminum or cast-iron body, under deck clamp and sump receiver to suit roof construction, flashing clamp ring with integral gravel stop, bearing pan, flow control weir assembly with aluminum, cast iron dome.
- .2 Type 2: standard roof drain with cast iron body with aluminum or cast-iron dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop.
- .3 Type 3: parapet or scupper drain; cast iron body with bronze or aluminum strainer/grate and flashing clamp.

2.3 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
 - .1 Wall Access: face or wall type, polished nickel bronze or stainless steel with cover flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: rectangular or round, cast iron body and frame with adjustable secured nickel bronze or cast top with anchor lugs] and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: cast iron or nickel bronze, round or square, gasket, vandal-proof screws.
 - .3 Cover for Terrazzo Finish: polished nickel bronze or brass with recessed cover for filling with terrazzo, vandal-proof locking screws.
 - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
 - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.4 NON-FREEZE WALL HYDRANTS

- .1 Recessed type with integral vacuum breaker, NPS [3/4] hose outlet, removable operating key. Chrome plated] or Polished bronze finish.

2.5 WATER HAMMER ARRESTORS

- .1 Stainless steel or copper construction, bellows piston type: to PDI-WH201.

2.6 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series and City of Cambridge standards. Application as indicated, horizontal mounted reduced pressure principle type, double check valve assembly. Backflow preventer with intermediate atmospheric vent or vacuum breaker.
 - .1 Acceptable Manufacturers
 - Watts
 - Zurn
 - Braukmann

2.7 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 series approved atmospheric vent vacuum breaker.

2.8 PRESSURE REGULATORS

- .1 Capacity: as indicated.
 - .1 Inlet pressure: 1034 kPa.
 - .2 Outlet pressure: 413 kPa.
- .2 Up to NPS 1-1/2 bronze bodies, screwed: to ASTM B62
- .3 NPS 2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class [B].
- .4 Semi-steel spring chambers with bronze trim.

2.9 BACKWATER VALVES

- .1 Coated extra heavy cast iron body with bronze seat, revolving bronze flapper and threaded cover.
- .2 Access:
 - .1 Surface access.

2.10 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.11 WATER MAKE-UP ASSEMBLY

- .1 Complete with backflow preventer pressure gauge on inlet and outlet, pressure reducing valve to CAN/CSA-B356, pressure relief valve on low pressure side and gate valves on inlet and outlet.
- .2 Pipe discharge to floor funnel drain.

2.12 WATER METERS

- .1 In accordance with ANSI/AWWA and municipal standards.

- .2 Capacity: [as indicated].
- .3 Accessories: [remote readout device].

2.13 TRAP SEAL PRIMERS (as indicated in schedule)

- .1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection.
- .2 Electronic type with air gap, solenoid valve and controls.
- .3 Install primer lines to drains as indicated.

2.14 STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS 2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.

2.15 DOMESTIC HOT WATER CIRCULATING PUMPS

- .1 Construction: closed-coupled, in-line centrifugal, all bronze or stainless-steel construction, shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings.
- .2 Supports: provide as recommended by manufacturer.

2.16 SOAP DISPENSING SYSTEMS

- .1 Integrated into wash fountains.
- .2 Tanks: Surface mounted or otherwise instructed by PM or Architect. Satin finished stainless steel, rectangular, with contents gauge on front fitted with chrome plated union shut-off cock and cleanout tee.
- .3 Outlets: gravity flow, lather type, stainless steel construction.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect and ensure proper operation of all devices. Inform consultant and PM of any discrepancies and remedy any faulty or defective items.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install in accordance with relevant National and Provincial codes and standards.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 START-UP

- .1 General:
 - .1 In accordance with General Commissioning Requirements:
- .2 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

3.5 TESTING AND ADJUSTING

- .1 General:
 - .1 Test and adjust plumbing specialties and accessories in accordance with General Commissioning Requirements:
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- [70] kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Adjust while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .6 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- .7 Roof drains:
 - .1 Check location at low points in roof.
 - .2 Check security, removability of dome.
 - .3 Adjust weirs to suit actual roof slopes, meet requirements of design.
 - .4 Clean out sumps.

- .5 Verify provisions for movement of roof systems.
- .8 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .9 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .10 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .11 Wall, ground hydrants:
 - .1 Verify complete drainage, freeze protection.
 - .2 Verify operation of vacuum breakers.
- .12 Pressure regulators, PRV assemblies:
 - .1 Adjust settings to suit locations, flow rates, pressure conditions.
- .13 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .14 Grease interceptors:
 - .1 Activate, using manufacturer's recommended procedures and materials.
- .15 Hose bibbs, sediment faucets:
 - .1 Verify that flow and pressure meet design criteria.
 - .2 Check for leaks, replace compression washer if required.
- .16 Hydronic system water Make-up Assembly:
 - .1 Verify flow, pressure, and connection.
- .17 Water meters:
 - .1 Verify location and accessibility.
 - .2 Test metre reading accuracy.
- .18 Soap Dispensing Systems:
 - .1 Verify location and reach.
 - .2 Check for leaks.

3.6 CLOSEOUT ACTIVITIES

- .1 Commissioning Reports: in accordance with General Commissioning Requirements.
- .2 Training: provide training and manuals to O&M Personnel.

3.7 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: remove all construction debris from the site.

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

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

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - .1 ANSI/ASHRAE/IES 90.1- Energy Standard for Buildings Except Low-Rise Residential Buildings
- .2 ASTM International (ASTM):
 - .1 ASTM C335/C335M-[17], Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
 - .2 ASTM C411-[19], Standard Specification for Hot-Surface Performance of High-Temperature Thermal Insulation
 - .3 ASTM C449/C449M-[07], Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
 - .4 ASTM C533-[17], Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
 - .5 ASTM C547-[22a], Standard Specification for Mineral Fiber Pipe Insulation
 - .6 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
 - .7 ASTM C1136-[21], Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - .8 ASTM C1729-[21], Standard Specification for Aluminum Jacketing for Insulation
 - .9 ASTM C1767M-[21], Standard Specification for Stainless Steel Jacketing for Insulation
- .3 ULC Standards (ULC):
 - .1 CAN/ULC-S102-[10], Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .2 CAN/ULC-S702.1-[14], Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification

1.2 SHOP DRAWING SUBMITTALS

- .1 Submit in accordance with submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's product literature, specifications, installation instructions and datasheets. Include product characteristics & performance criteria.
 - .2 Submit WHMIS Safety Data Sheet (SDS).
- .3 Shop Drawings:
 - .1 Submit digital drawings of all equipment & materials in accordance with general requirements.
- .4 Certificates: When requested, submit manufacturer's certificates certifying that materials comply with specified performance characteristics and physical properties.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit Materials maintenance procedures.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: Specialist in performing work of this Section with at least [three] years successful experience in this type and size of project, [member of Thermal Insulation Association of Canada (TIAC)].

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Perform in accordance with common product requirements.
- .2 Protect insulation, canvas, and other moisture-sensitive materials from moisture.

Part 2 PRODUCTS

2.1 DESCRIPTION

- .1 Regulatory Requirements:
 - .1 Combustible piping materials, including adhesives in accordance with CAN/ULC-S102:
 - .1 Flame-spread rating: Maximum [25].
 - .2 Smoke developed classification: Maximum [50].

2.2 INSULATION

- .1 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335/C335M.
- .2 Type A-1: Rigid moulded mineral fibre without factory-applied vapour retarder jacketing.
 - .1 Mineral fibre: To [[CAN/ULC-S702.1] [ASTM C547]].
 - .2 Maximum "k" factor: To CAN/ULC-S702.1.
- .3 Type A-3: Rigid moulded mineral fibre with factory-applied vapour retarder jacketing.
 - .1 Mineral fibre: To [[CAN/ULC-S702.1] [ASTM C547]].
 - .2 Jacketing: To ASTM C921.
 - .3 Maximum "k" factor: To [[CAN/ULC-S702.1] [ASTM C547]].
- .4 Type C-2: Mineral fibre blanket faced [[with] [without]] factory-applied vapour retarder jacketing.
 - .1 Mineral fibre: To [[CAN/ULC-S702.1] [ASTM C533]].
 - .2 Jacketing: To ASTM C1136.
 - .3 Maximum "k" factor: To [[CAN/ULC-S702.1] [ASTM C547]].
- .5 Type A-6: Flexible unicellular tubular elastomer.
 - .1 Insulation: [With vapour retarder jacket].
 - .2 Jacketing: To [ASTM C921].
 - .3 Maximum "k" factor: [_____].
 - .4 Certified by manufacturer as free of potential stress corrosion cracking substances.
- .6 Type A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
 - .1 Insulation: To [ASTM C533].
 - .2 Maximum "k" factor: To [ASTM C533].

- .3 Design to permit periodic removal and reinstallation.

2.3 JACKETING

.1 Polyvinyl Chloride (PVC) Jacketing:

- .1 One-piece moulded type [and sheet], in accordance with [ASTM C921], with pre-formed shapes as required.
- .2 Minimum service temperature: -20°C.
- .3 Maximum service temperature: 65°C.
- .4 Moisture vapour transmission: Maximum 0.02 perm.
- .5 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape in matching colour.

.2 ABS Plastic Jacketing:

- .1 One-piece moulded type [and sheet], in accordance with [ASTM C921], with pre-formed shapes as required.
- .2 Colours: [To match adjacent finish paint] [as selected by [Departmental Representative] [DCC Representative] [Consultant]].
- .3 Minimum service temperature: -40°C.
- .4 Maximum service temperature: 82°C.
- .5 Moisture vapour transmission: Minimum 0.012 perm.
- .6 Thickness: Minimum [0.75] mm.
- .7 Fastenings:
 - .1 Solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape in matching colour.

2.4 ACCESSORIES

- .1 Tape: Self-adhesive, aluminum, [reinforced] [plain], minimum [50] mm wide.
- .2 Contact Adhesive: Quick setting type.
- .3 Canvas Adhesive: Washable.
- .4 Tie Wire: Stainless steel, minimum [1.5]-mm diameter.
- .5 Bands: Stainless steel, [19] mm wide, minimum [0.5] mm thick.
- .6 Thermal Insulating and Finishing Cement: To ASTM C449, [[hydraulic setting] [air drying]] type, on mineral wool.
- .7 Vapour Retarder Lap Adhesive: Water-based and fire-retardant type, compatible with insulation.
- .8 Indoor Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Verify that pressure testing of piping systems and adjacent equipment is complete, witnessed, and certified.
- .2 Verify that surfaces are clean, dry, and free from foreign material.

3.2 INSTALLATION

- .1 Install to manufacturer's instruction manuals.
- .2 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
- .3 Install piping insulation continuous through wall and ceiling openings and sleeves, except where firestopping is required.
- .4 Supports and Hangers:
 - .1 Install hangers and supports outside vapour retarder jacket.
 - .2 Apply high compressive strength insulation that is suitable for piping service at oversized saddles and shoes where insulation saddles have not been provided.

3.3 INSTALLATION - REMOVABLE PREFABRICATED INSULATION AND ENCLOSURES

- .1 At expansion joints, valves, [primary flow measuring elements flanges and unions at equipment.
 - .1 Install components to permit movement of expansion joint to permit periodic removal and replacement without damage to adjacent insulation.
 - .2 Install insulation, fastenings, and finishes that are compatible with piping system.

3.4 PIPING INSULATION SCHEDULE

- .1 Includes valves, valve bonnets, strainers, flanges, and fittings, unless otherwise specified.

Application	Piping Insulation Type	Run-out	Pipe sizes (NPS) to 1	Pipe sizes (NPS) 1 1/4 to 2	Pipe sizes (NPS) 2 1/2 to 4	Pipe sizes (NPS) 5 to 6	Pipe sizes (NPS) 8 & over
Domestic Hot Water Supply (HWS)	[A-1]	25 mm	25 mm	25 mm	38 mm	38 mm	38 mm
Refrigerated Drinking Water	[A-3]	25 mm	25 mm	25 mm	25 mm	25 mm	25 mm
Domestic Cold Water Supply (CWS)	[A-3]	25 mm	25 mm	25 mm	25 mm	25 mm	25 mm
Domestic Cold Water Supply (CWS) with vapour retarder	[C-2]	25 mm	25 mm	25 mm	25 mm	25 mm	25 mm
Rainwater Leaders (RWL) and Rainwater Pipe (RWP)	[C-2]	25 mm	25 mm	25 mm	25 mm	25 mm	25 mm

- .2 Finishes:

- .1 Exposed indoors: [Canvas] [[Aluminum] [Stainless steel] [PVC] jacketing].
- .2 Exposed in mechanical rooms: [Canvas], [[aluminum] [stainless steel] [PVC] jacketing].
- .3 Concealed, indoors: Canvas on valves, fittings. No additional finish.
- .4 Outdoors: Waterproof [[aluminum] [stainless steel] [ABS]] jacketing.
- .5 Finish attachments: Stainless steel [screws] [bands], at [150] mm on centre.
- .6 Seals: [Wing] [Closed].

3.5 SITE QUALITY CONTROL

- .1 Non-Conforming Work: Replace insulation where there is damage to the vapour barrier and insulation is saturated with moisture.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes and standards shall be to the latest edition.
 - .1 ANSI/AWWA B301, Liquid Chlorine.
 - .2 ANSI/AWWA C104/A21.4, Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
 - .3 ANSI/AWWA C205, Cement Mortar Protective Lining and Coating for Steel water Pipe – 100mm and larger.
 - .4 ANSI/AWWA C207, Steel Pipe Flanges for Waterworks Service, 100mm and larger.
 - .5 ANSI/AWWA C500, Metal Seated Gate Valves for Water Supply Service.
 - .6 ANSI/AWWA C600, Installation of Ductile Iron Water Mains and their Appurtenances.
 - .7 ANSI/AWWA C800, Underground Service Lines, Valves and Fittings

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with this division.

1.3 RECORD DRAWINGS

- .1 Provide a complete set of as-built record drawings, (hard copy and digital). To include but not limited to all valve locations, list of equipment, pipe materials, all locations, operating manuals, etc.

1.4 SCHEDULING OF WORK

- .1 All work is to be scheduled to minimize interruptions of existing services.
- .2 Interruptions of any service during school hours is not permitted.
- .3 Submit a schedule of anticipated service interruptions for WDCSB project manager and engineer review and approval.
- .4 Notify building operation, maintenance and school staff of any interruptions 24 hours in advance.
- .5 Notify and obtain written approval from all local authorities having jurisdiction of any interruption of services, (water utility provider, fire dept., police, etc.).

Part 2 PRODUCTS

2.1 PIPES, JOINTS AND FITTINGS

- .1 Ductile iron pipe to ANSI/AWWA C151/A21.51, class 52 cement mortar lined to ANSI/AWWA C104/A21.4.
- .2 P.V.C pipe to AWWA C900, CSA B137.2, ASTM, class 150 P.V.C (DR18).
- .3 Joints and Fittings for ductile iron pipe.
 - .1 Joints:
 - .1 Rubber gasket for mechanical pipe joints to ANSI/AWWA C111/A21.11.
 - .2 Rubber gasket for flange pipe joints 1.6mm thick to ANSI/AWWA C111/A21.11
 - .3 Bolts, nuts, hex head with washers to ASTM A307, heavy series.

- .2 Fittings:
 - .1 Mechanical joint cast iron and ductile iron fittings NPS 3 and larger to ANSI/AWWA C110/A21.10.
 - .2 Flanged cast iron fittings NPS 3 and larger to ANSI/AWWA C110/A21.11

2.2 FITTINGS AND SPECIALTIES

- .1 All fittings and specialties to be installed where required. Fittings subject to a lateral thrust or blow-out shall be supported by cast in place concrete thrust blocks placed again undisturbed soil. Where soil conditions are unstable or for vertical bends use anchor blocks with rods connected to the closet solid joint for proper support.

2.3 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular materials:
 - .1 Crushed or screening stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117 Sieve sizes to CAN/CGSB-8.1.
- .2 Concrete mixes and materials required for bedding cradles, encasements, supports and thrust block to Concrete Section.

2.4 PIPE DISINFECTION

- .1 Liquid Chlorine to ANSI/AWWA B301 to disinfect all water mains.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Clean all pipes, fittings, valves, hydrants, etc. of any accumulated debris and water before installation. Inspect all materials for any defects and remove from site.

3.2 TRENCHING

- .1 In accordance with Excavating, Trenching and Backfilling Section.
- .2 X-Ray / Scan and existing concrete floor areas before cutting slab to ensure no conflicts.

3.3 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness to a depth of 150mm below bottom of pipe depth.
- .2 NO installations are to be made in frozen conditions.
- .3 Shape bed with grade to provide a continuous uniform bedding for piping.
- .4 Shape depressions in bedding to suit any joints or fittings.
- .5 Compact each layer full width of bed to at least 95% of corrected maximum dry density and 95% maximum density to ASTM D698

3.4 PIPE INSTALLATION

- .1 Connect to incoming domestic water / fire main piping provided by the site services contractor.
- .2 Install couplings necessary for connection to incoming services.

- .3 Install pipes to ANSI/AWWA - ANSI/AWWA C600 specifications.
- .4 Join pipes in accordance with ANSI/AWWA C600, C602 and C206 standards.
- .5 Handle all materials in accordance with the manufacturer's requirements.
- .6 Do not use chains or cables passing through pipes affecting pipe ends.
- .7 Provide vapour retarder as recommended by manufacturer.
- .8 Lay pipes on prepared bedding, true to line of grading. Ensure each pipe is in contact with shaped bedding for its entire length.
- .9 Face socket ends of piping in the direction of laying. Face socket ends up grade for any mains on grade 2% or greater.
- .10 Keep jointing materials free of any dirt or debris.
- .11 Keep gaskets clear of any dirt or debris, lubricate upon installation.
- .12 Install removable watertight covers on end of all pipes when work stops.
- .13 Pipe cutting and cleaning methods as per the pipe manufacturer's guidelines.
- .14 Install gaskets in accordance with the manufacturer's requirements.
- .15 Support / handle pipes with slings and/or a crane to minimize pressure on piping.
- .16 Complete each joint prior to installation of next section.
- .17 Avoid deflection after installation has been made
- .18 Apply pressure when making joints to ensure a fully completed connection.
- .19 Completed joints are to be supported by compacting bedding on side and top of piping.
- .20 Provide hydrostatic and leakage testing reports to the engineer and inspector for review and approval.
- .21 Backfill remainder of trench.

3.5 THRUST BLOCKS

- .1 Install thrust blocks to provincial standards.

3.6 HYDROSTATIC AND LEAKAGE TESTING

- .1 Provide all labour, equipment and materials required to perform hydrostatic and leakage tests.
- .2 Notify consultant 48hrs before all tests such that all testing is witnessed by the consultant.
- .3 Tests on thrust blocks to be conducted min. 5 days after installation.
- .4 Upon completion of pipe installation, inspection and testing surround and cover pipes between joints with approved granular material.
- .5 Strut and brace all caps, bends, tees and valves to prevent movement when tests are conducted.
- .6 Open valves.
- .7 Bleed air from mains by slowly filling main with potable water. Install corporation stops at high point in main where no air vacuum release valves are installed. Remove stops after completion of tests and holes sealed with plugs.
- .8 Thoroughly examine all areas for leaks.
- .9 Examine all pipes, fitting, joints, etc. when system is under pressure.

- .10 Replace any defective or faulty parts with new.
- .11 Do not exceed allowable leakage of 0.03L/mm diameter per 300mm diameter pipe.
- .12 Locate and repair any defects.
- .13 Repeat tests until any defective parts or areas corrected and passed.

3.7 PIPE SURROUND

- .1 Upon completion of all pipe installations and consultant inspection / approval, cover all pipe surrounding areas.
- .2 Hand place surrounding materials in uniform layers not exceeding section of 150mm compacted thickness.
- .3 Do not surround any piping or fittings under frozen conditions.
- .4 Compact each layer from mid-height of pipe invert to at least 95% of the corrected maximum dry density.
- .5 Compact each layer from mid-height of pipe to underside of the backfill to at least 90% of the corrected maximum dry density.

3.8 BACKFILL

- .1 Install backfill material above the pipe surround in uniform layers not exceeding 150mm compacted thickness.
- .2 No backfill to be installed during frozen conditions.
- .3 Compact backfill under all hard surface areas, (paving, concrete walkways, interlocked areas, etc.), to at least 95% corrected maximum dry density.

3.9 FLUSHING AND DISINFECTING

- .1 Flush all water mains with sufficient flow of potable water to produce a velocity of 1.5m/s within the piping for 10 mins or longer until all foreign materials have been removed from the piping network.
- .2 Flush flow rate for pipes 150mm and less to be 38l/s.
- .3 Flush flow rate for pipes 200mm to be 75l/s.
- .4 Provide all connections and pumps required for flushing as required.
- .5 Open and close all valves as required.
- .6 When flushing is completed and all inspections performed introduce a solution of chlorine as approved by the authorities having jurisdiction in watermain and ensure that it has been distributed and flushed form entire system. Rtae of chlorine to be equal to the rate of water entering the pipe.
- .7 Fill chlorine at the closest point of water entry into the building filling station.
- .8 Operate all valves during flushing of chlorine solution, flush system for 24 hours.
- .9 Measure for any chlorine residues at end of pipe being treated.
- .10 Perform bacteria tests and continue flushing process until all contaminants removed. Redo testing and provide certification that all contaminants removed throughout the system.

3.10 SURFACE RESTORATION

- .1 Restore all surfaces to the satisfaction of the authorities having jurisdiction and WCDSB.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards referenced shall be in accordance with the latest edition.
 - .1 ANSI/ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500
 - .5 ASME B16.26-[13], Cast Copper Alloy Fittings for Flared Copper Tubes
 - .6 ASME B31.9-[14], Building Services Piping
 - .7 ASTM A536-[84(2014)], Standard Specification for Ductile Iron Castings
 - .8 ASTM B32-[08(2014)], Standard Specification for Solder Metal
 - .9 ASTM B42-[15a], Seamless Copper Tube, Standard Sizes
 - .10 ASTM B88M-[14], Standard Specification for Seamless Copper Water Tube
 - .11 ANSI/AWWA C111/A21.11-[12], Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - .12 ANSI/AWWA C151/A21.51-[09], Ductile Iron Pipe, Centrifugally Cast, for Water
 - .13 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .14 Safety Data Sheets (SDS)
 - .15 MSS-SP-67, Butterfly Valves
 - .16 MSS-SP-70, Grey Iron Gate Valves, Flanged and Threaded Ends
 - .17 MSS-SP-71, Grey Iron Swing Check Valves, Flanged and Threaded Ends
 - .18 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves
 - .19 National Plumbing Code of Canada (NPC) [2020]
 - .20 CAN/ULC S115-[11], Standard Method of Fire Tests of Firestop

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with standards submittal procedures.
- .2 Product manufacturer's product literature and datasheets. Include product characteristics, performance criteria, physical sizes, finishes, and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer, pallets, crates, packing materials, etc.

Part 2 PRODUCTS

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems in building.
 - .1 Above ground:
 - .1 Copper tube hard drawn type L to ASTM B88.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings to ANSI/ASME B16.24
- .2 Cast bronze threaded fittings to ANSI/ASME B16.15
- .3 Cast copper, solder type to ANSI/ASME B16.18
- .4 Wrought copper and copper alloy, solder type to ANSI/ASME B16.22
- .5 NPS 50mm and larger:
 - .1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242
- .6 NPS 38MM and smaller:
 - .1 Wrought copper to ANSI/ASME B16.22
 - .2 Cast copper to ANSI/ASME B16.1.

2.3 JOINTS

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

2.4 GATE VALVES

- .1 NPS 50mm and under, soldered or screwed with Teflon tape to MSS SP-80
- .2 NPS 63mm and over flanged to MSS SP-80
- .3 NPS 63=mm and over, [other than mechanical rooms], flanged to MSS SP-80

2.5 GLOBE VALVES

- .1 NPS 50mm and under, soldered to MSS-SP-80, forged brass body / disc
- .2 NPS 50mm and under, screwed to MSS-SP-80, , forged brass body / disc

2.6 SWING CHECK VALVES

- .1 NPS 50mm and under, soldered to MSS-SP-80,, forged brass body / disc
- .2 NPS 50mm and under, screwed to MSS-SP-80, forged brass body / disc
- .3 NPS 63mm and over, flanged to MSS-SP-71, cast iron body disc

2.7 BALL VALVES

- .1 NPS 50mm and under, screwed class 150 bronze body
- .2 NPS 50mm and under, soldered to ANSI/ASME B16.18, class 150 bronze body

2.8 BUTTERFLY VALVES

- .1 NPS 63mm and over to MSS-SP-67, Class 200
 - .1 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
 - .2 Lever operated
- .2 NPS 63mm and over, grooved ends class 300 psig CWP, bubble tight shut-off, bronze body EPDM coated ductile iron disc with integrally cast stem.
 - .1 Operator:
 - .1 NPS 100mm and under: lever handle.
 - .2 NPS 150mm and over: gear operated.

2.9 Acceptable Manufacturers

Crane
Jenkins
Toyo/R+W Kitz
Centreline

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with National, Provincial, Plumbing Codes and in accordance with local authorities having jurisdiction.
- .2 Install pipe work in accordance with the relevant sections for installation requirements.
- .3 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.
- .7 Valves:
 - .1 Isolate equipment, fixtures and branches with the required valves.
 - .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.2 PRESSURE TESTS

- .1 Conform to relevant codes and section requirements for pressure testing of piping depending on application.

3.3 DISINFECTING FLUSHING AND CLEANING

- .1 Flush out, disinfect and rinse system to the relevant standards and requirements of authorities having jurisdiction
- .2 Flush entire system and outlets, let stand for 24 hours, then draw sample off longest run. Submit to testing laboratory to verify that piping system is clean to relevant standards. Repeat as necessary if required by testing agency to satisfy requirements.

3.4 PRE-START-UP INSPECTIONS

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

3.5 START-UP

- .1 Timing: start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.6 OPERATION REQUIREMENTS

- .1 Coordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products. Provide maintenance procedural document.

3.7 CLEANING

- .1 Clean in all areas affected by work.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referred to the latest edition.
- .2 CAN/CSA – B64,1 / B64.10.1 – Selection and Installation of Backflow Preventers / Maintenance and Field Testing of Backflow Preventers.

1.2 INFORMATION SUBMITTALS

- .1 Complete a cross-connection survey form and submit it to the authorities having jurisdiction for approval. Provide copies to the Engineer for record.
- .2 All surveys and data record are to be provided in the maintenance manual.

Part 2 PRODUCTS

2.1 DESCRIPTION

- .1 Supply and install all backflow prevention devices on fixtures and equipment as noted or required by the authorities having jurisdiction.
- .2 Acceptable manufacturers: Watts, Wilkins, Zurn, Mifab.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Verify that surfaces are clean, dry, and free from foreign material prior to installation.

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's instructions and the OBC, authorities having jurisdiction and all referenced codes and standards.

3.3 TESTING

- .1 Provide testing to municipal standards and the authorities having jurisdiction.
- .2 Provide a copy of the testing reports to the consultant and authorities having jurisdiction.
- .3 Provide a copy of the testing reports for each device in the maintenance manual.
- .4 Provide a tag on each device.
- .5 Provide a list of all devices with a tag number and detailed plastic-coated map noting the location of all devices. Locate all information on the wall in the main meter room.
- .6 All devices shall be c/w a 1-year warranty period.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes and standards shall be to the latest edition.
 - .1 ASTM C117, Test Method for Materials Finer Than 0.075mm sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Method for Sieve Analysis of Fine Coarse Aggregates.
 - .3 ASTM D698, Specification for ABS and PVC Composite Sewer Piping
 - .4 ASTM D3034, Specification for Type (PSM) (PVC) Sewer Pipe and Fittings.
 - .5 CAN/CSA-B182.1, Plastic drain and Sewer Pipe and Fittings.
 - .6 CAN/CSA-B182.2, PVC Sewer Pipe and Fittings, (PSM Type).
 - .7 CAN/CSA-B182.11, Standard Practice for the Installation of Thermoplastic Drain and Sewer, Storm Pipes and Fittings.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with this division.
- .2 Submit shop drawings of the manufacturers test data and certification prior to ordering materials or commencing with any work.

1.3 SCHEDULING OF WORK

- .1 All work is to be scheduled to minimize interruptions of existing services.
- .2 Interruptions of any service during school hours is not permitted.
- .3 Submit a schedule of anticipated service interruptions for WDCSB project manager and engineer review and approval.
- .4 Notify building operation, maintenance and school staff of any interruptions 24 hours in advance.
- .5 Notify and obtain written approval from all local authorities having jurisdiction of any interruption of services, (water utility provider, fire dept., police, etc.).

Part 2 PRODUCTS

2.1 PLASTIC PIPE

- .1 Type PSM PVC to ASTM D3034 or CAN/CSA-B182.2.
 - .1 Standard dimensional ratio SDR 28 35 41
 - .2 Locked in gasket and integral bell system
 - .3 Nominal 6M lengths.

2.2 CEMENT MORTAR

- .1 Portland cement to CAN/CSA-A300 Series, normal type 10.
- .2 Mix mortar in accordance with manufacturers instructions.

2.3 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material, crushed or screened stone, gravel or sand.
- .2 Granulations to be in accordance with ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.
- .3 Concrete mixes and materials for cradles, encasement and supports in concrete section.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Clean and dry all pipes and fittings prior to installation.
- .2 Inspect all materials for any defects and remove from site.

3.2 TRENCHING

- .1 In accordance with Excavating, Trenching and Backfilling Section.
- .2 X-Ray / Scan and existing concrete floor areas before cutting slab to ensure no conflicts.
- .3 Prevent any contents from the piping system to flow into the trench.
- .4 Trenching / rough-in are to be inspected by the consultant prior to backfill.

3.3 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness to a depth of 150mm below bottom of pipe depth.
- .2 No installations are to be made in frozen conditions.
- .3 Shape bed with grade to provide a continuous uniform bedding for piping.
- .4 Shape depressions in bedding to suit any joints or fittings.
- .5 Compact each layer full width of bed to at least 95% maximum dry density to ASTM D698.

3.4 PIPE INSTALLATION

- .1 Lay-in and join pipes in accordance with the relevant standards and manufacturers instructions.
- .2 Install couplings necessary for connection to incoming services.
- .3 Install pipes to CAN/CSA B182.11.
- .4 Handle all materials in accordance with the manufacturer's requirements.
- .5 Do not use chains or cables passing through pipes affecting pipe ends.
- .6 Lay pipes on prepared bedding, true to line of grading. Ensure each pipe is in contact with shaped bedding for its entire length.
- .7 Face socket ends of piping in the direction of laying. Face socket ends up grade for any mains on grade 2% of greater.
- .8 Keep jointing materials free of any dirt or debris.
- .9 Keep gaskets clear of any dirt or debris, lubricate upon installation.
- .10 Install removable watertight covers on end of all pipes when works stops.
- .11 Pipe cutting and cleaning methods as per the pipe manufacturers guidelines.

- .12 Install gaskets in accordance with the manufacturer's requirements.
- .13 Support / handle pipes with slings and/or a crane to minimize pressure on piping.
- .14 Complete each joint.
- .15 Avoid deflection after installation has been made
- .16 Apply pressure when making joints to ensure a fully completed connection.
- .17 Completed joints are to be supported by compacting bedding on side and top of piping.
- .18 Provide hydrostatic and leakage testing reports to the engineer and inspector for review and approval.
- .19 Backfill remainder of trench.

3.5 PIPE SURROUND

- .1 Upon completion of all pipe installations and consultant inspection / approval, cover all pipe surrounding areas.
- .2 Hand place surrounding materials in uniform layers not exceeding section of 150mm compacted thickness.
- .3 Do not surround any piping or fittings under frozen conditions.
- .4 Compact each layer from mid-height of pipe invert to at least 95% of the corrected maximum dry density to ASTM D698.

3.6 BACKFILL MATERIAL

- .1 As required in Trenching, Excavating and Backfill Sections.
- .2 Place backfill in unfrozen conditions.

3.7 FIELD TESTING OF GRAVITY DRAINS

- .1 Repair or replace pipes, pipe joints or bedding that is found to be defective.
- .2 Remove any debris or foreign materials from pipes.
- .3 Flush system.
- .4 Perform infiltration and exfiltration testing after jointing, bedding work is complete and service connections complete.
- .5 Repair and re-test any defective sewer lines as required.

3.8 SURFACE RESTORATION

- .1 Restore all surfaces to the satisfaction of the authorities having jurisdiction and WCDSB.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes, standards, etc. to be in accordance with the latest edition.
- .2 ASTM International (ASTM)
 - .1 ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 CAN/CSA B79, Commercial and Residential Drains and Cleanouts.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with this division.
- .2 Submit shop drawings of the manufacturers test data and certification prior to ordering materials or commencing with any work.

1.3 MAINTENANCE DATA

- .1 Provide shop drawings and product data.
- .2 To include all dimensions, product construction type and materials.
- .3 Requirements for operation and maintenance.

Part 2 PRODUCTS

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79
- .2 Type FD: General duty; cast iron body, nickel bronze strainer, integral seepage pan and clamping collar.
 - Acceptable materials:
 - Zurn ZN-415-B
 - Mifab F1100C
 - Watts FD-100-C-AS or FD-100-C-LS-1
 - Contour C2000R5NB or C2000S5NB
- .3 Type FDD: Combination floor / floor funnel drain; cast iron body, nickel bronze strainer, integral seepage pan and clamping collar, nickel bronze head strainer with integral funnel.
 - Acceptable materials:
 - Zurn ZN-415-F / BE or BF
 - Mifab F1100C-EG
 - Watts FD-100-C-EG-1
 - Contour C2000R5HNB

2.2 CLEAN OUTS

- .1 Cleanout plugs: Heavy-duty cast-iron male ferrule with brass screws and threaded brass or bronze plug. Sealing caulked seat or neoprene gasket.
- .2 Wall access face or wall type stainless steel round cover with flush head securing screws, bevelled edge with anchoring plugs.

Acceptable materials:

Zurn ZSS-1469

Mifab C1400-RD

Ancon CO-480-RD-3

Contour C3700RAC

- .3 Floor access rectangular, round or as indicated, cast iron body and frame with adjustable secured 15mm thick flush mounted heavy duty nickel bronze top and plugs bolted bronze with neoprene gasket.

- .4 Cover for unfinished concrete floors: nickel bronze round gasket, vandal proof screws.

Acceptable materials:

Zurn ZN-1400-HD or ZNX-1612

Mifab C1100-XR-6

Ancon CO-200-RX-1-6

Contour C3000RXNB

- .5 Cover for VCT tile and linoleum floors: square polished nickel bronze with 15mm thick flush heavy duty nickel bronze cover complete with vandal proof locking screws.

Acceptable materials:

Zurn ZN-1400-T-HD or ZNX-1612

Mifab C1100-S-6

Ancon CO-200-S-1-6

Contour C3000SNB

- .6 Cover for ceramic tile floors: square polished nickel bronze with 15mm thick flush heavy duty nickel bronze cover complete with vandal proof locking screws for flush finish.

Acceptable materials:

Zurn ZN-1400-T-HD or ZNX-1612

Mifab C1100-S-6

Ancon CO-200-S-1-6

Contour C3000RMNB

- .7 Cover for carpeted floors: round polished nickel bronze with 15mm thick flush heavy duty nickel bronze cover complete with vandal proof locking screws for flush finish.

Acceptable materials:

Zurn ZN-1400-HD-CM or ZN-1612-CM

Mifab C1100-S-1-6

Ancon CO-200-RC-1-6

Contour C3000RMNB

2.3 TRAP SEAL PRIMERS

- .1 All brass with integral vacuum breaker.

- .2 Provide trap seal primer stations where indicated. To be complete with solenoid valve, back flow preventor, vacuum breaker.

- .3 All trap seal primer units are to be complete with servicing isolation valves.

- .1 Type TP-1: Acceptable materials:

PPP Prime Pro Pro1-500

Zurn Z-1022

Watts MS-810

- .2 Type TP-2: Acceptable materials:
PPP Prime Pro Pro1-500 complete with DU-2, 2-way distribution unit
Zurn Z-1022 complete with DU2, 2-way distribution unit
- .3 Type TP-3: Acceptable materials (Electronic timed trap seal primer):
PPP SMP-500-115 complete with DU-3, 3-way distribution unit
Zurn Z-1020

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect and ensure proper operation of all devices. Inform consultant and PM of any discrepancies and remedy any faulty or defective items.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install in accordance with relevant National and Provincial codes and standards.
- .2 Install in accordance with manufacturer's instructions and as specified.
- .3 All floor, hub and/or floor funnel drain trap are to be furnished with trap seal primer adapter for priming.

3.4 TESTING AND ADJUSTING

- .1 General:
 - .1 Test, adjust and ensure proper operation of all devices.
- .2 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .3 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .4 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .5 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.

- .3 Verify that cleanout plug does not leak.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes and standards shall be to the latest edition.
- .2 American Society of Mechanical Engineers (ASME):
 - .1 ASME B31.9, Building Services Piping
- .3 ASTM International (ASTM):
 - .1 ASTM D2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
 - .2 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
 - .3 ASTM F1417, Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
- .4 CSA Group (CSA):
 - .1 ASME A112.18.2/CSA B125.2, Plumbing waste fittings
 - .2 CSA B181.1, Acrylonitrile-butadiene-styrene (ABS) drain, waste, and vent pipe and pipe fittings
 - .3 CSA B181.2, Polyvinylchloride (PVC) and chlorinated polyvinylchloride
 - .4 CSA B182.1, Plastic drain and sewer pipe and pipe fittings
 - .5 CSA B182.2, PSM type polyvinylchloride (PVC) sewer pipe and fittings
 - .6 CSA B182.4, Profile polyvinylchloride (PVC) sewer pipe and fittings
 - .7 CSA B182.6, (CPVC) drain, waste, and vent pipe and pipe fittings
 - .8 CSA B182.11, Standard practice for the installation of thermoplastic drain, storm, and sewer pipe and fittings
 - .9 CSA B182.13, Profile polypropylene (PP) sewer pipe and fittings for leak-proof sewer applications
- .5 ULC Standards (ULC):
 - CAN/ULC-S102.2, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

Part 2 PRODUCTS

2.1 PIPES AND FITTINGS

- .1 Buried Sanitary and Sanitary Vent Piping:
 - .1 80mm and smaller: ABS to CAN/CSA-B181.1.
 - .2 100MM and larger: SDR-35 to CAN/CSA-B181.2.
 - .3 Vent piping, PVC-DWV to CAN/CSA-B181.2.
- .2 Above Grade / Slab Sanitary and Sanitary Vent Piping, (in walls, plenum spaces, etc.)
 - .1 80mm and smaller: IPEX PVC-XFR to CAN/CSA-B181.1.
 - .2 100MM and larger: IPEX PVC-XFR to CAN/CSA-B181.2.
 - .3 Vent piping, IPEX PVC-XFR to CAN/CSA-B181.2.

- .3 Fire Stopping:
 - .1 Where any above grade / slab piping penetrates a fire separation, supply & install listed fire stopping devices and sealant at all penetrations in accordance with the manufacturers shop drawings.
 - .2 Refer to Architectural plans for fire rated assemblies.

2.2 JOINTS

- .1 Solvent weld for PVC to ASTM D2564
- .2 Solvent weld for ABS to ASTM D2235

Part 3 EXECUTION

3.1 PIPE INSTALLATION

- .1 Perform all installations in accordance with the relevant codes, standards and manufacturers instructions.
- .2 Installation of underground Pipes:
 - .1 Perform all excavation, bedding, backfill and compaction.
 - .2 Install materials in accordance with the manufacturer's instruction.
 - .3 Provide support to make gasketed joint connections.
 - .4 Stabilize all trenches
 - .5 Material and compaction to ASTM standards.
 - .6 Piping and joist shall be clean prior to assembly.
- .3 Clean Outs:
 - .1 Refer to plans for clean out locations
 - .2 Provide clean out at every change in piping direction.
 - .3 Clean outs are to be provided every 15M of horizontal piping.
 - .4 All clean outs are to be accessible.
- .4 Install piping at indicated slopes with continuous invert, free of sags and bends.
- .5 All fixtures discharging water into a sanitary sewer system or building sewer lines shall have a seal trap in connection with a venting system so sewer gasses can pass freely to the atmosphere with no pressure or siphonage on the water seal.
- .6 Before any piping is covered conduct tests in the presence of the consultant and local authorities having jurisdiction.
 - .1 Conduct ball tests.
 - .2 Fill piping to 1.5M above slab with water and verify that no water has leaked after a 2-hour period.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes and standards shall be to the latest edition.
 - .1 ASTM C14M, Specification for Non-reinforced Concrete Sewer, Storm Drain and Culvert Pipe.
 - .2 ASTM C76M, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - .3 ASTM C117, Test Method for Material Finer than 0.075mm Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136, Method for Sieve Analysis of fine and Coarse Aggregates.
 - .5 ASTM C443M, Specification for Joints for concrete pipe and manholes using rubber gaskets.
 - .6 ASTM D2680, Specification for ABS and PVC Composite Sewer Piping.
 - .7 ASTM D3034, Standards for PSM and PVC Sewer Pipe and Fittings.
 - .8 CAN/CSA-A3001, Cementitious Materials for use in Concrete
 - .9 ASTM C700, Specification for vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
 - .10 CAN/CSA-A257, Standards for Concrete Pipe and Manhole Sections.
 - .11 CAN/CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.
 - .12 CAN/CSA-B182.2, PVC Sewer Pipe and Fittings, (PSM Type).
 - .13 CSA B182.11, Standard Practice for the installation of Thermoplastic Drain, Storm and Sewer Pipe and Pipe Fittings.
 - .14 CAN/CGSB-8.1 / 8.2, Sieves Testing, Woven Wire.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with this division.
- .2 Submit shop drawings of the manufacturers test data and certification prior to ordering materials or commencing with any work.

1.3 SCHEDULING OF WORK

- .1 All work is to be scheduled to minimize interruptions of existing services.
- .2 Interruptions of any service during school hours is not permitted.
- .3 Submit a schedule of anticipated service interruptions for WDCSB project manager and engineer review and approval.
- .4 Notify building operation, maintenance and school staff of any interruptions 24 hours in advance.
- .5 Notify and obtain written approval from all local authorities having jurisdiction of any interruption of services, (water utility provider, fire dept., police, etc.).

Part 2 PRODUCTS

2.1 PLASTIC PIPE

- .1 Larger diameter pipe, ribbed PVC type and fittings to CAN/CSA B182.4 ASTM F794

- .1 Standard dimensional ratio SDR 35
- .2 Locked in gasket and integral bell system
- .3 Nominal 6M lengths.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material, crushed or screened stone, gravel or sand.
- .2 Granulations to be in accordance with ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.
- .3 Concrete mixes and materials for cradles, encasement and supports in concrete section.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Clean and dry all pipes and fittings prior to installation.
- .2 Inspect all materials for any defects and remove from site.

3.2 TRENCHING

- .1 In accordance with Excavating, Trenching and Backfilling Section.
- .2 X-Ray / Scan and existing concrete floor areas before cutting slab to ensure no conflicts.
- .3 Prevent any contents from the piping system to flow into the trench.
- .4 Trenching / rough-in are to be inspected by the consultant prior to backfill.

3.3 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness to a depth of 150mm below bottom of pipe depth.
- .2 No installations are to be made in frozen conditions.
- .3 Shape bed with grade to provide a continuous uniform bedding for piping.
- .4 Shape depressions in bedding to suit any joints or fittings.
- .5 Compact each layer full width of bed to at least 95% maximum dry density to ASTM D698.

3.4 PIPE INSTALLATION

- .1 Lay-in and join pipes in accordance with the relevant standards and manufacturers instructions.
- .2 Install couplings necessary for connection to incoming services.
- .3 Install pipes to CAN/CSA B182.11.
- .4 Handle all materials in accordance with the manufacturer's requirements.
- .5 Do not use chains or cables passing through pipes affecting pipe ends.
- .6 Lay pipes on prepared bedding, true to line of grading. Ensure each pipe is in contact with shaped bedding for its entire length.
- .7 Face socket ends of piping in the direction of laying. Face socket ends up grade for any mains on grade 2% of greater.

- .8 Keep jointing materials free of any dirt or debris.
- .9 Keep gaskets clear of any dirt or debris, lubricate upon installation.
- .10 Install removable watertight covers on end of all pipes when works stops.
- .11 Pipe cutting and cleaning methods as per the pipe manufacturers guidelines.
- .12 Install gaskets in accordance with the manufacturer's requirements.
- .13 Support / handle pipes with slings and/or a crane to minimize pressure on piping.
- .14 Complete each joint.
- .15 Avoid deflection after installation has been made
- .16 Apply pressure when making joints to ensure a fully completed connection.
- .17 Completed joints are to be supported by compacting bedding on side and top of piping.
- .18 Provide hydrostatic and leakage testing reports to the engineer and inspector for review and approval.
- .19 Backfill remainder of trench.

3.5 PIPE SURROUND

- .1 Upon completion of all pipe installations and consultant inspection / approval, cover all pipe surrounding areas.
- .2 Hand place surrounding materials in uniform layers not exceeding section of 150mm compacted thickness.
- .3 Do not surround any piping or fittings under frozen conditions.
- .4 Compact each layer from mid-height of pipe invert to at least 95% of the corrected maximum dry density to ASTM D698.

3.6 BACKFILL MATERIAL

- .1 As required in Trenching, Excavating and Backfill Sections.
- .2 Place backfill in unfrozen conditions.

3.7 FIELD TESTING OF GRAVITY DRAINS

- .1 Repair or replace pipes, pipe joints or bedding that is found to be defective.
- .2 Remove any debris or foreign materials from pipes.
- .3 Flush system.
- .4 Perform infiltration and exfiltration testing after jointing, bedding work is complete and service connections complete.
- .5 Repair and re-test any defective sewer lines as required.

3.8 SURFACE RESTORATION

- .1 Restore all surfaces to the satisfaction of the authorities having jurisdiction and WCDSB.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes and standards shall be to the latest edition.
- .2 ASTM International (ASTM):
 - .1 ASTM D2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
 - .2 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
- .3 CSA Group (CSA):
 - .1 CSA B181.1, Acrylonitrile-butadiene-styrene (ABS) drain, waste, and vent pipe and pipe fittings
 - .2 CSA B181.2, Polyvinylchloride (PVC) and chlorinated polyvinylchloride
 - .3 CSA B182.1, Plastic drain and sewer pipe and pipe fittings
 - .4 CSA B182.11, Standard practice for the installation of thermoplastic drain, storm, and sewer pipe and fittings

Part 2 PRODUCTS

2.1 PIPES AND FITTINGS

- .1 Buried Storm Piping:
 - .1 80mm and smaller: ABS to CAN/CSA-B181.1.
 - .2 100MM and larger: SDR-35 to CAN/CSA-B181.2.
- .2 Above Grade / Slab Storm Piping, (in walls, plenum spaces, etc.)
 - .1 80mm and smaller: IPEX PVC-XFR to CAN/CSA-B181.1.
 - .2 100MM and larger: IPEX PVC-XFR to CAN/CSA-B181.2.
- .3 Fire Stopping:
 - .1 Where any above grade / slab piping penetrates a fire separation, supply & install listed fire stopping devices and sealant at all penetrations in accordance with the manufacturers shop drawings.
 - .2 Refer to Architectural plans for fire rated assemblies.

2.2 JOINTS

- .1 Solvent weld for PVC to ASTM D2564
- .2 Solvent weld for ABS to ASTM D2235

Part 3 EXECUTION

3.1 PIPE INSTALLATION

- .1 Perform all installations in accordance with the relevant codes, standards and manufacturers instructions.

- .2 Installation of underground Pipes:
- .3 Perform all excavation, bedding, backfill and compaction.
- .4 Install materials in accordance with the manufacturer's instruction.
- .5 Provide support to make gasketed joint connections.
- .6 Stabilize all trenches
- .7 Material and compaction to ASTM standards.
- .8 Piping and joist shall be clean prior to assembly.
- .9 Clean Outs:
 - .1 Refer to plans for clean out locations
 - .2 Provide clean out at every change in piping direction.
 - .3 Clean outs are to be provided every 15M of horizontal piping.
 - .4 All clean outs are to be accessible.
- .10 Install piping at indicated slopes with continuous invert, free of sags and bends.
- .11 All fixtures discharging water into a sanitary sewer system or building sewer lines shall have a seal trap in connection with a venting system so sewer gasses can pass freely to the atmosphere with no pressure or siphonage on the water seal.
- .12 Before any piping is covered conduct tests in the presence of the consultant and local authorities having jurisdiction.
 - .1 Conduct ball tests.
 - .2 Fill piping to 1.5M above slab with water and verify that no water has leaked after a 2-hour period.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes, standards, etc. to be in accordance with the latest edition.
- .2 ASTM International (ASTM)
 - .1 ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 CAN/CSA B79, Commercial and Residential Drains and Cleanouts.

1.2 SUBMITTALS

- .1 Provide shop drawings and product data.
- .2 To include all dimensions, product construction type and materials.
- .3 Requirements for operation and maintenance.

Part 2 PRODUCTS

2.1 ROOF DRAINS

- .1 Roof Drains (No flow control per Prime Consultant)
- .2 Type RD: Cast iron body, under deck clamp and sump receiver to suit roof construction, flashing clamp ring with integral gravel stop, bearing pan and poly dome.
 - Acceptable materials:
 - Zurn Z100F
 - Mifab R1200
 - Watts RD-280

2.2 CLEAN OUTS

- .1 Cleanout plugs: Heavy-duty cast-iron male ferrule with brass screws and threaded brass or bronze plug. Sealing caulked seat or neoprene gasket.
- .2 Wall access face or wall type stainless steel round cover with flush head securing screws, bevelled edge with anchoring plugs.
 - Acceptable materials:
 - Zurn ZSS-1469
 - Mifab C1400-RD
 - Ancon CO-480-RD-3
 - Contour C3700RAC
- .3 Floor access rectangular, round or as indicated, cast iron body and frame with adjustable secured 15mm thick flush mounted heavy duty nickel bronze top and plugs bolted bronze with neoprene gasket.
- .4 Cover for unfinished concrete floors: nickel bronze round gasket, vandal proof screws.
 - Acceptable materials:
 - Zurn ZN-1400-HD or ZZN-1612
 - Mifab C1100-XR-6
 - Ancon CO-200-RX-1-6

Contour C3000RXNB

- .5 Cover for VCT tile and linoleum floors: square polished nickel bronze with 15mm thick flush heavy duty nickel bronze cover complete with vandal proof locking screws.
- Acceptable materials:
Zurn ZN-1400-T-HD or ZZN-1612
Mifab C1100-S-6
Ancon CO-200-S-1-6
Contour C3000SNB
- .6 Cover for ceramic tile floors: square polished nickel bronze with 15mm thick flush heavy duty nickel bronze cover complete with vandal proof locking screws for flush finish.
- Acceptable materials:
Zurn ZN-1400-T-HD or ZZN-1612
Mifab C1100-S-6
Ancon CO-200-S-1-6
Contour C3000RMNB
- .7 Cover for carpeted floors: round polished nickel bronze with 15mm thick flush heavy duty nickel bronze cover complete with vandal proof locking screws for flush finish.
- Acceptable materials:
Zurn ZN-1400-HD-CM or ZN-1612-CM
Mifab C1100-S-1-6
Ancon CO-200-RC-1-6
Contour C3000RMNB

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
- .2 Visually inspect and ensure proper operation of all devices. Inform consultant and PM of any discrepancies and remedy any faulty or defective items.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install in accordance with relevant National and Provincial codes and standards.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 TESTING AND ADJUSTING

- .1 General:
- .1 Test, adjust and ensure proper operation of all devices.

- .2 Roof drains:
 - .1 Check operations.
 - .2 Check security, accessibility, removability of strainer.
 - .3 Clean out baskets.
 - .4 Verify no leaks in piping or roof connections.
- .3 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .4 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .5 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes, standards, etc. to be in accordance with the latest edition.
- .2 ANSI Z21.10.1/CSA 4.1, Gas Water Heaters Volume 1, Storage Water Heaters with input ratings of 75,000 BTUH or less.
- .3 CSA-B149.1, Natural Gas and Propane Installation Code.
- .4 CAN/CSA-C309, Performance Requirements for Gas Lined Storage Tanks.

1.2 SHOP DRAWINGS

- .1 Provide shop drawings and product data.
- .2 To include the equipment, equipment performance, connections, fittings, control assemblies, ancillaries, wiring schematic, dimensions, etc.

Part 2 PRODUCTS

2.1 GAS FIRED HOT WATER TANK (HWT-1)

- .1 Rheem Professional classic heavy duty hot water tank - Model PRO+G50-50U
Floor mounted, 50 USG capacity, 50.0 MBH gas input – Minimum 3-year warranty
- .2 Acceptable Alternatives
Bradford White
A.O. Smith
John Wood
- .3 Complete house keeping pad, watertight stainless-steel drip pan and indirect drain line to floor funnel drain.
- .4 Gas burning complete with high limit control, gas valve, pressure regulator and safety shut off.
- .5 Sealed combustion venting through the roof, (ULC S636)
- .6 Drain Valve and hose end terminated above floor funnel drain.
- .7 Thermometer.
- .8 Control valve temperature sensor
- .9 ASME rated temp. & pressure relief valve.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with the manufacturer's recommendations and relevant codes / standards.
- .2 Install in accordance with CSA B149.
- .3 Start up and check for safe and proper operation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes, standards, etc. to be in accordance with the latest edition.
- .2 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.

1.2 SHOP DRAWINGS

- .1 Provide shop drawings and product data.
- .2 To include the equipment, equipment characteristics, connections, fittings, control assemblies, ancillaries, wiring schematic, dimensions, etc.

Part 2 PRODUCTS

2.1 DOMESTIC HOT WATER EXPANSION TANK (ET-1)

- .1 Pre-charged hydropneumatics steel expansion tank complete with internal diaphragm.
- .2 Construction shall be in accordance with ASME Boiler and Pressure Vessel Code.
- .3 Tank is to be c/w nameplate indicating a maximum working pressure of 150 psi and a maximum working temperature of 250°F.
- .4 24L/4.5Gal tank volume with 0.73 acceptance factor.
- .5 Acceptable materials: (Equal to):
 - .1 Amtrol ST-12C

2.2 DOMESTIC HOT WATER RECIRCULATING PUMP (RP-1)

- .1 Construction: closet coupled, in-line centrifugal, all bronze construction, stainless steel shaft / sleeve, oil lubricated sleeves / ball bearings.
- .2 Motor to be c/w thermal overload protection.
- .3 Provide supports for pump.
- .4 To be complete with optional controls: Auto, Aqua stat or 100% function.
- .5 Pump to be set to 100% and controlled on/off by programmable digital 24hr/365day time clock. Time clock to be set for school operating hours / days. Setting to be coordinated on site with consultant and project manager during shop drawings review process and on site.
- .6 Provide operating manuals for pump and time clock tagged in room near system and in closing operating manuals.
- .7 Acceptable materials:
 - Taco 006e3
 - Armstrong Astro Series
 - Bell & Gossett NBF Series
 - Grundfos Comfort PM Series

2.3 DOMESTIC HOT WATR THERMOSTATIC MIXING VALVE (MV-1)

- .1 1" inlet / outlet thermostatic controller with swivel action check stops, removable cartridge with strainer, stainless steel piston and liquid fill thermal motor with bellows mounted out of water. Volume control shut off valve, bimetal dial thermometer, (785mm face range 20'-240'f), brass pipe, fittings and unions. Standard valve and piping finish rough bronze.
- .2 ASSE 1017 / CSA B125.3 certified.
- .3 Acceptable materials: (Equal to):
 - .1 Symmons 7-1000A-ASB-W

2.4 WATER HAMMER ARRESOTR (WHA-1)

- .1 Copper construction, bellows type to PDI-WH-201.
- .2 ASSE/ANSI certified.
- .3 Acceptable materials: (Equal to):
 - .1 Mifab MWH Series (38mm)

2.5 Unions

- .1 Acceptable manufacturers
Crane
Grinnel
Dart

Part 3 FIELD QUALITY CONTROL

- .1 Start up and commission system
- .2 Check all power supplies.
- .3 Check power protective devices
- .4 Cheak for safe and proper operation
- .5 Adjust flow rates.

Part 4 CLOSE OUT DOCUMENTS

- .1 Provide maintenance and engineering data in manuals.
- .2 Data to include but not limited to manufacturers name, models, types, year, capacities, serial numbers and details of operating, serving and maintenance requirements.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes, standards, etc. to be in accordance with the latest edition.
- .2 AHRI 1010, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers
- .3 CAN/CSA Group (CSA):
 - .1 CAN/CSA-B45, Plumbing Fixtures (Consists of B45.0, B45.1, B45.2, B45.3, B45.4, B45.5, B45.6, B45.7, B45.8 and B45.9)
 - .2 CAN/CSA B125.3, Plumbing Fittings.
 - .3 CAN/CSA-B651, Accessible Design for the Built Environment.
 - .4 CAN/CSA-B45S1, Supplement#1 to CAN/CSA B-45 Series Plumbing Fixtures.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings and product data.
- .2 To include the equipment, equipment characteristics, trims, connections, rough-in details, fittings, control assemblies, ancillaries, consumption rates, dimensions, etc.

1.3 CLOSE OUT DOCUMENTS

- .1 Provide maintenance data including monitoring requirements.
- .2 Provide description of fixtures and trim, manufacturer name, model, year and capacities.
- .3 Provide details of operation, servicing and maintenance.
- .4 Spare parts list.

Part 2 PRODUCTS

2.1 MANUFACTURED UNITS

- .1 Fixtures in accordance with CAN/CSA-B45.
- .2 Trims, fittings in accordance with CAN/CSA-B125.3
- .3 Exposed chrome plated brass piping.
- .4 Fixture locations to suit architectural plans.
- .5 Fixtures and trim to be of same type.
- .6 Provide fixture carrier systems for all wall mounted fixtures, (equal to Zurn, Smith or Watts carrier systems or otherwise specified by the manufacturer).

2.2 FIXTURE CARRIERS

- .1 All wall mounted fixtures are to be c/w factory built floor mounted carrier systems.
- .2 Acceptable Manufacturers
 - .1 Watts
 - .2 Zurn

.3 Ancon

2.3 T-1: WATER CLOSET, HARD WIRED SENSOR TYPE FLUSH VALVE, BARRIER FREE, (BOPYS AND GIRLS WASHROOMS)

- .1 Barrier free, floor mounted, top spud sensor flush valve toilet.
- .2 Top of seat to be 430mm – 485mm, (17" – 19") form the finished floor.
- .3 Vitreous china bowl, floor mounted, syphon jet, elongated rim, top spud for flush valve installation, bolts, caps.
 - .1 Acceptable Manufacturers
 - .1 American Standards Madera, (419mm / 16.5" height).
 - .2 Crane
 - .3 Kohler
- .4 Flush Valve: exposed, polished chrome, externally adjustable, diaphragm type with NPS 25mm, (1"), screwdriver angle stops, AC powered with transformer, flush connection and coupling for NPS 40MM, (1-1/2"), top spud, wall and spud escutcheons, seat bumper and vacuum breaker. Low flush cycle adjustable from 3.8G – 17L, (1.0G – 4.5G), per flush. Factory set to 5.7L, (1.5G), per flush. Transformer suitable for 120/1/60, (provide flush valve offset extension as required).
- .5 Important Note: The sensor assembly and sensor eye must clear the rear grab bar and top of the toilet seat cover in it open / lifted position.
 - .1 Acceptable Manufacturers
 - .1 Delta 81T201-WMSHWA
 - .2 Sloan
 - .3 Moen
- .6 Seat: White, elongated, open front seat with seat cover, antimicrobial, moulded solid plastic, stainless steel check hinges, stainless steel or brass insert post.
 - .1 Acceptable Manufacturers
 - .1 Centoco 820STSSFE-001 / AM820STS
 - .2 Bemis

2.4 T-2: WATER CLOSET, HARD WIRED SENSOR TYPE FLUSH VALVE, (BOYS AND GIRLS WASHROOMS)

- .1 Floor mounted, top spud sensor flush valve toilet.
- .2 Top of seat to be 430mm – 485mm, (17" – 19") form the finished floor.
- .3 Vitreous china bowl, floor mounted, syphon jet, elongated rim, top spud for flush valve installation, bolts, caps.
 - .1 Acceptable Manufacturers
 - .1 American Standards Madera, (419mm / 16.5" height).
 - .2 Crane
 - .3 Kohler
- .4 Flush Valve: exposed, polished chrome, externally adjustable, diaphragm type with NPS 25mm, (1"), screwdriver angle stops, AC powered with transformer, flush connection and coupling for NPS 40MM, (1-1/2"), top spud, wall and spud escutcheons, seat bumper and vacuum breaker. Low flush cycle adjustable from 3.8G – 17L, (1.0G – 4.5G), per flush. Factory set to 5.7L, (1.5G), per flush. Transformer suitable for 120/1/60, (provide flush valve offset extension as required).

- .1 Acceptable Manufacturers
 - .1 Delta 81T201-WMSHWA
 - .2 Sloan
 - .3 Moen
- .5 Seat: White, elongated, open front seat, antimicrobial, moulded solid plastic, stainless steel check hinges, stainless steel or brass insert post.
 - .1 Acceptable Manufacturers
 - .1 Centoco1500STSCC-001
 - .2 Bemis

2.5 T-3: WATER CLOSET, MANUAL FLUSH LEVER TANK TYPE, (KINDERGARDEN)

- .1 Junior height fixture, floor mounted, tank type manual flush lever toilet.
- .2 Vitreous elongated china bowl, floor mounted, siphon jet, tank with tank liner inside, bolts, caps.
- .3 HET toilet, 4.8L, (1.28G), per flush.
 - .1 Acceptable Manufacturers
 - .1 American Standards Baby Devoro 2315.228
 - .2 Crane
 - .3 Kohler
- .4 Seat: White, elongated, open front seat with seat cover, antimicrobial, moulded solid plastic, stainless steel check hinges, stainless steel or brass insert post.
 - .1 Acceptable Manufacturers
 - .1 Centoco 820STSSFE-001 / AM820STS
 - .2 Bemis

2.6 T-4: WATER CLOSET, MANUAL FLUSH LEVEL TANK TYPE, (STAFF WASHROOM)

- .1 Floor mounted, tank type manual flush lever toilet with pressure assist technology.
- .2 Vitreous elongated china bowl, floor mounted, siphon jet, tank with tank liner inside, bolts, caps.
 - .1 Acceptable Manufacturers
 - .1 American Standards Cadet Pressure Assist 2416.016
 - .2 Crane
 - .3 Kohler
- .3 Seat: White, elongated, open front seat, antimicrobial, moulded solid plastic, stainless steel check hinges, stainless steel or brass insert post.
 - .1 Acceptable Manufacturers
 - .1 Centoco 1500STSCC-001
 - .2 Bemis

2.7 WF-1: 3 USER WASH FOUNTAIN, (BOYS AND GIRLS WASHROOMS)

- .1 Barrier free terreon bowl c/w stainless steel access panel.
- .2 Trim: Push button mechanical meter controlled, moulded spray head, stop valves, horizontal swing check valves, thermostatic mixing valve preset for 40°C. 0 – 45 second adjustable spray time, (set to 20 seconds).

- .3 Soap dispensers: concealed mounted on back splash c/w 2 soap valves and vandal proof filler caps.
- .4 Color: To be selected by Architect / consultant during shop drawing review process.
 - .1 Acceptable Manufacturers
 - .1 Bradley: Tri fount MF 2933

2.8 L-1: SINGLE COMPARTMENT SINK, (CORRIDOR)

- .1 Single compartment hand sink.
- .2 20-gauge type 302 stainless steel construction, self rimming, undercoated clamps.
- .3 100mm, (4"), on centres.
- .4 380x380x150mm, (15"x15"x6").
 - .1 Acceptable Manufacturers
 - .1 Kindred Creemore CSLA1515-6-2CB
 - .2 Franke
 - .3 Steel Queen
 - .4 Elkay
- .5 Faucet: chrome plated brass, with single gooseneck spout, vandal resistant, aerator, blade handle, thermostatic mixing valve.
 - .1 Acceptable Manufacturers
 - .1 Delta 27C4834
 - .2 Moen
 - .3 Chicago Faucets
- .6 Waste Fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass p-trap with cleanout.

2.9 L-2: WALL MOUNTED HAND SINK, (KINDERGARDEN)

- .1 Wall mounted, integral back sink.
- .2 Vitreous china with splash lip, soap depression, supply opening at 100mm, (4") centres and overflow.
- .3 500x450mm, (20"x18").
- .4 Sink is to be mounted for junior height / kindergarten use, refer to architectural elevations for height prior to installation.
 - .1 Acceptable Manufacturers
 - .1 American standard Lucerne
 - .2 Crane
 - .3 Kohler
- .5 Water Fitting grid strainer.
- .6 Faucet:
 - .1 Chrome plated brass, single blade handle, mixing valve spout, aerator.
 - .1 Acceptable Materials:
 - .1 Delta 22C131
 - .2 Moen 8413
 - .3 Chicago Faucets

2.10 L-3: SINGLE COMPARTMENT SINK, (KINDERGARDEN)

- .1 Single compartment sink.
- .2 20-gauge type 302 stainless steel construction, self rimming, undercoated clamps.
- .3 450x450x200mm, (18"x18"x8").
- .4 Cold water supply only
- .5 Color: To be selected by Architect / consultant during shop drawing review process.
 - .1 Acceptable Manufacturers
 - .1 Franke S6808-1
 - .2 Kindred
 - .3 Steel Queen
 - .4 Elkay
- .6 Faucet: chrome plated brass, with single gooseneck spout, vandal resistant, aerator, single opening.
 - .1 Acceptable Manufacturers
 - .1 Delta W6600-9 complete with locking pin
 - .2 Moen
 - .3 Chicago Faucets
- .7 Waste Fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass p-trap with cleanout.
- .8 Mount fixture with ledge / faucet at side.

2.11 L-4: WALL MOUNTED HAND SINK, (STAFF WASHROOM)

- .1 Wall mounted, integral back sink.
- .2 Vitreous china with splash lip, soap depression, supply opening at 100mm, (4") centres and overflow.
- .3 500x450mm, (20"x18").
 - .1 Acceptable Manufacturers
 - .1 American standard Lucerne
 - .2 Crane
 - .3 Kohler
- .4 Water Fitting grid strainer.
- .5 Faucet:
 - .1 Chrome plated brass, single blade handle, mixing valve spout, aerator.
 - .1 Acceptable Materials:
 - .1 Delta 22C131
 - .2 Moen 8413
 - .3 Chicago Faucets

2.12 DF-1, WALL MOUNTED DRINKING FOUNTAIN / BOTTLE FILL STATION, (BARRIER FREE IN CORRIDOR)

- .1 Wall mounted unit to provide 8 gph of water. 1-1.5 gpm flow rate with laminar flow to minimize splashing. Antimicrobial protected plastic components. Push bar / button activated and water efficient bubbler. Bottle filling unit shall meet DADA guidelines for frontal / side approach. Leads free design to meet Safe Drinking Water Act. Certified to UL399, CAN/CSA 22.2.120. To be c/w wall plate and wall hanger.
- .2 Trim: vandal resistant, angle stream / squirt bubbler with stream regulator. Self closing pushbutton valve, screwdriver stop, water tailpiece, trap and access cover.
 - .1 Acceptable Manufacturers
 - .1 Murdock A171100F-VR-BF12
 - .2 Elkay EZH2O LZS8WSLK

2.13 EW-1, WALL MOUNTED EMERGENCY EYE WASH STATION

- .1 Wall mounted stainless steel bowl and dust cover emergency eye wash station, push handle activated. Thermostatic mixing valve factory preset to 85°F. 7gpm @ 30psi.
 - .1 Acceptable Manufacturers
 - .1 Guardian WB436621
 - .2 Uline H-11049
 - .3 Haws
 - .4 Bradley

2.14 MS-1, FLOOR MOUNTED MOP SINK

- .1 Fiat TSB3000 floor mounted 610mm x 610mm x 305mm, (24"x24"x12"), terrazzo mop sink with 150MM, (6"), drop open front section, stainless steel caps 145bb strainer plate, 51340075000 brass drain assembly 832aa hose / bracket combination kit, 834aa faucet adaptor, stainless steel splash wall guard behind sink on wall, 830aa block wall surface mounted mop sink faucet c/w wall hanger support kit.

2.15 PLUMBING TRIMS

- .1 Acceptable Manufacturers
 - Chicago
 - Symmons
 - American Standard
 - Crane

Part 3 CLOSE OUT DOCUMENTS

- .1 Provide maintenance and engineering data in manuals.
- .2 Data to include but not limited to manufacturers name, models, types, year, capacities, serial numbers and details of operating, serving and maintenance requirements.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

- .1 ANSI/ASME B31.1, Power Piping
- .2 ANSI/ASME B31.3, Process Piping
- .3 ANSI/ASME Boiler and Pressure Vessel Code
 - .1 BPVC Section I: Power Boilers
 - .2 BPVC Section V: Non-destructive Examination
 - .3 BPVC Section IX: Welding and Brazing Qualifications
 - .4 ANSI/AWWA C206, Field Welding of Steel Water Pipe

.2 American Welding Society (AWS):

- .1 AWS C1.1M/C1.1, Recommended Practices for Resistance Welding
- .2 AWS Z49.1, Safety in Welding, Cutting and Allied Process
- .3 AWS W1, Welding Inspection Handbook

.3 CSA Group (CSA):

- .1 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum
- .2 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding
- .3 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code
- .4 CSA-W117.2, Safety in Welding, Cutting and Allied Processes
- .5 CSA W178.1, Certification of Welding Inspection Organizations
- .6 CSA W178.2, Certification of Welding Inspectors

1.2 QUALIFICATIONS:

.1 Welders:

- .1 Welding qualifications in accordance with CSA B51.
- .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
- .3 Submit welder's qualifications. Each welder to possess identification symbol issued by authority having jurisdiction.
- .4 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.

.2 Inspectors:

- .1 Inspectors qualified to CSA W178.2.

.3 Certifications:

- .1 Registration of welding procedures in accordance with CSA B51.
- .2 Copy of welding procedures available for inspection.
- .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

Part 2 PRODUCTS

2.1 ELECTRODES

- .1 Electrodes: in accordance with CSA W48 Series

Part 3 EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 No work is to be conducted in occupied area.
- .3 Obtain 'Hot Work' permits.

3.2 QUALITY OF WORK

- .1 Welding: in accordance with ANSI/ASME B31.1, B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, and special procedures specified elsewhere of provincial authority having jurisdiction.

3.3 INSTALLATION REQUIREMENTS

- .1 Identify each weld with welder's identification symbol.
- .2 Backing rings:
 - .1 Where used, fit to minimize gaps between ring and pipe bore.
 - .2 Do not install at orifice flanges.
- .3 Fittings:
 - .1 NPS 50mm and smaller: install welding type sockets.
 - .2 Branch connections: install welding tees or forged branch outlet fittings.

3.4 INSPECTION AND TESTS - GENERAL REQUIREMENTS

- .1 Review weld quality requirements and defect limits of applicable codes and standards with the consultant and authorities having jurisdiction.
- .2 Formulate "Inspection and Test Plan" in cooperation with [Departmental Representative] [DCC Representative] [Consultant].
- .3 Do not conceal welds until they have been inspected, tested and approved by inspector.
- .4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.5 SPECIALIST EXAMINATIONS AND TESTS

- .1 General:
 - .1 Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by the consultant.

- .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction
- .3 Inspect and test 25% of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination [and] [magnetic particle (hereinafter referred to as "particle") tests and or full gamma ray radiographic (hereinafter referred to as "radiography") tests].
- .4 Hydrostatically test welds to ANSI/ASME B31.1
- .5 Visual examinations: include entire circumference of weld externally and [wherever possible] internally.
- .6 Failure of visual examinations:
 - .1 Upon failure of welds by visual examination, perform additional testing as directed by the consultant of total of up to 10% of welds, selected at random by the radiographic tests.

3.6 DEFECTS CAUSING REJECTION

- .1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code
- .2 In addition, hydronic water systems:
 - .1 Undercutting greater than 0.8 mm adjacent to cover bead on outside of pipe.
 - .2 Undercutting greater than 0.8 mm adjacent to root bead on inside of pipe.
 - .3 Undercutting greater than 0.8 mm at combination of internal surface and external surface.
 - .4 Incomplete penetration and incomplete fusion greater than total length of 38 mm in 1500 mm length of weld depth of such defects being greater than [0.8] mm.
 - .5 Repair cracks and defects in excess of [0.8] mm in depth.
 - .6 Repair defects whose depth cannot be determined accurately on basis of visual examination or radiographic tests.

3.7 REPAIR OF WELDS WHICH FAILED TESTS

- .1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE):
 - .1 ANSI/ASHRAE/IES 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
- .3 ASTM International (ASTM):
 - .1 ASTM C335/C335M, Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
 - .2 ASTM C449, Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
 - .3 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - .4 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation
 - .5 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
 - .6 ASTM C1423, Standard Guide for Selecting Jacketing Materials for Thermal Insulation
 - .7 ASTM C1729, Standard Specification for Aluminum Jacketing for Insulation
 - .8 ASTM C1767M, Standard Specification for Stainless Steel Jacketing for Insulation
- .4 ULC Standards (ULC):
 - .1 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .2 CAN/ULC-S702.1, Standard For Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification

1.2 SHOP DRAWINGS

- .1 Submit in accordance general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finishes, and limitations.
- .3 Manufacturers' Instructions:
 - .1 Submit manufacturers' duct insulation jointing recommendations and special handling criteria, installation sequence, and cleaning procedures.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer to be a specialist in performing this work and have at least 3 years of successful experience in this type and size of project and qualified to standards of TIAC.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and listing information.
- .2 Protect from weather and construction work / traffic.
- .3 Store at temperatures and conditions recommended by manufacturer.

Part 2 PRODUCTS

2.1 INSULATION

- .1 Fire/Smoke Rating: To CAN/ULC-S102.
 - .1 Maximum flame-spread rating: 25.
 - .2 Maximum smoke developed classification: 50.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- .3 Type C-1: Rigid mineral fibre board to ASTM C612 with factory applied vapour retarder jacket to CGSB 51-GP-52Ma. Maximum 'k' factor to: ASTM C553
- .4 Type C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma. Maximum "k" factor: To ASTM C553.
- .5 Type C-3: High temperature fire rated duct wrap. ULC classified soluble amorphous wool blanket with factory applied flame resistant aluminum foil fiberglass reinforced facing.

2.2 JACKETS

- .1 Canvas jacketing: 220 g/m2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: Compatible with insulation.
- .3 Aluminum jacketing: To ASTM B209 with moisture barrier.
 - .1 Thickness: 0.50-mm, (26 gauge), sheet.
 - .2 Finish: Smooth finish.
 - .3 Jacket banding and mechanical seals: 15mm wide, 0.5mm, (26 gauge), thick stainless steel.
 - .4 Self adhesive type not permitted.
- .4 Stainless steel jacketing:
 - .1 Type: 316.
 - .2 Outer Surface Treatment and Emittance:
 - .3 Thickness: 0.25mm, (32 gauge), sheet.
 - .4 Smooth finish.
 - .5 Jacket banding and mechanical seals 15mm wide, 0.5mm thick stainless steel.
- .5 Self adhesive aluminum:
 - .1 Aluminum skin with adhesive, 1.5mm thick.
 - .2 Modified SBS membrane.
 - .3 Ultraviolet resistance.
 - .4 Overlap joints 50mm.

2.3 ACCESSORIES

- .1 Vapour Retarder Lap Adhesive: Water based, fire retardant type, and compatible with insulation.
- .2 Indoor Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: Hydraulic setting on mineral wool, to ASTM C449.
- .4 ULC listed canvas jacket:
 - .1 220 g/m2 cotton, plain weave, treated with dilute fire-retardant lagging adhesive to ASTM C921
- .5 Tape: Self-adhesive, aluminum, reinforced 75mm wide minimum.
- .6 Contact Adhesive: Quick setting
- .7 Canvas Adhesive: Washable.
- .8 Tie wire: 1.5mm stainless steel.
- .9 Banding: 19mm wide, 0.5mm thick stainless steel.
- .10 Facing: 25mm stainless steel hexagonal wire mesh stitched on one face of insulation.
- .11 Fasteners: 4mm-diameter pins with 40mm clips to suit thickness/length of insulation.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Verify that pressure testing of ductwork systems is complete, witnessed, and certified.
- .2 Verify that surfaces are clean, dry, and free from foreign material.

3.2 INSTALLATION

- .1 Install to manufacturer's instructions, and in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions.
- .3 Use two layers of insulation with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes. Duct insulation shall be continuous through wall and ceiling openings and sleeves, except where firestopping is required.
 - .1 Ensure hangers and supports are outside vapour retarder jacket.
- .5 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: Install at 300mm on centre in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

- .1 Insulation Types and Thicknesses: Conform to following table:

	Type	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	[C-1]	[Yes]	[50]
Round cold and dual temperature supply air ducts	[C-2]	[Yes]	[50]
Rectangular warm air ducts	[C-1]	[No]	[25]
Round warm air ducts	[C-1]	[No]	[25]
Supply, return, and exhaust ducts exposed in space being served			[None]
Outside air ducts to mixing plenum	[C-1]	[Yes]	[25]
Mixing plenums	[C-1]	[Yes]	[25]
Exhaust duct between dampers and louvres	[C-1]	[No]	[25]
Rectangular ducts outside	[C-1]	[Special]	[50]
Round ducts outside	[C-1]	[Special]	[50]
Acoustically lined ducts	[None]		

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

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

.3 Exposed Insulation Finishes:

	MICA Manual Rectangular	MICA Manual Round
Indoor, concealed	None	None
Indoor, exposed	Canvas	Canvas

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - .1 ANSI/ASHRAE/IES 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
- .3 ASTM International:
 - .1 ASTM C335/C335M, Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
 - .2 ASTM C411, Standard Specification for Hot-Surface Performance of High-Temperature Thermal Insulation
 - .3 ASTM C449/C449M, Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
 - .4 ASTM C533, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
 - .5 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation
 - .6 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
 - .7 ASTM C1136, Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - .8 ASTM C1729, Standard Specification for Aluminum Jacketing for Insulation
 - .9 ASTM C1767M, Standard Specification for Stainless Steel Jacketing for Insulation
- .4 ULC Standards (ULC):
 - .1 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .2 CAN/ULC-S702.1, Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification

1.2 SHOP DRAWINGS

- .1 Submit in accordance with standard submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's product literature, specifications, and datasheets. Include product characteristics, performance criteria, and limitations.
 - .2 Submit WHMIS Safety Data Sheet (SDS).
- .3 Drawings:
 - .1 Submit a schedule with a list of insulation for each service location, insulation type, thickness, and jacketing type.
- .4 Certificates: When requested, submit manufacturer's certificates certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturers' Instructions: Submit manufacturer's installation instructions.

1.3 QUALIFICATIONS

- .1 Installer must have at least 3 years experience in this size and type of project.
- .2 Installer to be qualified in standards of TIAC.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Materials to be delivered to site in its original packaging and manufacturers labels and listings.
- .2 Protect all materials from weather & moisture.
- .3 Protect all materials from construction traffic and any potential source of damage.
- .4 All materials are to be stored in temperatures acceptable by the manufacturer.

Part 2 PRODUCTS

2.1 DESCRIPTION

- .1 Regulatory Requirements:
 - .1 Combustible piping materials, including adhesives in accordance with CAN/ULC-S102:
 - .1 Flame-spread rating: Maximum 25.
 - .2 Smoke developed classification: Maximum 50.
- .2 Acceptable Manufacturers
 - Fiberglas Canada
 - Manson
 - Knauf

2.2 INSULATION

- .1 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335/C335M.
- .2 Type A-1: Rigid moulded mineral fibre without factory-applied vapour retarder jacketing.
 - .1 Mineral fibre: ASTM C547/C553.
 - .2 Jacket: CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: ASTM C547/C553
- .3 Type A-3: Flexible unicellular tubular elastomer.
 - .1 Insulation: ASTM C547/C553.
 - .2 Jacket: CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: ASTM C547/C553.
 - .4 To be manufacturer certified to be free of potential cvrakcing or stress corrosion.

2.3 JACKETING

- .1 Polyvinyl Chloride (PVC) Jacketing:
 - .1 One-piece moulded type and sheet, in accordance with CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: White.
 - .3 Minimum service temperature: -20°C.

- .4 Maximum service temperature: 65°C.
- .5 Moisture vapour transmission: Maximum 0.02 perm.
- .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape in matching colour.
- .7 Special requirements:
 - .1 Indoor: [_____].
 - .2 Outdoor: UV-rated material at least [0.5] mm thick.
- .8 Covering adhesive: Compatible with insulation.
- .2 Canvas Jacketing: 220 g/m² cotton, plain weave, and treated with dilute fire retardant.
 - .1 Lagging adhesive: Compatible with insulation.
- .3 Aluminum Jacketing: To ASTM B209M.
 - .1 Thickness: Minimum 0.50mm sheet. Thickness based on the outer diameter of the insula
 - .2 Finish: Smooth.
 - .3 Joining: Longitudinal and circumferential slip joints with 50mm laps.
 - .4 Fittings: Minimum 0.5mm-thick die-shaped fitting covers with factory-attached protective liner.
 - .5 Jacket banding and mechanical seals: Stainless steel, [19] mm wide, minimum 0.5mm thick at 300mm spacing.
 - .6 Jacketing elbows: Factory fabricated, same material as adjacent straight jacketing, 2-piece, smooth finish.
- .4 Stainless steel Jacketing: Type: 316, to ASTM C1767M.
 - .1 Thickness: Minimum 0.25mm.
 - .2 Finish: Smooth.
 - .3 Joining: Longitudinal and circumferential slip joints with 50mm laps.
 - .4 Fittings: Minimum 0.5]m-thick die-shaped fitting covers with factory-attached protective liner.
 - .5 Jacket banding and mechanical seals: Stainless steel, 19mm wide, minimum 0.5mm thick at 300mm spacing.

2.4 ACCESSORIES

- .1 Weatherproof Sealant for Jackets Installed Outdoors.
- .2 Tape: Self-adhesive, aluminum, reinforced, minimum 50mm wide.
- .3 Contact Adhesive: Quick setting type.
- .4 Canvas Adhesive: Washable.
- .5 Tie Wire: Stainless steel, minimum 1.5mm diameter.
- .6 Bands: Stainless steel, 19mm wide, minimum 0.5mm thick.
- .7 Thermal Insulating and Finishing Cement: To ASTM C449, on mineral wool.
- .8 Vapour Retarder Lap Adhesive: Water-based and fire retardant type, compatible with insulation.
- .9 Indoor Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.
- .10 Outdoor Vapour Retarder Finish:

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

Part 3 EXECUTION

3.1 PREPARATION

- .1 Verify that pressure testing of piping systems and adjacent equipment is complete, witnessed, and certified.
- .2 Verify that surfaces are clean, dry, and free from foreign material.

3.2 INSTALLATION

- .1 Install to manufacturer's instructions and in accordance with TIAN National Standards.
- .2 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
- .3 Install piping insulation continuous through wall and ceiling openings and sleeves, except where firestopping is required. Coordinate with Section 07 84 00 - Firestopping.
- .4 Supports and Hangers:
 - .1 Hangers and supports in accordance with Hangers and Supports for HVAC Piping and Equipment.
 - .2 Install hangars and supports outside vapour retarder jacket.
 - .3 Apply high compressive strength insulation that is suitable for HVAC piping service at oversized saddles and shoes where insulation saddles have not been provided.

3.3 INSTALLATION - REMOVABLE PREFABRICATED INSULATION AND ENCLOSURES

- .1 At expansion joints, valves, primary flow measuring elements flanges and unions at all equipment].
- .2 Install components to permit movement of expansion joint, to permit periodic removal and replacement without damage to adjacent insulation.
- .3 Install insulation, fastenings, and finishes that are compatible with piping system.
- .4 Install aluminum high temperature fabric insulation jacketing.

3.4 INSTALLATION - ELASTOMERIC INSULATION

- .1 Insulation to remain dry.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges, and fittings, unless otherwise specified.
- .2 Install insulator and jackets in accordance with TIAC codes and standards.
- .3 Insulate ends of capped piping with type and thickness for capped services.
- .4 Provide insulation thickness as listed in the following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed run-outs to HVAC fixtures, chrome plated piping, valves, fittings.

Application	Temperature	Piping Insulation Type	Run- out	Pipe sizes (NPS) to 1	Pipe sizes (NPS) 1 1/4 to 2	Pipe sizes (NPS) 2 1/2 to 4
Condensate	up to 175°C	[A-1]	38 mm	50 mm	50 mm	50 mm
Hot Water Heating	up to 94°C	[A-1]	25 mm	38 mm	50 mm	50 mm
Refrigerant		[A-3]	25 mm	25 mm	25 mm	

.5 Finishes:

- .1 Exposed indoors: PVC jacketing.
- .2 Exposed in mechanical rooms: PVC jacketing.
- .3 Concealed, indoors: OVC jacketing
- .4 Outdoors: Waterproof aluminum jacketing.
- .5 Finish attachments: Stainless steel screws, bands, at 150mm on centre.
- .6 Seals: Closed.

3.6 SITE QUALITY CONTROL

- .1 Non-Conforming Work: Replace insulation where there is damage to the vapour barrier and insulation is saturated with moisture.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 American Society of Mechanical Engineers (ASME):
 - .1 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24, Metric/Inch Standard
 - .2 ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings
 - .3 ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
 - .4 ASME B18.2.1, Square and Hex Bolts and Screws Inch Series
- .3 ASTM International (ASTM):
 - .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings
 - .2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
 - .3 ASTM B75M, Standard Specification for Seamless Copper Tube [Metric]
 - .4 ASTM B837, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems
- .4 CSA Group (CSA):
 - .1 CAN/CSA B149.1HB:[20], Natural Gas and Propane Installation Code Handbook
 - .2 CAN/CSA B149.2:[20], Propane Storage and Handling Code
 - .3 CSA W47.1:[19], Certification of Companies for Fusion Welding of Steel
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Safety Data Sheets (SDS)

1.2 SHOP DRAWINGS

- .1 Submittals in accordance with submittal procedures.
- .2 Submit manufacturer's product literature, specifications and datasheet for piping, fittings and equipment.
- .3 Indicate on manufacturers catalogue literature.
- .4 Health and Safety:

Part 2 PRODUCTS

2.1 GAS SERVICE

- .1 Arrange with the local gas utility provider to have the gas service upgraded / provided in accordance with the engineering drawings.
- .2 Pay for all associated fees and charges requested by the local gas provider to provide the service / meter installation requirement.
- .3 Submit any plans requested by the gas utility provider.
- .4 Coordinate meter type, regulator, etc. with BAS contractor and gas utility provider.

2.2 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:
 - .1 NPS 13mm – 50mm, screwed.
 - .2 NPS 2 65mm and over, plain end.
- .2 Buried pipes: CGA approved polypropylene complete with tracer wire and marker.
- .3 Copper tube: to ASTM B837

2.3 JOINTING MATERIAL

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1
- .3 Flange gaskets: non-metallic flat.
- .4 Soldered to: ASTM B32
- .5 Screwed brass fittings: Teflon tape.

2.4 FITTINGS

- .1 Steel pipe fittings, screwed, flanged or welded:
 - .1 Malleable iron: screwed, banded, Class 150.
 - .2 Steel pipe flanges and flanged fittings: to ASME B16.5
 - .3 Welding: butt-welding fittings.
 - .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M
 - .5 Bolts and nuts: to ASME B18.2.1
 - .6 Nipples: schedule 40, to ASTM A53/A53M
- .2 Copper pipe fittings, screwed, flanged or soldered:
 - .1 Cast copper fittings: to ASME B16.18
 - .2 Wrought copper fittings: to ASME B16.22
- .3 Brass fittings to ASTM B16.

2.5 BALL VALVES

- .1 To provincial code approved ball valve.
- .2 NPS 50mm and under.
 - .1 Bpdy and cap: Cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: Class 125, 860 kPa, WP 1.4 MPa.
 - .3 Connections: Screwed ends to ASTM B1.20.1
 - .4 Stem: Tamperproof ball drive
 - .5 Stem packing nut: External to body.
 - .6 Ball and seat: Replaceable stainless-steel ball and Teflon seats.
 - .7 Stem seal: TFE with external packing nut.
 - .8 Operator: Removable lever handle.

2.6 LUBRICATED PLUG VALVES

- .1 To provincial code approved Lubricated plug type.
- .2 Body: Cast iron to ASTM A126, 125 psig rating.
- .3 Plug: Tapered with regular pattern port.
- .4 Ends: ANSI B1.20.1.
- .5 Flanged: ANSI B16.1
- .6 Nickel plated lubrication system. Lubricated to suit type and temp. of vessel fluid.
- .7 Lubricate forced to seal and prevent corrosion.
- .8 O-rings between body and plug.
- .9 Removable level handle.

2.7 SUPPORTS

- .1 Equal to C-port CE series adjustable gas supports with fastening brackets.
- .2 Approved gas piping flashing, pitch pockets, etc. where pipes penetrate roof.

2.8 PIPING ON ROOF

- .1 Support piping in accordance with seismic requirements.
 - .1 38mm or less at 2.4M
 - .2 50mm or greater at 3.0M
- .2 Provide support at each elbow and fitting.
- .3 Provide support at each regulator or isolation valve.
- .4 Provide support within 600mm at equipment connection.

Part 3 EXECUTION

3.1 PIPING

- .1 Install in accordance with all provincial codes and CAN/CSA B149.
- .2 Assemble piping to ANSI standards.
- .3 Connect to equipment in accordance with the manufacturers shop drawings.
- .4 Slope piping down in the direction of flow to low points.
- .5 Install drip points:
 - .1 At low points in piping system.
 - .2 At connections to equipment.
- .6 Use eccentric reducers at pipe size change installed at positive drainage.
- .7 Provide required clearance for maintenance.
- .8 Ream pipes, clean of scale or dirt, (interior and exterior).
- .9 Install piping to minimize pipe dismantling at equipment.
- .10 Install regulator vents to code.

- .11 Paint gas piping with 2 coats of approved yellow paint.

3.2 VALVES

- .1 Install valves with stems upright or horizontal unless otherwise approved by the consultant or authorities having jurisdiction.
- .2 Install valves at branch take-offs to isolate pieces of equipment.

3.3 SITE QUALITY CONTROL

- .1 Site Tests and Inspections:
 - .1 Test system in accordance with CAN/CSA B149 and requirements of authorities having jurisdiction.
- .2 Provide a copy of and tag piping in accordance with TSSA standards.

3.4 ADJUSTING

- .1 Purging: purge after pressure test in accordance with CAN/CSA B149.
- .2 Pre-Start-Up Inspections:
 - .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
 - .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.5 CLEANING

- .1 Cleaning: in accordance with CAN/CSA B149.
- .2 Perform cleaning operations in accordance with manufacturer's recommendations.

3.6 GAS FIRED EQUIPMENT

- .1 Once all work has been completed, start-up all new and existing equipment in accordance with the manufacturers shop drawings.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
 - .1 American National Standards Institute/American Water Works Association (ANSI/AWWA):
 - .1 ANSI/AWWA C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - .2 American Society of Mechanical Engineers (ASME):
 - .1 ASME B16.1, Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
 - .2 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300
 - .3 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard
 - .4 ASME B16.9, Factory-Made Wrought Buttwelding Fittings
 - .5 ASME B18.2.1, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loded Head and Lag Screws (Inch Series)
 - .6 ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
 - .3 ASTM International (ASTM):
 - .1 ASTM A47/A47M-[99(2009)], Standard Specification for Ferritic Malleable Iron Castings
 - .2 ASTM A53/A53M-[10], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
 - .3 ASTM A536-[84(2009)], Standard Specification for Ductile Iron Castings
 - .4 ASTM B61-[08], Standard Specification for Steam or Valve Bronze Castings
 - .5 ASTM B62-[09], Standard Specification for Composition Bronze or Ounce Metal Castings
 - .6 ASTM E202-[10], Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols
 - .4 CSA Group (CSA):
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings
 - .2 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding
 - .3 CSA w47.1, Certification of Companies for fusion Welding of Steel.
 - .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS):
 - .1 MSS-SP-67, Butterfly Valves
 - .2 MSS-SP-70, Grey Iron Gate Valves, Flanged and Threaded Ends
 - .3 MSS-SP-71, Grey Iron Swing Check Valves Flanged and Threaded Ends
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves
 - .5 MSS-SP-85, Grey Iron Globe and Angle Valves, Flanged and Threaded Ends

1.2 SHOP DRAWINGS

- .1 Submit in accordance with submittal procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for hydronic systems and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide Operation and Maintenance Data: submit operation and maintenance data for hydronic systems for incorporation into manual.
 - .1 Include special servicing requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, well-ventilated area.

Part 2 PRODUCTS

2.1 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Grade [B], as follows:
 - .1 To NPS 150mm and smaller: Schedule 40.
- .2 Final connection to copper heating elements.
 - .1 Type 'L' copper with 95/5 solder joints and dielectric couplings. Maximum 600mm length.

2.2 PIPE JOINTS

- .1 NPS 50mm and under: screwed fittings with pulverized lead tape.
- .2 NPS 63mm and over: welding fittings and flanges to CSA W47.1.
- .3 Flanges: plain or raised face, slip-on.
- .4 Flange gaskets: to ANSI/AWWA C111/ A21.11.
- .5 Pipe thread: taper.
- .6 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

2.3 FITTINGS

- .1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
- .2 Pipe flanges and flanged fittings:
 - .1 Cast iron: to ASME B16.1, Class 125.
 - .2 Steel: to ASME B16.5
- .3 Butt-welding fittings: steel, to ASME B16.9
- .4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

2.4 VALVES

- .1 Connections:
 - .1 NPS 50mm and smaller: screwed ends.
 - .2 NPS 63mm and larger: flanged ends.
- .2 Gate valves: Application: isolating equipment, control valves, pipelines:
 - .1 NPS 50mm and under:
 - .1 Mechanical Rooms: Class 125, rising stem, wedge disc. bronze.
 - .2 Elsewhere: Class 125, non rising stem wedge disc. bronze.
 - .2 NPS 63mm and over:
 - .1 Rising stem wedge disc, bronze.
 - .1 Operators: handwheel.
- .3 Butterfly valves: Application: isolating cells or section of multiple component equipment.
NPS 63mm and over: flanged ends.
- .4 Globe valves: Application: throttling, flow control, emergency bypass:
 - .1 NPS 50mm and under:
 - .1 With PTFE disc., bronze.
 - .2 NPS 63mm and over:
 - .1 With solid bronze disc, trim and cast-iron body.
- .5 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, cap and cap.
- .6 Swing check valves:
 - .1 NPS 50mm and under:
 - .1 Class 125, swing, with PTFE disc., bronze.
 - .2 NPS 63mm and over:
 - .1 Flanged or Grooved ends: Bronze trim, Cast iron.
- .7 Ball valves:
 - .1 NPS 75mm and under:
 - .1 Body & cap: Cast high tensile bronze.
 - .2 Pressure rating: Class 125, 860kPa.
 - .3 Connections:
 - .1 NPS 50mm and under screwed ends with HEX shoulders.
 - .2 NPS 63mm and higher flanged ends.
 - .4 Stem: Stainless steel tamperproof ball drive.
 - .5 Ball and seat: replaceable stainless-steel ball and teflon seats.
 - .6 Removable operator handle.
 - .7 Full port.

2.5 BALANCING VALVES:

- .1 Size 15mm – 50mm: Bronze body, brass ball, MPT connections with variable orifice.
- .2 Size 63mm and greater: Cast iron body, raise flange connections, glove style with brass plug.

Part 3 EXECUTION

3.1 EXAMINATION

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

3.2 PIPING INSTALLATION

- .1 All work is to be done by a licenced pipe fitter.
- .2 Connect to equipment in accordance with the manufacturers shop drawings.
- .3 Install concealed pipes close to building structure to minimize furring.
- .4 Slope piping in the direction of drainage and positive venting
- .5 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.
- .6 Provide sufficient clearance for insulation installation.
- .7 Ream pipe, clean of any scale or dirt, (interior and exterior), before assembly
- .8 Assemble piping using fittings manufactured to ANSI standards.

3.3 CIRCUIT BALANCING VALVES

- .1 Install flow measuring stations and flow balancing valves.
- .2 Remove handwheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.4 TESTING

- .1 Test system in accordance with General Mechanical Requirements.
- .2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.5 BALANCING

- .1 Balance water systems to within plus or minus 5% of design output.

3.6 FILLING OF SYSTEM

- .1 Refill with clean water after all work has been completed.
- .2 Co-ordinate filling of system with HVAC water treatment contractor.
- .3 Drain and vent all new and existing piping, radiators, etc. for a complete and operable system.

3.7 FLUSHING AND CLEANING

- .1 Flushing and cleaning should only take place after all work has been completed and successful piping pressure testing.
- .2 Bypass all devices and associated valves during the flushing process.

- .3 Purge any air from system.

3.8 PROTECTION

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

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 ANSI/AMSE B16.22, Wrought copper alloy and Copper Alloy Solder – Joint pressure Fittings.
- .3 ANSI/ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings.
- .4 ANSI/ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .5 ASME B31.5, Refrigeration Piping and Heat Transfer Components
- .6 ASTM B280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- .7 CSA B52:[18] [23], Mechanical Refrigeration Code.
- .8 Environmental Code for Practice for Elimination of Fluorocarbon Emissions for Refrigeration and Air Conditioning Systems.

Part 2 PRODUCTS

2.1 PIPING AND FITTINGS

- .1 Provide refrigerant piping and fittings in accordance with CSA B51 and ASME B31.5.
- .2 Service: Design pressure in accordance with CSA B52.

2.2 TUBING

- .1 Processed for refrigeration installations, deoxidized, dehydrated, and sealed.
 - .1 Hard-drawn copper: To ASTM B280, Type ACR-B.
 - .2 Soft annealed copper: To ASTM B280 or ASTM B819.
 - .3 Other copper materials: To CSA B52 and ASME B31.5, with minimum wall thicknesses in accordance with ASTM B280.

2.3 FITTINGS

- .1 Service: Design pressure 2070 kPa and temperature 121°C.
- .2 Brazed: Wrought copper to ANSI/ASME B16.22.
- .3 Flanged: Bronze or Brass to ANSI/ASME 16.24.
- .4 Flared: Bronze or Brass for refrigeration to ANSI/ASME 16.26

2.4 SLEEVES

- .1 Provide sleeves with diameters large enough to allow minimum 6 mm clearance between the sleeve and the insulation or uninsulated pipes.
- .2 Material: Hard copper and steel.

2.5 VALVES

- .1 Provide valves designed, manufactured, and tested specifically for refrigerant service and in accordance with CSA B52.
- .2 Diameter 22 mm and Under: Class 500, 3.5 MPa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture-proof seal for below-freezing applications, brazed connections.
- .3 Diameter Over 22 mm: Class 375, 2.5 MPa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture-proof seal for below-freezing applications, brazed connections.

2.6 FILTER DRIER

- .1 On lines 20mm outside diameter and larger, filter drier shall be replaceable core type with Schraeder type valve.
- .2 On lines smaller than 20mm outside diameter, filter drier shall be sealed type using flared copper fittings.
- .3 Size to be full line size.

2.7 SIGHT GLASS

- .1 Combination moisture and liquid indicator with protection cap.
- .2 Sight glass shall be full line size.
- .3 Connections shall be solid copper or brass type, no copper coated steel sight glass permitted.

2.8 SUCTION LINE TRAP

- .1 Standard one-piece traps.

2.9 EXPANSION VALVES

- .1 For pressure type distributors, externally equalized with SS diaphragm.
- .2 Size valves to provide full rated capacity of system.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install refrigerant piping in accordance with CSA B52, ASME B31.5, ECCC's Environmental code of practice for the elimination of fluorocarbon emissions from refrigeration and air conditioning systems.
- .2 General:
 - .1 Soft annealed copper tubing: Bend without crimping or constriction.
 - .2 Hard-drawn copper tubing: Do not bend. Minimize use of fittings.
- .3 Hot Gas Lines:
 - .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
 - .2 Provide traps at base of risers greater than 2400 mm high and at each 7600 mm thereafter.
 - .3 Provide inverted deep traps at top of risers.

- .4 Provide double risers for compressors having capacity modulation.
 - .1 Large riser: Install traps as specified.
 - .2 Small riser: Size for 5.1 m³/s at minimum load. Connect upstream of traps on large riser.

3.2 BRAZING PROCEDURES

- .1 Brazing procedures in accordance with CSA B51 and CSA B52.
- .2 Bleed inert gas into pipe during brazing.
- .3 Remove valve internal parts, solenoid valve coils, sight glass.
- .4 Do not apply heat near expansion valve and bulb.

3.3 SITE QUALITY CONTROL

- .1 Site Tests and Inspections:
 - .1 Leak tests:
 - .1 Perform testing in accordance with CSA B52 and ECCC's Environmental code of practice for the elimination of fluorocarbon emissions from refrigeration and air conditioning systems.
 - .2 Close valves on factory-charged equipment and other equipment not designed for test pressures.
 - .3 Test procedures:
 - .1 Build pressure up to 35 kPa with refrigerant gas on high and low sides.
 - .2 Supplement with nitrogen to required test pressure.
 - .3 Test for leaks with electronic or halide detector.
 - .4 Repair leaks in accordance with procedures described in ECCC's Environmental code of practice for the elimination of fluorocarbon emissions from refrigeration and air conditioning systems.
 - .5 Repeat leak tests.
 - .2 Perform other site tests and inspections.
 - .1 Close service valves on factory-charged equipment.
 - .2 Ambient temperatures to be at least 13°C for at least 12 hours before and during dehydration.
 - .3 Use copper lines of largest practical size to reduce evacuation time.
 - .4 Use two-stage vacuum pump with gas ballast on second stage capable of pulling 5 Pa absolute and filled with dehydrated oil.
 - .5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.
 - .6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
 - .1 Twice to 14 Pa absolute and hold for 4 hours.
 - .2 Break vacuum with refrigerant to 14 kPa.
 - .3 Final to 5 Pa absolute and hold for at least 12 hours.
 - .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
 - .5 Record test results for submission.

- .3 Charging:
 - .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
 - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
 - .3 Re-purge charging line if refrigerant container is changed during charging process.
- .4 Checks:
 - .1 Make checks and measurements in accordance with manufacturer's operation and maintenance instructions.
 - .2 Record test results for submission.
- .5 Manufacturer Services:
 - .1 Provide manufacturer's site services consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions [and warranty requirements].

3.4 CLOSEOUT ACTIVITIES

- .1 Instructions:
 - .1 Post instructions in frame with glass cover and in accordance with Operations and Manual Section and CSA B52.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .3 ASTM International (ASTM)
 - .1 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 - .3 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards -Metal and Flexible.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual.

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sealants, joints, fittings, metal ducts, etc.
- .3 Test and Evaluation Reports:
 - .1 Certification of Ratings:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.3 DELIVERY, STORAGE AND HANDLING

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

Part 2 PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
2500	A
1500	A
1000	A
750	A
500	B
250	B
125	C

.2 Seal classification:

- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
- .3 Class C: transverse joints and connections made airtight with sealant.

2.2 SEALANT

.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

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

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

- .1 Rectangular: standard radius and short radius with single thickness turning vanes centreline radius: 1.5 times width of duct.
- .2 Round (exposed areas): smooth radius 1.5 times diameter.
- .3 Round (concealed areas): 3-piece adjustable smooth radius 1.5 times diameter.

.3 Mitred elbows, rectangular:

- .1 To 400mm: with double thickness turning vanes.
- .2 Over 400 mm: with double thickness turning vanes.

- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct, 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 Full radiused elbows.
- .7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: [as for transitions].
- .8 Diffuser connection to main.
 - .1 90' round spin in collars with balancing damper and locking quadrant.

2.6 FIRE STOPPING

- .1 Retaining angles around duct on all sides of fire separation in accordance with Fire Stopping section.
- .2 Fire stopping materials and installation shall not distort duct.
- .3 Any ductwork passing through a fire rated assembly shall be fire stopped.

2.7 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA standards.

2.8 STAINLESS STEEL

- .1 To ASTM A480/A480M, Type 304.
- .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA standards.
- .3 Joints: to ASHRAE and SMACNA standards.

2.9 ALUMINUM

- .1 To ASHRAE and SMACNA standards. Aluminum type: 3003-H-14.
- .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA standards.
- .3 Joints: to ASHRAE and SMACNA standards.

2.10 BLACK STEEL

- .1 To ASTM A635/A635M
- .2 Thickness: [1.2] mm or as indicated.
- .3 Fabrication: ducts and fittings to ASHRAE and SMACNA standards.
- .4 Reinforcement: as indicated.

- .5 Joints: continuous weld.

2.11 HANGERS AND SUPPORTS

- .1 Band hangers: Use on round and oval type ducts only up to 500mm diameter of same material as duct but next sheet metal gauge larger / heavier than duct.
- .2 Trapeze hangers: Use on ducts over 500mm diameter or longest side to ASHRAE and SMACNA standards.

- .1 Hanger configuration: to ASHRAE and SMACNA standards.
- .2 Hangers: galvanized steel angle with black galvanized steel rods to ASHRAE and SMACNA standards.

Duct Size	Angle Size	Rod Size
(mm)	(mm)	(mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .3 Upper hanger attachments:
- .1 For concrete: manufactured concrete inserts.
- .2 For steel joist: [manufactured joist clamp] [steel plate washer].
- .3 For steel beams: manufactured beam clamps:

Part 3 EXECUTION

3.1 GENERAL

- .1 Do all work in accordance with NFPA, ASHRAE and SMACNA standards.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Insulate strap hangers 100 mm beyond insulated duct, ensure diffuser is fully seated.
- .4 Support risers in accordance with ASHRAE and SMACNA standards.
- .5 Install breakaway joints in ductwork on sides of fire separation.
- .6 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .7 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing in accordance with ASHRAE and SMACNA standards.

Duct Size	Spacing
(mm)	(mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

- .1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

- .1 Coordinate leakage test with air balancing and testing TAB contractor.
- .2 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Do not install additional ductwork until trial test has been passed.
- .5 Test section minimum of 30m long with not less than three branch takeoffs and two 90 degrees elbows.
- .6 Complete test before performance insulation or concealment Work.

3.5 CLEANING

- .1 Keep ducts, duct liners, insulation, etc. clean of any construction debris or dust.
- .2 Upon completion of all work vacuum clean all ductwork.
- .3 Ensure all existing systems are clean upon completion of all work.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA -HVAC Duct Construction Standards -Metal and Flexible.
- .3 ANSI/NFPA 96: Installation of Warm Air Heating and Air Conditioning Systems.

1.2 SHOP DRAWINGS

- .1 Submit in accordance with standard Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, certifications and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.3 DELIVERY, STORAGE AND HANDLING

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

Part 2 PRODUCTS

2.1 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
 - .1 Up to 300mm x 300mm: two sash locks complete with safety chain.
 - .2 301mm to 450mm: four sash locks [complete with safety chain.
 - .3 451mm to 1000mm: piano hinge and minimum two sash locks.
 - .4 Doors over 1000mm: piano hinge and two handles operable from both sides.
 - .5 Hold open devices.
 - .6 300mm x 300mm glass viewing panels.

2.4 TURNING VANES

- .1 Factory or shop fabricated double thickness to recommendations of SMACNA and as indicated

2.5 INSTRUMENT TEST

- .1 1.6mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

2.7 SPLITTER DAMPERS

- .1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.
- .2 Double thickness construction.
- .3 Control rod with locking device and position indicator.
- .4 Rod configuration to prevent end from entering duct.
- .5 Pivot: piano hinge.
- .6 Folded leading edge.

2.8 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside bronze end bearings.

- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.9 MULTI-BLADED DAMPERS

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

2.10 DAMPER INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.

Part 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Flexible Connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
- .2 Length of connection: 100mm.
- .3 Minimum distance between metal parts when system in operation: 75mm.
- .4 Install in accordance with recommendations of SMACNA
- .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.

- .2 Ensure slack material in flexible connection.
- .6 Access Doors and Viewing Panels:
 - .1 Size:
 - .1 600mm x 600mm for person size entry.
 - .2 600mm x 1000mm for servicing entry.
 - .3 300mm x 300mm for viewing.
 - .4 As indicated.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.
- .7 Instrument Test Ports:
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations:
 - .1 For traverse readings:
 - .1 Ducted inlets to roof and wall exhausters.
 - .2 Inlets and outlets of other fan systems.
 - .3 Main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 At outside air intakes.
 - .2 In mixed air applications in locations as approved by [Departmental Representative] [DCC Representative] [Consultant].
 - .3 At inlet and outlet of coils.
 - .4 Downstream of junctions of two converging air streams of different temperatures.
 - .5 And as indicated.
- .8 Turning Vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 National Fire Protection Association (NFPA):
 - .1 NFPA 80, Standard for Fire Doors and Other Opening Protectives
 - .2 NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives
- .3 ULC Standards (ULC):
 - .1 CAN/ULC-S112, Standard Methods of Fire Test of Fire-Damper Assemblies
 - .2 CAN/ULC-S112.1, Standard for Leakage Rated Dampers for Use in Smoke Control Systems
 - .3 CAN/ULC-S112.2, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies
 - .4 ULC-S505, Standard for Fusible Links for Fire Protection Service

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data: Product literature and data sheets, including product characteristics, performance criteria, physical sizes, design details of breakaway joints, finishes, example warranty documentation, limitations and certifications.
 - .1 Submit product data for:
 - .1 Fire dampers.
 - .2 Smoke dampers.
 - .3 Combination Fire & Smoke Dampers.
 - .4 Firestop flaps.
 - .5 Operators.
 - .6 Fusible links.
- .3 Certificates: Certifying work of this Section complies with specified performance characteristics and physical properties and signed by the manufacturer and manufacturers independent inspection and testing service agency.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Closeout Submittals.
- .2 Operation and Maintenance Data:
 - .1 Include, in the operation and maintenance manual, manufacturer's maintenance and operating instructions and recommended cleaning materials and methods for:
 - .1 Fire dampers.
 - .2 Smoke dampers.
 - .3 Combination Fire & Smoke Dampers.
 - .4 Firestop flaps.
 - .5 Operators.
 - .6 Fusible links.

- .3 Warranty Documentation:
 - .1 Submit warranty information in Closeout Submittals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit maintenance procedures in accordance with Closeout Submittals.
- .2 Extra Stock Materials:
 - .1 Supply [six] fusible links of each type.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Store and protect fire and smoke dampers from damage and distortion.
- .2 Handle dampers by the frame or sleeve. Do not lift or move dampers by the blades, actuator, or jackshaft.

1.6 WARRANTY

- .1 Manufacturer Warranty: Manufacturer's standard warranty document, executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract.
 - .1 Manufacturer's warranty period: [5] years.

Part 2 PRODUCTS

2.1 FIRE DAMPERS

- .1 Arrangement type as indicated
- .2 Listed and bearing label of ULC or cUL meeting requirements of the authority having jurisdiction (AHJ). Perform fire test on fire damper assemblies in accordance with CAN/ULC-S112.
- .3 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire separation.
- .4 Fire rated for assembly unless otherwise indicated.
- .5 Automatic operating type with dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .6 Top Hinged: Offset single damper, round or square; multi-blade hinged or interlocking type; roll door type; guillotine type; sized to maintain full duct cross section as indicated on Drawings.
- .7 Fusible link actuated weighted to close and lock in closed position when released or with a negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .8 40mm x 40mm x 3mm retaining angle iron frame on full perimeter of fire damper, (on both sides of fire separation being pierced).
- .9 Equip fire dampers with steel sleeve or frame-installed disruption ductwork or impair damper operation.
- .10 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC or cUL listed design.
- .11 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

2.2 SMOKE DAMPERS

- .1 ULC- or cUL-listed and labelled:
 - .1 Normally closed reverse action smoke vent (S/D-RASV): Folding blade type, opened by gravity upon detection of smoke, or from remote alarm signalling device actuated by an electro thermal link. Two flexible stainless steel blade edge seals to provide required constant sealing pressure.
 - .2 Normally open smoke/seal (S/D-SSD): Folding blade type, closed by means of electro thermal link or from remote alarm signalling device. Blade edge seals of flexible stainless steel to provide required constant sealing pressure. Provide stainless-steel negator springs with locking devices to ensure positive closure for units mounted horizontally in vertical ducts.
 - .3 Motorized smoke damper (S/D-M): Folding blade type, normally open with power on. Close damper automatically when power is interrupted. Both damper and damper operator to be ULC-listed and labelled.
 - .4 Electro thermal link (S/D-ETL): Dual responsive fusible link which melts when subjected to localized heat and from external electrical impulse of low power and short duration.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- .1 Dampers: Similar to smoke dampers specified above.
- .2 Combined Actuator: Electrical control system actuated from smoke sensor or smoke detection system and from fusible link.
- .3 Combination fire and smoke dampers to be CAN/ULC-S112.1 listed and labelled.

2.4 FIRESTOP FLAPS

- .1 Fire Smoke Flaps: ULC- or cUL-listed and labelled and fire tested in accordance with CAN/ULC-S112.2.
- .2 Made of a minimum 1.5 mm thick sheet steel with a minimum 1.6 mm thick non-asbestos ULC-listed insulation and corrosion-resistant pins and hinges.
- .3 Flaps held open with fusible link conforming to ULC-S505 and closed when subjected to localized heat.

2.5 ACCESSORIES

- .1 Firestop and Smoke Seal Systems: In accordance with Firestopping.
- .2 Access Doors: In accordance with Air Duct Accessories.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install fire dampers in accordance with the relevant standards and in accordance with conditions of each listing.
- .2 Install dampers with the centreline of the damper depth or thickness centred in thickness of walls or partitions or in depth of floor slabs.
- .3 Install smoke dampers and combination smoke/fire damper in accordance with the relevant standards and in accordance with conditions of each listing.
- .4 Install dampers free from racking. Do not compress or stretch damper frames into the duct or opening.
- .5 Maintain integrity of fire separations. Install firestop and smoke seal systems in accordance with firestopping requirements.

- .6 Install duct smoke detectors in accordance with Fire Detection and Alarm requirements.
- .7 Install access doors adjacent to each damper.
- .8 Install access doors, fusible links, and damper operators so they are easily observable and accessible.
- .9 Install breakaway joints of ULC-approved design on each side of fire separation.
- .10 Install markings required in installation standard to identify damper locations.

3.2 SITE QUALITY CONTROL

- .1 Site Tests and Inspections:
 - .1 Conduct operational testing in accordance with the relevant standards, as applicable.
 - .2 Prepare an acceptance testing report for each type of damper installed.
 - .3 After completion and before concealment, obtain approvals of complete installation from AHJ.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 ASTM International (ASTM)
 - .1 ASTM A653/A653M-[11], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish.
 - .2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with closeout submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dampers incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 PRODUCTS

2.1 MOTORIZED DAMPERS

- .1 Opposed blade type.
- .2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, [structurally formed and welded galvanized steel] [extruded aluminum] frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

- .5 Operator: Control System for HVAC system.
- .6 Performance:
 - .1 Leakage: in closed position less than 2% of rated air flow at 250 kPa differential across damper.
 - .2 Pressure drop: at full open position less than 100 kPa differential across damper.
- .7 Insulated aluminum dampers:
 - .1 Frames: insulated with extruded polystyrene foam with RSI 0.88.
 - .2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, RSI 0.88.

2.2 DISC TYPE DAMPERS

- .1 Frame: brake formed, welded, 1.6 mm thick, galvanized steel to ASTM A653/A653M
- .2 Disc: spin formed, 1.6 mm thick, galvanized steel to ASTM A653/A653M
- .3 Gasket: extruded neoprene, field replaceable, with 10 year warranty.
- .4 Bearings: roller self lubricated and sealed.
- .5 Operator: compatible with damper, linear stroke operator, spring loaded actuator, zinc-aluminum foundry alloy casting cam follower.
- .6 Performance:
 - .1 Leakage: in closed position less than 0.001% of rated air flow at 100 kPa pressure differential across damper.
 - .2 Pressure drop: at full open position less than 100 kPa differential across damper.

2.3 BACK DRAFT DAMPERS

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, centre pivoted counterweighted.

2.4 RELIEF DAMPERS

- .1 Automatic multi-leaf aluminum dampers with ball bearing centre pivoted and counter-weights set to open at 100 Pa static pressure, adjustable.

Part 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions

- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper.
- .5 Ensure dampers are observable and accessible.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 ASTM International (ASTM):
 - .1 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- .3 National Fire Protection Association (NFPA):
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems
- .4 Underwriters' Laboratories Inc. (UL):
 - .1 UL 181, Standard for Factory-Made Air Ducts and Air Connectors
 - .2 UL 181B, Standard for Closure Systems for Use With Flexible Air Ducts and Air Connectors
- .5 ULC Standards (ULC):
 - .1 CAN/ULC-S109, Standard Methods for Flame Tests of Flame-Resistant Fabrics and Films
 - .2 CAN/ULC-S110, Standard Methods of Tests for Air Ducts

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate firestopping and smoke seals around ductwork that penetrates fire separations with Firestopping requirements.
 - .2 Coordinate installation of ductwork with vibration isolation connectors in accordance with vibration and seismic controls for HVAC.

1.3 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, product literature, and data sheets for flexible ducts. Indicate product characteristics, performance criteria, physical sizes, finishes, limitations, thermal properties, friction loss, acoustical loss, leakage, flame-spread rating, smoke developed classification.
- .3 Shop Drawings: Submit Shop Drawings drawn to scale indicating flexible duct type(s) and locations.
- .4 Test and Evaluation Reports: Submit catalogue or published ratings obtained from tests carried out by manufacturer or independent testing agency signifying adherence to specified codes and standards.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in a clean, dry, well-ventilated] location and in accordance with manufacturer's recommendations.

Part 2 PRODUCTS

2.1 GENERAL

- .1 Factory fabricated flexible ducts to CAN/ULC-S110.
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

2.2 REGULATORY REQUIREMENTS

- .1 Flame-Spread Rating: Not to exceed 25.
- .2 Smoke Developed Classification: Not to exceed 50.
- .3 Combustible Coverings and Linings: To ASTM C411, and not flame, glow, smoulder, or smoke when exposed to the maximum temperature in service.

2.3 METALLIC - UNINSULATED

- .1 Spiral wound flexible aluminum.
- .2 Performance:
 - .1 Factory tested to 2.5 kPa without leakage.
 - .2 Maximum relative pressure drop coefficient: 3.

2.4 METALLIC - INSULATED

- .1 Spiral wound flexible aluminum with factory applied, 37mm-thick flexible glass fibre thermal insulation with vapour barrier and neoprene laminate jacket.
- .2 Performance:
 - .1 Factory tested to 2.5 kPa without leakage.
 - .2 Maximum relative pressure drop coefficient: 3.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrates previously installed are acceptable for flexible ducts installation in accordance with manufacturer's instructions.
 - .1 Inform consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Install ductwork and fittings in accordance with SMACNA manuals, ASHRAE standards, NFPA 90A, [CAN/ULC-S110] [UL 181] [and] [NFPA 90B].
- .2 Provide tight-fitted connections throughout ductwork.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 ASTM International (ASTM):
 - .1 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
 - .2 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .3 ASTM C916, Standard Specification for Adhesives for Duct Thermal Insulation
 - .4 ASTM C1071, Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
 - .5 ASTM C1338, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
 - .6 ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- .3 National Fire Protection Association (NFPA):
 - .1 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems
- .4 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
 - .1 SMACNA, HVAC Duct Construction Standards, Metal and Flexible.
 - .2 SMACNA IAQ Guideline for Occupied Buildings Under Construction.
- .5 Thermal Insulation Association of Canada (TIAC):
 - .1 Mechanical Insulation Best Practices Guide
- .6 Underwriter's Laboratories of Canada (ULC):
 - .1 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, product literature and data sheets for duct liners and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with closeout submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for duct liners for incorporation into manual.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with common product requirements.

- .2 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, well-ventilated area.

Part 2 PRODUCTS

2.1 DUCT LINER

- .1 General:
 - .1 Rigid mineral fibre duct liner: air surface coated mat facing.
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with [CAN/ULC-S102] [and] [NFPA 90A] [NFPA 90B].
 - .3 Fungi resistance: to [ASTM C1338] [ASTM G21].
- .2 Rigid:
 - .1 Use on flat surfaces.
 - .2 25mm thick, to [ASTM C1071] Type [2], fibrous glass rigid board duct liner.
 - .3 Density: 48 kg/m³ minimum.
 - .4 Thermal resistance to be minimum [0.76 (m².degrees C)/W for 25 mm thickness] [1.15 (m².degrees C)/W for 38 mm thickness] [1.53 (m².degrees C)/W for 50 mm thickness] when tested in accordance with ASTM C177, at 24 degrees C mean temperature
- .3 Flexible:
 - .1 Use on round or oval surfaces].
 - .2 25mm thick, to ASTM C1071, fibrous glass blanket duct liner.
 - .3 Thermal resistance to be minimum [0.37 (m².degrees C)/W for 12 mm thickness] [0.74 (m².degrees C)/W for 25 mm thickness] [1.11 (m².degrees C)/W for 38 mm thickness] [1.41 (m².degrees C)/W to 50 mm thickness] when tested in accordance with [ASTM C177], at 24 degrees C mean temperature.

2.2 ADHESIVE

- .1 Adhesive: NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based fire-retardant type.

2.3 FASTENERS

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

2.4 JOINT TAPE

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

2.5 SEALER

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

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions that conditions of substrate previously installed are acceptable for duct liner installation in accordance with manufacturer's instructions.
 - .1 Visually inspect.
 - .2 Inform consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 GENERAL

- .1 Install ductwork and plenum insulation and accessories per the TIAC Mechanical Insulation Best Practices Guide. Where the Contract Documents differ from the TIAC Mechanical Insulation Best Practices Guide, the Contract Documents shall govern.
- .2 Do work in accordance with SMACNA HVAC Duct Construction Standard.
- .3 Line inside of ducts where indicated.
- .4 Duct dimensions, as indicated, are clear inside duct lining.

3.3 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 100% coverage of adhesive.
 - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.
- .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres, impact driven mechanical fasteners to compress duct liner sufficiently to hold it firmly in place.
 - .1 Spacing of mechanical fasteners in accordance with SMACNA HVAC Duct Construction Standard.

3.4 JOINTS

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply 2 coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of the consultant.
- .3 Protect leading edges of duct sections with sheet metal nosing having 15mm overlap and fastened to duct.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA):
 - .1 ANSI/AMCA Standard 99, Standards Handbook
 - .2 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
 - .3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans
 - .4 ANSI/AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide:
 - .1 Fan performance curves showing point of operation and efficiency.
 - .2 Sound rating data at point of operation.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Spare Parts:
 - .1 Submit in accordance with closeout submittals.
 - .1 Supply:
 - .1 Matched sets of belts.
 - .2 Supply list of individual manufacturer's recommended spare parts for equipment, include:
 - .2 Bearings and seals.
 - .3 Addresses of suppliers.
 - .4 List of specialized tools necessary for adjusting, repairing or replacing.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with common product requirements.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, well-ventilated area.
 - .2 Store and protect HVAC fans from nicks, scratches, and blemishes.
- .3 PERFORMANCE CRITERIA

- .4 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
- .1 Capacity: flow rate, static pressure, bhp, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.

Part 2 PRODUCTS

2.1 FANS GENERAL

- .1 Acceptable Manufacturers
Greenheck
Carnes
Jenn Air

2.2 CENTRIFUGAL FANS

- .1 Fan wheels:
 - .1 Welded aluminum construction.
 - .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
 - .3 forward curved blades.
- .2 Bearings: heavy duty grease lubricated ball or roller self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 100 000 hours.

2.3 CABINET FANS - GENERAL PURPOSE

- .1 Fan characteristics and construction: as centrifugal fans.
- .2 Hung single wheel with DWDI centrifugal fans in factory fabricated casing complete with vibration isolators and seismic control measures, motor, variable speed V-belt drive with guard casing.

2.4 UTILITY SETS

- .1 Characteristics and construction: [for centrifugal fans].
- .2 Preassemble single width centrifugal fan with removable weatherproof protective hood with vents, and automatic spring loaded back draft damper, mesh bird screen.
- .3 Provide belt driven sets with adjustable motor bed plate [and variable pitch driver sheave].

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification that conditions of substrate previously installed are acceptable in accordance with manufacturer's instructions.
 - .1 Visually inspect.
 - .2 Inform consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2

FAN INSTALLATION

- .1 Install fans as indicated, complete with resilient mountings, vibration and seismic controls for HVAC Piping and Equipment.
- .2 Provide flexible connections.
- .3 Provide sheaves and belts required for final air balance.
- .4 Bearings and extension tubes to be easily accessible.
- .5 Access doors and access panels to be easily accessible.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA):
 - .1 ASTM A653, Standard Specifications for Steel Sheet, Zinc Coated, (galvanized or zinc-iron alloy coated), by the Hop Dip Process.
 - .2 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
 - .3 UL 181, Factory-Made Air Ducts and Air Connectors.

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [air terminal units] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate the following:
 - .1 Capacity.
 - .2 Pressure drop.
 - .3 Noise rating.
 - .4 Leakage.
 - .5 Dimensions.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with closeout submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for units incorporated into manual.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with common product requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect units from nicks, scratches, and blemishes.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

2.2 MANUFACTURED UNITS

- .1 Terminal units of the same type to be product of one manufacturer.

2.3 VARIABLE VOLUME AND TEMPERATURE BOXES

- .1 Single duct, variable volume and temperature units as noted on the engineering drawings.
- .2 Size and capacities as indicated.
- .3 Complete with:
 - .1 Operator and controller.
 - .2 Sound attenuator:
 - .3 Multiport outlet adapter.
 - .4 Controller to operate damper.
- .4 Adjustable reset start point.
- .5 Adjustable reset span.
- .6 Operator to be factory mounted and calibrated:
 - .1 Gauge taps for balancing with standard pressure gauge.
 - .2 Controller to have adjustable flow settings.
- .7 Casing: constructed of galvanized steel, internally lined with [25] mm, [0.7] kg density fibrous glass, to UL 181 and NFPA 90A.
- .8 Damper: galvanized steel with peripheral gasket and self-lubricating bearings. Air leakage past closed damper not to exceed 2% of nominal rating at 750 Pa inlet static pressure, in accordance with Air Diffusion Council test procedure.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification that conditions of substrate previously installed under other Sections or Contracts are acceptable for air terminal units installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect.
 - .2 Inform consultant]of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Install in accordance with manufacturers recommendations.
- .2 Support independently of ductwork.

- .3 Locate controls, dampers and access panels for easy access.

3.3 PERFORMANCE VERIFICATION

- .1 Refer to General Commissioning Requirements.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, product literature and data sheets for [diffusers, registers and grilles] and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.
 - .6 Dimensions.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with closeout submittals.
 - .2 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with common product requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect diffuser, registers and grilles from nicks, scratches, and blemishes.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance Requirements:

- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: As directed on engineering drawings.

2.3 MANUFACTURED UNITS

- .1 Grilles, registers, and diffusers of same generic type, products of one manufacturer.
 - .1 Acceptable Alternatives
 - EH Price
 - Nailor
 - Kruger
 - Titus

2.4 SUPPLY GRILLES AND REGISTERS

- .1 As directed on engineering drawings.

2.5 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 As directed on engineering drawings.

2.6 DIFFUSERS

- .1 As directed on engineering drawings.

2.7 LINEAR GRILLES

- .1 As directed on engineering drawings.

2.8 DOOR GRILLES

- .1 As directed on engineering drawings.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's instructions.
 - .1 Visually inspect.
 - .2 Inform consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Install with flat head coated screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place.
- .4 Provide concealed safety chain on each grille, register and diffuser.

3.3 CLEANING

- .1 Clean all devices upon completion of construction and testing.

END OF SECTION

GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 Air Movement and Control Association (AMCA):
 - .1 ANSI/AMCA Standard 500, Laboratory Methods of Testing Louvers for Rating
- .3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - .1 ASHRAE Handbook – HVAC Applications
- .4 ASTM International (ASTM):
 - .1 ASTM A780/A780M, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - .2 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - .3 ASTM E2886/E2886M, Standard Test Method for Evaluating the Ability of Exterior Vents to Resist the Entry of Embers and Direct Flame Impingement
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate installation of exterior louvres and vents with Architectural Drawings and all trades on site.
 - .2 Coordinate installation of roof vents with Architectural Drawings and all trades on site.
 - .3 Coordinate compatibility of factory-applied primer with finish paints indicated.
 - .4 Coordinate for electrical connections for motor operated adjustable louvres.

1.3 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
 - .1 Product Data:
 - .2 Submit manufacturer's instructions, product literature, and data sheets for [louvres] intakes [and] [vents]. Indicate product characteristics, performance criteria, physical size, finishes, and limitations.
 - .3 Indicate the following:
 - .1 Pressure drop.
 - .2 Face area.
 - .3 Free area.
 - .4 Dimensions.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Perform in accordance with common product requirements.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in a clean, dry, well-ventilated location, and in accordance with manufacturer's recommendations.
 - .2 Store and protect louvres, intakes, and vents from nicks, scratches, and blemishes.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: Obtained from tests carried out by manufacturer or those ordered by manufacturer from an independent testing agency signifying adherence to codes and standards.

2.2 GRAVITY ROOF OUTSIDE AIR INTAKES AND RELIEF VENTS

- .1 Factory manufactured aluminum hinged at curb line.
- .2 Screens: Integral bird screen mesh made of a aluminum or stainless-steel wire.
- .3 Refer to engineering drawings for size, location and specification.

2.3 GOOSENECK HOODS

- .1 Refer to engineering drawings for size, location and specification.

2.4 FIXED LOUVRES - ALUMINUM

- .1 Construction: Welded with exposed joints ground flush and smooth.
- .2 Material: Extruded aluminum alloy.
- .3 Blade: Stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500mm.
- .4 Frame, head, sill and jamb: 100mm deep one-piece extruded aluminum, minimum 3mm thick with approved slot for sealant, integral to unit.
- .5 Mullions: At a maximum 1500mm centres.
- .6 Fastenings: Aluminum nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, stainless steel washer and aluminum body.
- .7 Screen: 15mm diameter wire aluminum bird screen on inside face of louvres in formed U-frame.
- .8 Finish: Factory applied enamel anodized, prime coated, ready for finish painting.
- .9 Colour: As selected by consultants during shop drawing approval process.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification that conditions of substrates previously installed are acceptable for louvres, intakes, and vents installation in accordance with manufacturer's instructions.
 - .1 Inform consultant of unacceptable conditions immediately upon discovery.

- .2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Perform in accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.
- .3 Anchor securely into opening. Seal with sealant to ensure weather tightness.
- .4 Install screens where indicated. Where screen joints are unavoidable, overlap edges and ends by a minimum of 25mm.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 All codes & standards shall be referenced to the latest edition.
- .2 ANSI/AHRI 210/240, Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
- .3 Ari 270, Unitary Air-Conditioning and Air Source Heat Pump Systems.
- .4 CSA B52, Mechanical Refrigeration Code.
- .5 CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations.
- .6 CSA C22.2 No.236, Heating and Cooling Equipment.
- .7 ANSI/UL 1995, Central Cooling Air Conditioning.
- .8 ANSI/NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

1.2 SHOP DRAWINGS

- .1 Submit in accordance with general submittal procedures.
- .2 Product Data:
 - .1 Product literature and data sheets for outdoor HVAC equipment, including product characteristics, performance criteria, physical size, finishes, and limitations.
 - .2 Project layout and dimensions.
 - .3 Equipment, piping, connections, complete with valves, strainers, control assemblies, thermostatic controls, auxiliaries, and hardware.
 - .4 Sizes and recommended bypass connections for recommended ancillaries, which are mounted, wired, and piped ready for final connection to building system.
 - .5 Piping, valves, and fittings shipped loose showing final location in assembly.
 - .6 Control equipment shipped loose, showing final location in assembly.
 - .7 Complete internal and external schematics.
 - .8 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes, including mass distribution drawings showing point loads.
 - .9 Vibration isolation details
 - .10 Refrigerant type.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into maintenance manuals.
- .2 Maintenance data to include complete unit shop drawings with all unit data indexed. To include but not limited to all unit data and capacities, function operation, wiring diagrams, control and servicing for all components, etc.
 - .1 Manufacturer's maintenance and operating instructions.
 - .2 Recommended cleaning materials and methods.
 - .3 Manufacturer's name, model type and year, number of units, and capacity.
 - .4 Manufacturer's warranty information.

1.4 WARRANTY

- .1 1 year on all parts and labour.
- .2 5 Years on compressor.
- .3 10 years on heat exchanger.

Part 2 PRODUCTS

2.1 HIGH EFFICIENCY EQUIPMENT 15 TONS AND LESS

- .1 Efficiency:
 - .1 Exceeds the minimum ASHRAE 90.1 Energy Standards Rating.
 - .2 Units 5 tons and under to meet SEERR Rating of 15.0.
 - .3 Units 6 -10 tons of cooling and larger to meet EER rating of 12.0.
 - .4 Unit 12.0 tons of cooling and larger to meet EER of 9.6.
 - .5 Electronic controls with data linked diagnostic operation.
 - .6 Energy Start Rated
- .2 General
 - .1 Roof-mounted, self-contained multi-zone unit(s) with gas burner and direct expansion refrigeration bearing label of CSA, CGA and ULC.
 - .2 Unit(s) to consist of cabinet and frame, supply fan, return fan, heat exchanger, burner with integral induced draft fan, control, air filter, refrigerant cooling coil, compressor, condenser coil and fans, motorized outside air damper, return damper, gravity exhaust damper and power exhaust.
 - .3 Prefabricated Roof Curb: 610mm high complete vibration isolation rails to conform to the requirements of National Roofing Contractors Association, (NRCA).
 - .4 2 speed fan motors.
 - .5 Performance rating for unit larger than in accordance with ANSI/AHRI 210/240.
 - .6 Dehumidification package factory installed and tested.

2.2 CABINET

- .1 Cabinets: Weatherproofing tested and certified to AGA and soundproofing tested to ARI 270.
- .2 Framing and Supports: Minimum 2-mm-thick welded steel, galvanized after manufacture and with lifting lugs.
- .3 Outer Casing: Weathertight galvanized steel with baked enamel finish complete with flashing.
- .4 Access: Removable gasketed hinged door panels with locking door handle fasteners.
- .5 Insulation: Neoprene or other permanent waterproof coating on glass/mineral fibre surfaces where conditioned air is handled, 50mm thick, and 32 kg/m³ density.

2.3 FANS

- .1 Centrifugal, forward curved impellers, statically and dynamically balanced. V-belt drive with adjustable variable pitch motor pulley, vibration isolated hinge mounted motor.
 - .1 Vibration isolators: Minimum 95% efficiency.

2.4 AIR FILTERS

- .1 50mm thick, 30% efficiency, permanent metal framed, replaceable media throwaway type to unit manufacturer.
- .2 To meet ANSI / NFPA 90A and CAN/ULC air filter requirements.
- .3 Provide 5 spare filters.

2.5 HEAT EXCHANGERS AND BURNERS

- .1 Gas fired, multiple flue passes, with primary heating surface of stainless steel: secondary heating surface and stainless steel tubes.
 - .1 Gas burner: Factory-mounted, wired and fire tested complete with operating and safety controls.
 - .2 Forced type.
 - .3 Spark ignited pilot with pilot flame safety shut off.

2.6 REFRIGERATION

- .1 In accordance with CSA B52, CSA C22.2 No.236 and ANSI/ULC requirements.
- .2 Compressor/Condenser Section:
 - .1 Semi-Hermetic compressors, vibration isolated with flexible suction and discharge connections, oil sight glass, oil pressure switch, crankcase heater, and [automatic pump down system] with control to liquid line solenoid valve.
 - .2 Fans: Propeller type with single piece spun venturi outlets and zinc-plated guards.
 - .3 Motors: Sequenced for head pressure control.
 - .4 Electrical system: Complete with operating controls, oil and refrigerant pressure protection, motor overload protection, weatherproof electrical wiring with [weatherproof, raintight] disconnect.
 - .5 Include refrigerant piping with automatic hot gas bypass, sight glass, filter and valves.
 - .6 Condenser: Staggered copper tube aluminum fin coil assembly with sub-cooling rows.
 - .7 Capacity reduction: Hot gas bypass or cylinder unloading.
 - .8 Refrigerant: R454B.
- .3 Evaporator:
 - .1 Rated to ANSI/AHRI 210/240.
 - .2 Thermostatic expansion valve with adjustable super heat [and external equalizer].
 - .3 Coil: staggered seamless copper tubes expanded into aluminum fins and insulated condensation pan.
 - .4 Cooling coil condensate drain pans: Designed to avoid standing water, easily cleaned or removable for cleaning.
 - .5 Drain connection: Deep seal trap complete with trap seal primer.

2.7 CONTROLS AND SAFETIES

- .1 Electronic control.
- .2 Network monitoring.
- .3 Scrolling marquee display.
- .4 Unit control with standard suction pressure transducers and condensing temperature thermistors.

- .5 Provide a 5°F temperature difference between cooling and heating setpoints to meet ASHARE 90.1 Energy Standard.
- .6 Display a current alarm list and an alarm history list.
- .7 Automatic compressor redundancy.
- .8 Service run test capability
- .9 To accept input from a CO2 sensor, (indoor and outdoor).
- .10 Configurable alarm lights shall be provided which activates the certain types of alarm occurrences.
- .11 Compressor minimum run time (3 minutes) and minimum off time (5 minutes).
- .12 Service diagnostics mode.
- .13 Economizer with enthalpy control.
- .14 Self-contained low voltage control circuit.
- .15 Unit to have -18°C (0°F) low ambient operation.
- .16 Solid state compressor lockout protection to provide optional reset capability at the space thermostat should nay of the following safety devices trip and shut off the compressor.
 - .1 Compressor lockout protection provided for internal or external overload.
 - .2 Low pressure protection.
 - .3 Freeze protection.
 - .4 High pressure protection.
 - .5 Compressor reverse rotation protection.
 - .6 Loss of charge protection.
- .17 Supply air sensor located in the unit to detect both heating and cooling operation.
- .18 Induced draft heating section with.
 - .1 High temperature limit switch.
 - .2 Induced draft motor speed sensor.
 - .3 Flame rollout switch.
 - .4 Flame proving controls.
 - .5 Redundant gas valve.

2.8 UNIT CONTROLS

- .1 In addition to combustion safety controls, provide low limit on supply and duct type smoke detectors as noted in schedule.
- .2 Zone Cooling Control:
 - .1 Room thermostat to activate cooling relay in control circuit cycling compressor. Provide safeties and pressure controls. Condenser fans to operate in sequence.
 - .2 When call for cooling is satisfied, relay is de-energized.
- .3 Zone Heating control:
 - .1 Room thermostat controls burner operation to maintain rom temperature setting.
- .4 Mixed Air Control:

- .1 Motorized outside, return and gravity relief dampers with spring return damper operator and control package to automatically vary outside air quantity. Outside air and exhaust air dampers are normally closed.
- .2 Tight fitting opposed blade dampers with neoprene or other suitable gaskets, synthetic bushings and maximum 1% leakage.
- .3 Damper operation: 24-V, spring return motor with gear train sealed in oil.
- .4 Mixed air controls: Maintain 14°C, (57°F), mixed air temperature, lock out compressor below 10°C, (50°F) ambient, restart 15°C, (59°F), revert dampers to provide 25% fresh air above 21°C, (70°F) adjustable.

2.9 SYSTEM CONTROL

- .1 Equipment control will be by the unit manufacturer and integral economizer controls.
- .2 System control to be coordinated with BAS contractor.

2.10 CAPACITY

- .1 As indicated:

2.11 ACCESSORIES

- .1 600MM high, (24"), roof curb.
- .2 Levelling curb.
- .3 Vibration rail.
- .4 Opposed blade economizer dampers.
- .5 Condenser coil guard.
- .6 Power exhaust.
- .7 Stainless steel vertical extension on flue gas discharge.
- .8 Stainless steel heat exchanger.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install per manufacturer's instructions on roof curbs.
- .2 Manufacturers to certify installation and supervise / certify start up and commission test.

3.2 SYSTEM STARTUP

- .1 Manufacturers to certify installation and supervise / certify start up and commission test.

END OF SECTION

Part 1

General

1.1

GENERAL

- .1 This Section covers items common to Electrical Divisions.
- .2 This section supplements requirements of Division 1.
- .3 Furnish labour material and equipment necessary for completion of work as described in contract documents.

1.2

DEFINITIONS

- .1 "Provide" means to supply and install the products and services specified.
- .2 "The Work" means the total construction required by the Contract Documents and includes all labor, Products and services.
- .3 "Products" means all material, machinery, equipment and wires forming the completed Work as required by the Contract Documents.

1.3

INTENT

- .1 Provide all Products, labor and services specified or shown in the Specifications Drawings and other Contract Documents complete with incidentals necessary for a complete operating installation of new Fire Alarm System at 1670 Oxford St., East, London Ontario. Provide all tools, instruments, equipment and services required to do the Work.
- .2 The Specifications are integral with the Drawings which accompany them. Neither is to be used alone. Any item or subject omitted from one but included in the other is properly specified.
- .3 Wherever differences occur in the Contract Documents, the maximum conditions will govern and be allowed for in the Tender price. The item to be incorporated will be at the option of the Consultant.

1.4

LIABILITY INSURANCE

- .1 This contractor must maintain and produce at the request of the consultant proof of proper insurance to fully protect the Owner, the Consultant and the Contractor from any and all claims due to accidents, misfortunes, acts of God, etc.

1.5

CONTRACT DOCUMENTS

- .1 The Drawings of this Division are performance drawings and indicate general arrangement of the Work. They are diagrammatic except where specific details are given. They must be read in conjunction with all other Division Drawings.
- .2 Obtain accurate dimensions from site measurement. Locations and elevations of services are approximate and must be verified before construction is undertaken. Investigate existing Communication mast, underground cable trace ways, ducts and shafts, junction boxes, conduits etc.
- .3 Where required provide detailed layout of work with respect to the building structure and to other piping, ducts, conduit and underground cable ducts, pipes and etc. If required produce field drawings for approval before work proceeds.
- .4 Adjust the location of materials and/or equipment as directed without adjustment to contract price, provided that the changes are requested before installation and do not affect quantity of materials.
- .5 Visit the site prior to tender and verify all conditions and dimensions. Allow for any rerouting of existing services and equipment in the tender price. Failure to do so does not relieve the Contractor from responsibility.

1.6 DRAWINGS

- .1 Electrical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to runs of conduits and ducts to accommodate structural conditions. Location of conduits and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.
- .2 As work progresses and before installing fixtures and other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings or obtain directions for exact location of such equipment and fitments.
- .3 Electrical drawings are diagrammatic. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Conceal wiring, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.
- .4 Before commencing work, check and verify all sizes, locations, grades, elevations, levels and dimensions to ensure proper and correct installation. Verify existing/municipal services.
- .5 Locate all electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.
- .6 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install services so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.
- .7 Relocate equipment and/or material installed but not co-ordinated with work of other Sections as directed, without extra charge.
- .8 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.7 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for review single line electrical diagrams.
 - .1 Electrical distribution system in main electrical room.
- .3 Submit for review fire alarm riser diagram, plan and zoning of building at fire alarm control panel and annunciator.
- .4 Shop drawings:
 - .1 Provide shop drawings of all Products.
 - .2 Submission shall be submitted electronically
 - .3 Provide a complete list of shop drawings to be submitted prior to first submission.
 - .4 Submit a schedule of shop drawings for approval no later than two (2) weeks after award of Contract, indicating the anticipated date of submission for review.
 - .5 Assume full responsibility for submission of shop drawings. Allow minimum one week for Consultant's review.

- .6 The Consultant will only review shop drawings bearing the Contractor's stamp of approval.
- .7 Submit shop drawings showing the following:
 - .1 Project name.
 - .2 Project tag number.
 - .3 Manufacturer's name and model number.
 - .4 Supplier's name.
 - .5 Approval agencies.
 - .6 Performance characteristics.
 - .7 Dimensions.
 - .8 Electrical characteristics.
 - .9 Bill of materials and finishes.
 - .10 Time required to fabricate and deliver.
 - .11 All variations from Tender Documents.
- .8 The Consultant's review shall not relieve this Division Contractor from responsibility to provide materials and equipment in accordance with the design intent and Contract Documents.
- .9 If required circulate shop drawings which affect the Work of other Divisions for their review and comments prior to submission to the Consultant.
- .10 Drawings will be marked and action taken as follows:

1.8 QUALITY ASSURANCE

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction.
- .2 The installations of the division must conform to the latest edition of the Electrical Safety Code as well as its supplemental bulletins and instructions. Provide materials and labour necessary to comply with rules, regulations and ordinances.
- .3 Complete underground systems in accordance with CSA C22.3 No. 7-84 except where specified otherwise.
- .4 Abbreviations for electrical terms: to CSA Z85-1983.
- .5 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.9 ALTERNATES AND SUBSTITUTIONS DURING PROGRESS OF WORK

- .1 Substitute Products will only be considered when tendered Products become unobtainable. Written proof is required.
- .2 Throughout these sections are lists of "Alternate Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.

- .3 Provide detailed Specifications and shop drawings with complete performance characteristics of the proposed alternate with the submission to the Consultant. Submit proof that substitute product is equal to that specified.
- .4 Assume responsibility and pay for any additional installation cost incurred by all Divisions resulting from the substitution. Revise record drawings incorporating all substitutions and changes.
- .5 Submit the price variation from the total contract price for each substituted product.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials.
- .2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury, but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

1.11 PERMITS, FEES AND INSPECTION

- .1 A submission has been made (if required by this size of project) by the consultant to the Electrical Safety Authority for review of this project. The payment of the required review costs will be co-ordinated by the consultant. A copy of the Electrical Safety Authority review report will be forwarded to the successful contractor for information and action.
- .2 The contractor is required to include in his tender all required inspection costs by the Electrical Safety Authority. Permit application is the responsibility of the contractor.
- .3 Reproduce drawings and specifications required by Electrical Safety Authority at no cost.
- .4 Notify Consultant of changes required by Electrical Safety Authority prior to making changes.
- .5 Furnish Certificates of Acceptance to Engineer from Electrical Safety Authority and other authorities having jurisdiction upon completion of work.

1.12 SYSTEM STARTUP

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

1.13 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.

- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.14 OPERATION AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual as specified in other Sections of this Division.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection. Make changes as requested and re-submit as directed by Consultant.
- .3 Submit one manual for approval. Three manuals will be required at project completion. Each of which shall be in a three ring binder (minimum 50 mm (2") ring) labelled:
 - .1 Operation and Maintenance Manual.
 - .2 Project Name.
 - .3 Location.
- .4 Each manual must include (in "tabbed" sections) the following:
 - .1 Index
 - .2 List of General, Mechanical, Electrical Contractors and all associated sub-contractor names, addresses and contact numbers.
 - .3 List of suppliers and equipment wholesalers local to the project.
 - .4 One year warranty letter for all parts, equipment and workmanship.
 - .5 List of manufacturers, spare parts list and source.
 - .6 Copy of typewritten schedules for all new and renovated panels.
 - .7 Receipt of spare fuses from owner's representative.
 - .8 Receipt of turned over keys for electrical panels.
 - .9 Final certificate from the Electrical Safety Authority.
 - .10 Final Fire alarm verification certificate and field technician device sheets.
 - .11 Certificate of exit/emergency lighting testing as per the specification.
 - .12 Copy of electrical shop drawings which have been stamped and reviewed by Consultant
 - .13 Coordination study shop drawings.
 - .14 Any special warranties on equipment required (i.e. LED lighting and digital control).
 - .15 System commissioning certificate and report.
 - .16 Lighting controls systems commissioning certificate.
 - .17 UPS Equipment manufacturer onsite commissioning and start up certificate.

- .5 Upon acceptance of Operation and Maintenance Manual by the consultant, a pdf file of the entire manual is to be provided on a USB stick. Only one USB stick is to be provided containing both the approved manuals and record drawings.

1.15 RECORD DRAWINGS

- .1 Records drawings:
 - .1 Identify each drawing in lower right hand corner in letters at least 3mm (1/8") high as follows: - "RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .2 Submit to Consultant for approval. When returned, make corrections (if any) as directed.
 - .3 Once approved, submit completed reproducible paper record drawings as well s a scanned pdf file copy on USB Stick with Operating and Maintenance manuals.

1.16 SUBSTANTIAL PERFORMANCE

- .1 Complete the following to the satisfaction of the consultant prior to submission of substantial performance.
 - .1 Record Drawings.
 - .2 Maintenance Manuals.
 - .3 System Start up.
 - .4 Instructions to Owners.
- .2 Final Certificates (Electrical Safety Authority, Fire Alarm, Emergency Lighting, Lighting Controls Commissioning, UPS equipment manufacturer on site commissioning start up).

1.17 REVISION TO CONTRACT

- .1 Provide the following for each item in a given change notice:
 - .1 Itemized list of material with associated costs.
 - .2 Labour rate and itemized list of labour for each item.
 - .3 Copy of manufacturers/suppliers invoice if requested.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from Electrical Safety Authority.
- .2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit is specified in the Electrical Specifications except for conduit, wiring and connections below 50V, which are related to control systems specified in the Mechanical specifications.

2.3 WARNING SIGNS

- .1 To meet requirements of Electrical Safety Authority and Consultant.

- .2 Provide porcelain enamel signs, minimum size 175 x 250 mm (7" x 10").

2.4 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
- .1 Nameplates: lamicoid 3mm (1/8") thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.
- .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	9 x 50 mm (3/8" x 2")	1 line	3 mm (1/8") high letters
Size 2	12 x 70 mm (1/2" x 2 1/2")	1 line	5 mm (3/16") high letters
Size 3	12 x 70 mm (1/2" x 2 1/2")	2 lines	3 mm (1/8") high letters
Size 4	20 x 90 mm (3/4" x 3 1/2")	1 line	9 mm (3/8") high letters
Size 5	20 x 90 mm (3/4" x 3 1/2")	2 lines	5 mm (3/16") high letters
Size 6	25 x 100 mm (1" x 4")	1 line	12 mm (1/2") high letters
Size 7	25 x 100 mm (1" x 4")	2 lines	6 mm (1/4") high letters

- .2 Wording on nameplates to be approved by Consultant prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .6 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m (45') intervals.
- .3 Colours bands must be 25mm (1") wide.

	<u>Prime</u>
up to 208 V	Yellow
up to 600 V	White
Voice/Data	Orange
Security	Brown

	<u>Prime</u>
Fire Alarm	Red
Public Address	Black
Exit and emergency lighting	Pink

- .4 This contractor must paint all system junction boxes and covers in conformance with the above schedule.

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment "equipment green" finish.
- .2 Paint indoor switchgear and distribution enclosures light gray.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks, fastenings, and conduits etc. to prevent rusting

2.9 MANUFACTURERS AND CSA LABELS

- .1 All labels must be visible and legible after equipment is installed.

2.10 FIRESTOPPING

- .1 General
- .1 Maintain the integrity of floor and wall fire separations around electrical raceways, cables, bus ducts and boxes passing through rated floors or walls.
- .2 Materials
- .1 Materials to form a ULC or cUL listed firestop system to CAN/ULC-S115 "Standard Method of Fire Tests of Firestop Systems".
- .2 Firestop system rating: minimum 2 hrs., higher where indicated.
- .3 Submit shop drawings consisting of product technical data and ULC or cUL listing.
- .4 Stand of Acceptance
- .1 Fyresleeve
- .2 General Electric Pensil
- .3 IPCC
- .4 Rectorseal Corporation
- .5 Proset
- .6 Hilti
- .7 3M
- .8 AD Fire Protection System Inc.
- .9 Eastern Wire + Conduit
- .5 Other manufacturers having products with explicitly similar characteristics, listings or classifications and approvals are acceptable.
- .3 Installation:

- .1 Submit a complete fire stopping and smoke seal schedule to the Consultant for review. Include details, cut sheets, system description and location for each proposed fire stopping and smoke sealing application.
- .2 Install firestopping in accordance with the manufacturer's recommendations and in accordance with the ULC or cUL listing.
- .3 Firestopping to be installed only by personnel trained by the manufacturer on the installation of such systems.
- .4 Firestop system manufacturer's training and inspection services:
 - .1 Provide the services of the firestop system manufacturer to provide training to trades performing the fire stopping. Create and maintain a log of those personnel who obtain training.
 - .2 Provide the services of the firestop system manufacturer to inspect the installation of the firestopping while in progress and a final inspection at completion of work. Provide a manufacturer's inspection report to the Owner and Engineer.
- .5 Seal space between penetrating service and sleeve or opening in fire rated floors and walls with a fire stopping and smoke sealing system.
- .6 At time of application of materials, surfaces to be clean, dry and free from dust, oil, grease, loose or flaking paint, loose concrete or masonry and foreign materials.
- .7 Wiring may penetrate a fire rated assembly provided it is enclosed in non-combustible conduit, and the passage of the conduit in turn is suitably sealed to the assembly with fire stop material.
- .8 Where wiring with a combustible covering and not enclosed in non-combustible conduit penetrates a fire resistance rated assembly, group the wiring into separate fire sealed penetrations to ensure the overall diameter of the combined wire(s) in each penetration does not exceed 25 mm.
- .9 Arrange single conductor metal sheathed cables to individually penetrate the fire rated assembly and be individually fire stopped.
- .10 Where wiring is installed in cable trays and penetrates a fire rated assembly;
 - .1 terminate and independently support the cable tray on each side of the fire rated assembly, and
 - .2 provide sufficient working room to properly install and inspect the fire stopping materials and penetration.
- .11 Smoke seal and fire stop electrical boxes that penetrate a fire rated wall using fire rated putty pads, install putty pads on the outside of boxes.
- .12 Co-ordinate installation of cast-in-place fire stopping devices with the Division responsible for the placement of concrete.

Part 3

Execution

3.1

INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50mm (2") beyond either side.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 LOCATION OF OUTLETS

- .1 Do not install outlets back-to-back in wall; allow minimum 150mm (6") horizontal clearance between boxes.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3m (10'), and information is given before installation.
- .3 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1100mm (42").
 - .2 Wall receptacles:
 - .1 General: 400mm (16").
 - .2 Above top of continuous baseboard heater: 200mm (8").
 - .3 Above top of counters or counter splash backs: 100mm (4").
 - .4 In mechanical rooms: 1200mm (48").
 - .3 Panelboards: as required by Code or 1400mm (56").
 - .4 Voice/Data outlets: At height or adjacent outlet or at 400mm (16").
 - .5 Fire alarm stations: 1200mm (3'-11").
 - .6 Fire alarm visual and signal devices: 2250mm (88.5").
 - .7 Thermostat: 1200mm (3'-11").
 - .8 Heaters: 200mm (8") to bottom of heater.
 - .9 Clocks: 2100mm (84").

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings as determined from the co-ordination study.

3.7 FIELD QUALITY CONTROL

- .1 Load Balance:

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Provide upon completion of work, load balance report indicating phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system, communications, PA and security.
 - .6 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been install to manufacturer's instructions.
 - .7 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Consultant.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Submit test results for Consultant's review.

3.8 REPAIR, CUTTING, CORING AND RESTORATION

- .1 Be responsible for required digging, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
- .2 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
- .3 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
- .4 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
- .5 Slots, cores and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

3.9 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

3.10 GUARANTEE AND WARRANTY

- .1 At the substantial completion stage of this project this Contractor must provide a written guarantee indicating that any defects, not due to ordinary wear and tear or improper use which occur within the first year from the date of substantial completion will be corrected at the contractor's expense.
- .2 If the electrical sub-contractor's office is 50 kilometers (30 miles) or more from the project site, the sub-contractor is to provide a service/warranty work agreement for warranty period with a local electrical sub-contractor approved by Consultant. Include copy of service/warranty agreement in warranty section of operation and maintenance manual.
- .3 Warranty period shall start from date of substantial completion.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 Life safety and fire protection systems are to be installed to comply with the provisions of the current Ontario Building and Fire Codes. As a result, commissioning of these integrated systems must be performed as a whole to ensure the proper operation and inter-relationship between systems.
- .2 The commissioning is to provide functional verification and documented confirmation that these building systems satisfy the intent of the Building Code.
- .3 These systems as applicable to any given project include but are not limited to fire alarm, sprinkler system and associated valves, standpipe, smoke control, ventilation, and pressurization systems, elevator recalls and emergency lighting.

1.2 GENERAL

- .1 This commissioning process is the responsibility of the electrical sub-contractor.
- .2 This process must be coordinated with suppliers and sub-contractors associated with these systems (mechanical and/or electrical).
- .3 This process must be coordinated with the project construction schedule and be completed, including all associated documentation, prior to the consultant's certification of the project for occupancy.
- .4 All applicable contractors, sub-contractors, and suppliers are to include all required costs in their respective tender costs.
- .5 All work is to be performed in accordance with CAN/ULC S1001-2011. Special consideration is to be given to the Sequence of Operations.
- .6 The work to be performed by this contractor is also described in CAN/ULC S1001-2011.

1.3 QUALITY ASSURANCE

- .1 The following criteria must be met in order to be considered an acceptable commissioning sub-contractor for this project:
 - .1 Manufacturers: and regularly engaged in functional testing and implementation of life safety and fire protection systems for not less than five years.
 - .2 Qualifications: Firms with at least five years of successful experience in facility construction, inspection, acceptance testing or commissioning as it relates to fire protection and life safety and equipment similar to that required for this project.
 - .3 The Contractor shall be an established commissioning contractor that has had and currently maintains a locally run and operated business for at least five years.

- .4 The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the systems.
 - .2 Approved Life Safety Systems Commissioning Agents
 - .1 **Firms must be CAN/ULC S1001 certified. The Contractor shall provide a ULC Certificate confirming the LSSCA agent is ULC certified prior to tender closing.**
- 1.4 GENERAL REQUIREMENTS**
- .1 The Commissioning Process shall encompass and co-ordinate the following areas:
 - .1 System documentation.
 - .2 System start-up and Performance Testing (Functional Testing).
- 1.5 RESPONSIBILITIES**
- .1 General Contractor:
 - .1 The general contractor shall verify completeness of the building envelope, perimeter and interior items which affect proper operation of the noted systems.
 - .2 The general contractor will assure participation and co-operation of Sub- Contractors and Specialty Contractors (mechanical, electrical, building management, etc.) under the General Contractor's jurisdiction as required for the commissioning process.
 - .2 Mechanical Contractor:
 - .1 Verify Functional performance of associated mechanical systems for compliance with design intent as specified in the appropriate Specification sections.
 - .2 Provide the documentation with standard Functional performance reports on completion of the testing.
 - .3 Verify submissions for system operation and maintenance manuals, as-built (record) documents, spare parts listing, special tools listing, and other items as may be specified
 - .3 Electrical Contractor:
 - .1 The Life Safety Systems Commissioning Agent (LSSCA) is being retained by the electrical contractor, however; this contractor's work to satisfy the LSSCA requirements shall be included in the tender price.
 - .2 Verify Functional performance of electrical systems for compliance with design intent as specified in the appropriate Specification sections.
 - .3 Provide the documentation with standard Functional performance reports on completion of the testing.
 - .4 Verify submissions for electrical system operation and maintenance manuals, record documents, spare parts listing, special tools listing, and other items as may be specified.
 - .5 As a minimum this contractor must include for:
 - .1 Providing the LSSCA with documentation of design and shop drawings.
 - .2 Provide documents for sequence of operation and maintenance of system.
 - .3 Testing of all components and accessories to confirm Alarm/Supervisory/Trouble at the fire panel.
 - .4 Testing and operation of any generator (s) as applicable to the project.

- .5 Other items that may be requested by the LSSCA.
- .6 Re-commissioning of any items that may have failed.
- .7 Re-setting of the system to proper operation after tests are completed.
- .4 Equipment Manufacturers:
 - .1 The equipment manufacturers shall be responsible for providing labour, material, equipment, etc., required within the scope of the respective equipment to facilitate the commissioning process.
 - .2 The equipment manufacturers will perform Pre-Functional and Functional Performance Tests required by the commissioning process.
- .5 Design Engineer:
 - .1 The design engineer shall observe Functional Performance Testing, at his discretion.
 - .2 The design engineer shall provide technical capabilities for resolution of deficiencies, where required.

Part 2 Commissioning Process

2.1 OPERATIONS AND MAINTENANCE MANUALS

- .1 Furnish Final, reviewed Operation and Maintenance Manuals to the Consultant fourteen (14) days prior to scheduled Functional Performance Tests.

2.2 FUNCTIONAL PERFORMANCE TEST

- .1 The contractor shall be responsible for the Functional Performance Tests. These tests ensure that all equipment and systems are installed in accordance with the Specifications, Drawings and manufacturers' requirements.
- .2 The contractor shall be responsible for co-ordinating schedule for Functional tests of various equipment and systems.
- .3 In the Functional Test, all noted systems and sub-systems shall be checked for the following:
 - .1 Verify that each element has been properly installed, properly identified, and that all connections have been made correctly.
 - .2 Verify that tests, meter readings, and specific mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.
 - .3 Re-commission any item (s) that may have failed.
 - .4 Notify the consultant in writing, at least fourteen (14) days prior to the date of Functional Performance Testing. Schedule the Functional performance tests over a period of consecutive business days.
- .4 Provide ULC Certificate confirming the system is fully functional and test to the Engineer for review and approval.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2No.65-1956 (R1965), Wire Connectors.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for armoured cable and flexible conduit as required.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

- .1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated T90 for indoor above grade installations and RW90 for below grade installations.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Type: ethylene propylene rubber.
 - .2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat interlocking galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride material.
- .7 Fastenings:
 - .1 One-hole malleable iron straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.

- .2 Channel type supports for two or more cables at 4.5m centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
 - .1 Watertight approved for TECK cable.

2.3 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Connectors must be suitable for installed environment and approved for use with armoured cable.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.
 - .2 In trenches in accordance with Section 26 05 43.01.
- .2 All lighting and branch circuits from SPD protected panels are to be provided with separate neutrals. Size branch circuits accordingly. All lighting branch circuit connections in classrooms, and similar rooms with multiple lighting zones shall not be looped. Provide junction boxes and bx pigtail to each fixture individually.

3.2 INSTALLATION OF TECK CABLE 0 -1000 V

- .1 Install cables.
 - .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - 0 - 1000 V.

3.3 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .3 These cables are to be installed in concealed locations only. These concealed locations are considered to be stud walls and “drops” to stud walls, lighting fixtures, and ceiling mounted devices.
- .4 These “drops” shall not be permitted to exceed 2.4m (8’-0”). To limit these “drops” to lengths noted above, provide addition branch wiring in conduit.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International)

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as required by code.
- .3 Rod electrodes: copper clad steel 19mm dia. by 3m long.
- .4 Grounding conductors: bare stranded copper, tinned, soft annealed.
- .5 Insulated grounding conductors: green with insulation type that matches specified phase conductors. Gauge shall be in conformance with the latest edition of the Electrical Safety code to suit required installation conditions.
- .6 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process inspectable wrought copper compression connectors to ANSI/IEEE 837..
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.

- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end.
- .13 Ground secondary service pedestals.

3.2 ELECTRODES

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- .4 Install rod electrodes and make grounding connections.
- .5 Bond separate, multiple electrodes together.
- .6 Use size 2/0 AWG copper conductors for connections to electrodes.

3.3 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of secondary 120/208V system.

3.4 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.5 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical/sprinkler room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.6 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
 - .2 Sound, fire alarm, intercommunication systems as indicated.

3.7 PERMAFROST

- .1 Bond non-current carrying metal parts together with size 2/0AWG copper equipotential conductor. Run conductor from separate lug or service neutral bar to, but not necessarily limited to, following indoor systems and equipment:
 - .1 Hot water heating system.
 - .2 Main water pipe.
 - .3 Main building drain.
 - .4 Oil line.
 - .5 Telephone, radio/tv, emergency and fire alarm lead-in or service conduits, near panels.
 - .6 Make connections to pipes on building side of main valves and tanks. Connect jumpers across boilers to supply and return hot water heating pipes.
- .2 Drive three -19 mm diam x 3 m copper clad ground rods at least 1.8 m apart in original undisturbed ground. If rods will not penetrate permafrost, drive at angle not more than 60° from vertical, and in same direction. Rods must be driven, not trenched.
- .3 Install ground wire from service neutral bar to rods and where buried use bare copper not smaller than size 1AWG7- strand or size 4AWG solid, and at least 460 mm below ground. Bond ground conductor, or short tap from it to outside metal sheathing of building close to power service conduit. Use lug or cast clamp, with bronze or plated bolt, nut and washers (not sheet metal screw or wood screw). Remove paint from sheathing for good contact. Conduit is required only on outside wall of building. Indoors, run bare and fasten as specified for equipotential bonding wire.
- .4 Install electrode interconnections where metal parts, circuits or grounding conductors and/or electrodes are in proximity to lightning rod conductors.

3.8 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 Products

1.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted.

Part 2 Execution

2.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 1.5m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .14 All light fixtures installed in or on T-bar ceilings to be independently supported. Use appropriate jack chain and anchors.

END OF SECTION

Part 1 Products

1.1 MATERIAL

- .1 Splitters must conform to CSA C22.2 No. 76 (latest edition)
- .2 Junction and pull boxes must conform to CSA C22.2 No.40 (latest edition)

1.2 SPLITTERS

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.
- .4 Splitter length must match arrangement of equipment unless indicated otherwise.

1.3 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

Part 2 Execution

2.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines on 19mm (3/4") painted plywood backboards.

2.2 JUNCTION AND PULL BOXES INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Install pull boxes so as not to exceed 30m (100') of conduit run between pull boxes in conformance with the Electrical Safety Code.

2.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.2 No 18 (latest edition).

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 L
- .3 102 mm (4') square or larger outlet boxes as required for special devices.
- .4 Gang boxes where wiring devices are grouped.
- .5 Blank cover plates for boxes without wiring devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76mm x 50mm x 38 mm (3"x2"x 2^{1/2}" or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required. Iberville 1104 Series.
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit utility rooms, minimum size 102 x 54 x 48 mm. Iberville 1110 series
- .3 102 mm (4") square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm (4") square outlet boxes with extension and plaster rings for flush mounting devices in finished tile walls.

2.3 MASONRY BOXES

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

2.4 CONCRETE BOXES

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

2.5 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm and 19 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

- .1 Cast FS or FD ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles in areas (other than utility rooms) where surface conduit is used.

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm (1-1/4") and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.
- .5 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-R2003, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardwar.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Flexible Non-metallic Tubing

Part 2 Products

2.1 CONDUITS

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

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 53 mm (2") and smaller.
 - .1 Two-hole steel straps for conduits larger than 53 mm (2").
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5m (5') on centre.
- .4 Threaded rods, 6mm (1/4") diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm (1") and larger conduits.
- .3 EMT fittings shall be set screw style (zinc alloy).
- .4 Flexible metal conduit fittings shall be screw-in type.
- .5 Liquid type flexible metal conduit fittings shall be sealtite type.
- .6 PVC fittings shall be PVC type complete with PVC adaptors at all boxes.
- .7 Where bushings are noted to be provided, they must be "screwed" type fastened to a conduit connector. Push-fit or glued in place bushings will not be accepted.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Nylon Twine.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Use electrical metallic tubing (EMT) for all branch circuits unless specified otherwise.
- .4 Use rigid PVC conduit underground and in kitchen areas.
- .5 Use flexible metal conduit for connection to motors in dry areas, connection to recessed fixtures without prewired outlet box, connection to surface or recessed fixtures, work in movable metal partitions.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations and for connections to kitchen equipment.
- .7 Use explosion proof flexible connection for connection to explosion proof motors.
- .8 Conduits terminating at electrical equipment in sprinklered areas are to be provided with insulated compression style connectors equal to Thomas & Betts Cat#TC8XXSC or approved equal.
- .9 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .10 Minimum conduit size for lighting and power circuits: 21 mm (3/4"). Single drops from ceiling mounted junction boxes down to a light switch or duplex receptacle may be reduced to 16mm (1/2")
- .11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .12 Mechanically bend steel conduit over 27mm (1") diameter.
- .13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .14 Install fish cord in empty conduits.

- .15 Run 2-27mm (1") spare conduits up to accessible ceiling space each flush panel. Terminate these conduits in 152 x 152 x 102 mm (6"x6"x4") junction boxes in ceiling space.
- .16 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .17 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75mm (3") parallel to steam or hot water lines with minimum of 25mm at crossovers.
- .7 Do not fasten surface conduit larger than 25mm (1") to roof deck. Provide standoffs or supports as manufactured by Caddy or use Unistrut trapeze fastened to structure.

3.4 CONCEALED CONDUITS

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

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 27mm (1") concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits 27mm (1") and larger 300mm (12") below slab (measured from top of slab to bottom of conduit) and encased in 78mm (3") sand envelope.
 - .1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA International)

Part 2 Products

2.1 MATERIALS

- .1 Rigid PVC ducts must conform to CSA C22.2 No. 211.0, 211.1 and 211.2 (latest edition)
- .2 Ducts and/or cables must be excavated, bedded, reinforced, encased and backfilled as per details on the drawings.

2.2 DUCT

- .1 Ducts indicated for encasement in concrete must be DB-2. Ipex "Super Duct" or approved equal.
- .2 Ducts indicated for direct burial must be type SCEPTER. Ipex "Scepter" rigid PVC duct or approved equal.

2.3 DUCT FITTINGS

- .1 Fittings required to provide a complete continuous ductbank installation shall included but not limited to, couplings, bell end fitting, caps, adapters, base and intermediate spacers.
- .2 Small or large angle couplings will be required.
- .3 Expansion joints are to be provided when running ducts in concrete across expansion joints and where exposed on roofs or exterior of buildings.

Part 3 Execution

3.1 BASIC INSTALLATION

- .1 Excavate trench along route as indicated and at depth to suit cables and/or ducts as detailed.
- .2 If required, trench is to be pumped to maintain excavation free of water.
- .3 Import granular fill and place in bottom of trench. Compact to provide a firm level base.
- .4 Quantity and arrangement of ducts must be provided according to drawing details.
- .5 When ducts terminate at buildings or precast bases provide bell end fittings.
- .6 When terminating a ductbank for future extension terminate each duct with a coupling, if ducts are encased in concrete set coupling flush with end of concrete.
- .7 Attach ducts to spacers using non-metallic materials.
- .8 Provide concrete as detailed. Pour concrete down sides of ductbank to ensure spaces around and under ducts are filled first.
- .9 Concrete must obtain 50% of its specified strength prior to backfilling.

- .10 Backfilling must be imported granular 'A' material.
- .11 Backfill must be placed at 150mm (6") compacted lifts.
- .12 Excess excavated material must be removed from site by this contractor.
- .13 Ensure ducts indicated to be installed along a curb line are installed at least 600mm (24") from that curb line.

3.2 DIRECT BURIAL OF CABLES

- .1 After sand bed specified is in place, lay cables maintaining 75mm (3") clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150mm (6") for each 60m run, maintaining minimum cable separation and bending radius requirements.
- .3 Underground cable splices not acceptable.
- .4 Duct separation:
 - .1 Provide separation of ducts in conformance with the details in the Electrical Safety Code.

3.3 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

3.4 MARKERS

- .1 Mark cable every 150 m along duct runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Install cedar post type markers.
- .5 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.5 FIELD QUALITY CONTROL

- .1 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .2 Check phase rotation and identify each phase conductor of each feeder.
- .3 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .4 Pre-acceptance tests.

- .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000V megger on each phase conductor.
- .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .5 Provide Consultant with list of test results showing location at which each test was made, circuit tested and result of each test.
- .6 Remove and replace entire length of cable if cable fails to meet any of test criteria.
- .7 The Consultant requires a minimum of 48 hours notice to inspect at his discretion the following: ductbank excavation, bedding and duct placement. Pouring and/or placement of ductbank encasement.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 This analysis is to be performed by an independent, third-party firm.
- .2 The studies must be submitted to the Consultant prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Consultant may be obtained for a preliminary submittal of sufficient study data to ensure that the selection of device ratings and characteristics will be satisfactory.
- .3 The studies shall include all portions of the electrical distribution system from the normal power source or sources down to and including the smallest adjustable trip circuit breaker in the distribution system. Normal system connections and those, which result in maximum fault conditions, shall be adequately covered in the study.
- .4 The firm should be currently involved in high- and low-voltage power system evaluation. The study must be performed, stamped and signed by a registered professional engineer in the Province of Ontario. Credentials of the individual(s) performing the study and background of the firm shall be submitted to the Consultant for approval prior to start of the work. A minimum of five (5) years experience in power system analysis is required for the individual in charge of the project.
- .5 The firm performing the study should demonstrate capability and experience to provide assistance during start up as required.

1.2 DATA COLLECTION FOR THE STUDY

- .1 The Contractor shall provide the required data for preparation of the studies. The Consultant performing the system studies shall furnish the Contractor with a listing of the required data immediately after award of the contract.
- .2 The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to release of the equipment for manufacturing.
- .3 Data collected for the study, including correspondence with local utility, shall be included with study report.

Part 2 Products

2.1 SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND COORDINATION STUDY:

- .1 The short-circuit study shall be performed with the aid of a digital computer program and shall be in accordance with the latest applicable IEEE and ANSI standards.
- .2 In the short-circuit study, provide calculation methods and assumptions, the base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, tabulations of calculation quantities and results, conclusions, and recommendations. Calculate short-circuit interrupting and momentary (when applicable) duties for an assumed 3-phase bolted fault at each supply switchgear lineup, unit substation primary and secondary terminals, low-voltage switchgear lineup, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboard, and other significant overcurrent protective device locations throughout the system. Provide a ground fault current study for the same system areas, including the associated zero sequence impedance data. Include in tabulations fault impedance, X to R ratios, asymmetry factors, motor fault contribution, short circuit kVA, and symmetrical and asymmetrical fault currents.

- .3 In the protective device coordination study, provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size, log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.
- .4 Include on the curve sheets power company relay and fuse characteristics, medium-voltage equipment protective relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices. In addition, include all devices down to the largest branch circuit and largest feeder circuit breaker in each motor control center, and main breaker in branch panelboards. Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical fault current to which the device is exposed.
- .5 Select each primary protective device required for a delta-wye connected transformer so that its characteristic or operating band is within the transformer characteristics, including a point equal to 58 percent of the ANSI withstand point to provide secondary line-to-ground fault protection. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by a 16 percent current margin to provide proper coordination and protection in the event of secondary line-to-line faults. Separate medium-voltage relay characteristic curves from curves for other devices by at least a 0.4-second time margin.
- .6 Include complete fault calculations as specified herein based on contract documents.
- .7 Submit qualifications of individual(s) who will perform the work for approval prior to commencement of the studies. Provide studies in conjunction with equipment submittals to verify equipment ratings required. Submit the study to Consultant for review prior to delivery of the study to the Owner. Make all additions or changes as required by the reviewer.
- .8 Utilize equipment load data for the study obtained by the Contractor from contract documents, including contract addendum's issued prior to bid openings.
- .9 Include fault contribution of all motors in the study. Notify the Consultant in writing of circuit protective devices not properly rated for fault conditions.
- .10 When emergency generator is provided, include phase and ground coordination of the generator protective devices. Show the generator decrement curve and damage curve along with the operating characteristic of the protective devices. Contractor shall obtain the information from the generator manufacturer and include the generator actual impedance value, time constants and current boost data in the study. Do not use typical values for the generator.
- .11 Evaluate proper operation of the ground relays in 4-wire distributions with more than one main service circuit breaker, or when generators are provided, and discuss the neutral grounds and ground fault current flows during a neutral to ground fault.
- .12 For motor control circuits, show the MCC full-load current plus symmetrical and asymmetrical of the largest motor starting current and time to ensure protective devices will not trip during major or group start operation.

2.2 STUDY REPORT

- .1 The results of the power system study shall be summarized in a final report. Six (6) bound copies of the final report must be submitted.

- .2 The report shall include the following sections:
 - .1 Descriptions, purpose, basis, and scope of the study.
 - .2 Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same.
 - .3 Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - .4 Fault current calculations including a definition of terms and guide for interpretation of computer printout.

Part 3 Execution

3.1 POWER COMPANY APPROVAL

- .1 Copies of the final report must be submitted to the power company for their review and approval. Approved copies of the report shall be submitted to the Consultant.

3.2 FIELD SETTINGS

- .1 The Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study, and protective device coordination study.
- .2 Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short-circuit and protective device coordination study shall be carried out by the Contractor at no additional cost to the Owner. SPEC NOTE: Define areas where concealed/surface conduits are permitted. Specify in following paragraphs.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

- .1 Submit shop drawings for each system in Conformance with The Electrical General Requirements Section

1.2 PRODUCT/MAINTENANCE DATA

- .1 Submit product/maintenance data for each system for inclusion in maintenance manual conforming to The General Electrical Requirements Section.

1.3 SCOPE

- .1 The scope of this Section will include the following systems.
 - .1 Surface mounted raceway.
 - .2 Hand dryers.
 - .3 Cable management hangers
 - .4 Telecommunication network system rough-in.
 - .5 Miscellaneous clocks.
 - .6 Classroom control panels.
 - .7 Occupancy sensors.
 - .8 Public Address system rough-in.
 - .9 Security and access control rough-in.
 - .10 UPS System.

Part 2 Products

2.1 SURFACE MOUNTED RACEWAY

- .1 The two compartment surface raceway shall be complete with the following features:
 - .1 Surface non-metallic raceway is to be utilized in dry interior locations only as covered in Article 352 Part B of the National Electrical Code, as adopted by the National Fire Protection Association and as approved by the American National Standards Institute.
 - .2 The surface non-metallic raceway system specified herein for branch circuit wiring and/or data network, voice, video and other low-voltage wiring shall be the 5400 System as manufactured by the Wiremold Company.
 - .3 The raceway and all system components must be ULc Listed and exhibit non-flammable self-extinguishing characteristics tested to comparable specifications of UL94V-0. The raceway base and cover shall be manufactured by rigid compound, available in ivory or white colours (Architect Selection).
 - .4 The raceway shall be a two-piece design with a base and a snap-on cover. Total width shall be 133 mm (5.1/4") by 44.5 mm (1.3/4") deep with an approximate thickness of 2.4 mm (1/12"). The base and cover shall be available in 2.4 m (8') lengths. The raceway shall be available with two multiple wiring channels formed by integral barriers in the base
 - .5 The cover shall span the entire width of the base concealing all of the wiring channels.
 - .6 A full complement of fittings must be available including, but not limited to flat, internal and external elbows, tees entrance fittings, cover clips and end caps. They shall be manufactured of a rigid PVC compound. The fittings shall have a matte texture, in ivory

or white colours to match the base and cover. They shall overlap the cover and base to hide uneven cuts. All fittings shall be supplied with a base where applicable to eliminate mitring. A transition fitting shall be available to adapt to other Wiremold series raceways.

- .7 Device brackets shall be available for mounting standard devices in-line with the raceway. Faceplates shall match and fit flush in the device plate. They shall be manufactured of rigid PVC compound. They shall be ivory or white colours to match raceway base cover (Architect selection). Contractor is to provide devices as noted.
- .8 The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP (including Category 5e and 6), STP (150 ohm) Fibre Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting. The electrical contractor is to provide adapter plates for faceplates to be provided by the voice/data sub-contractor. The recommended plate is a Deco adapter 3-port plate style, confirm with voice/data sub-contractor.
- .9 Acceptable alternate manufacturers include:
 - .1 Hubbell Base Trak
 - .2 Panduit Pan-Way

2.2 HAND DRYERS

- .1 Hand dryers where noted on the drawings are to be supplied and installed by this Division with the following features:
 - .1 Surface mounting.
 - .2 Fixed nozzle.
 - .3 White finish with automatic activation.
 - .4 Rating of 1000 W (15 A) at 120 V.
 - .5 Dyson Airblade V
 - .6 Approved alternates by:
 - .1 World Dryer
 - .2 Comac

2.3 CABLE MANAGEMENT HANGERS

- .1 Hangers where noted are to be complete with the following features:
 - .1 Approximately 53mm (4") high by 78mm (3") protrusion.
 - .2 Constructed from flat galvanized steel bar c/w mounting accessories as required.
 - .3 Suitable for wall or suspended mounting.
 - .4 Acceptable Manufacturers:
 - .1 Mono Systems Cat. # The Hook H-233
 - .2 EMF Cat.#H-533-S
 - .3 Eaton Cat #NCM-JHW20-25
 - .4 Cablofil Cat. #CJ64

2.4 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

- .1 Provide cable management hangers above ceiling space for routing of new data cables. Coordinate all requirements with network vendor.
- .2 Outlets where noted shall be single gang flush mounted in wall or surface raceways.
- .3 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.
- .4 Provide a #6 insulated green ground conductor from main service ground to voice equipment backboard located on drawings.
- .5 Voice/data installation shall be by Board approved vendor as part of cash allowance.

2.5 MISCELLANEOUS CLOCKS

- .1 Room and/or office clocks shall be surface mounted 300 mm (12") round style, battery operated. Finish to suit Architect.
- .2 Library and general purpose room clocks shall be surface mounted 375 mm (15") round style, battery operated. General purpose room clocks must be provided with wire guard. Finish to suit Architect.
- .3 Manufacturers shall be as follows:
 - .1 300 mm (12"):
Edwards Cat. #2941-2B
Simplex Cat. #BAT Series
American Time Cat. #E56BADD304
 - .2 375 mm (15"):
Edwards Cat. #2942-2B
Simplex Cat. # BAT Series
American Time Cat. # E66BADD304

2.6 CLASSROOM CONTROL PANELS

- .1 All new Classroom Control Panels to be supplied and installed by the general contractor. Electrical contractor to coordinate device locations and requirements with G.C. Refer to architectural specifications for Classroom control panel requirements.

2.7 PUBLIC ADDRESS SYSTEM ROUGH-IN

- .1 Provide cable management hangers above ceiling space for routing of new data cables. Coordinate all requirements with network vendor.
- .2 Provide conduit from device and outlet locations to cable management systems as noted on drawings.
- .3 Device/Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.
- .4 Provide grounding of equipment as noted on drawings.
- .5 Public address system installation shall be by Board approved vendor as part of a cash allowance.

2.8 SECURITY AND ACCESS CONTROL ROUGH-IN

- .1 Provide cable management hangers above ceiling space for routing of new data cables. Coordinate all requirements with network vendor.

- .2 Provide conduit from device and outlet locations to cable management systems as noted on drawings.
- .3 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.
- .4 Provide grounding of equipment as noted on drawings.
- .5 Security and access control systems installation shall be by Board approved vendor as part of a cash allowance.

2.9 UPS SYSTEM

- .1 UPS shall be by purchased as part of a cash allowance. Installation to be by this contractor as part of the base contract.
- .2 Electrical contractor to supply an online 5000VA, 208/120V 1Ø, hard wired in – hard wired out, floor mounted UPS with bypass switch as follows:
 - .1 5000VA, 208V4U UPS rack module Liebert CAT. #GXT5-5000MVRT4UXLN C/W three (3) VTV-GXT5-EBC144VRT2U batteries.
 - .2 Include Liebert Power Assurance Package VTV-PAPGXT-5K6K & (3) VTV-PAPGXT-BATT.
 - .3 Great Lakes E Cabinet # GL300E-2432-B-SQM6MS: 30"H x 24"W x 32"D, 13 RMU, 600 lb. Weight Capacity, Color: Black. Rack to include Frame with levelers (2.5"H; not installed unless specified at time of order); Mesh Front Door; Mesh Rear Door; Solid (2) Side Panel; 3/8" sq. (M6) Mounting Rails with Rack Mount Hardware for each UPS and external batteries respectively.

Part 3 Execution

3.1 SURFACE MOUNTED RACEWAY

- .1 Raceway is to be supplied and installed c/w all necessary fittings, hardware and device brackets for configuration as noted in the drawings for a complete functional installation.
- .2 Install conduit system, wiring and devices as indicated.
- .3 Ensure raceway is installed as per manufacturer recommendations.
- .4 Where the raceway ends at a wall install end cap.

3.2 HAND DRYERS

- .1 Install and connect hand dryers in conformance with manufacturer's recommendations.
- .2 Hand dryers are to be mounted at a height to suit age of expected users'. Unless otherwise noted confirm height with manufacturer, owner, Architect, and/or consultant prior to rough in.
- .3 Once installed this contractor is to caulk the joint between dryer and wall surface with a bead of white silicone.

3.3 CABLE MANAGEMENT HANGERS

- .1 Install hangers as per manufacturers standards.
- .2 Prior to installation co-ordinate location with other services within the ceiling space.
- .3 Co-ordinate with note sub-contractors to install cables noted to be utilizing these hangers. Cables are to be installed such that the maximum sag between hangers does not exceed 25mm (1"). This electrical contractor to coordinate.
- .4 Attaching cable to any t-bar support rods is not acceptable.

3.4 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

- .1 Conduits terminated into ceiling spaces must be within 3m (10') of cable management hangers or zone conduits (if applicable).
- .2 Ensure specified zone conduits are installed back to service backboard.
- .3 Outlets are to be installed complete with 25 mm (1") conduit to corridor ceiling space or nearest cable management hanger or zone conduit (if applicable).
- .4 Provide insulated bushings on all conduits terminated in ceiling space.

3.5 MISCELLANEOUS CLOCKS

- .1 Ensure clocks are installed where noted complete with batteries and all necessary mounting hardware.
- .2 Set clocks to proper time of day and ensure all are operational at the time of final inspection.

3.6 CLASSROOM CONTROL PANELS

- .1 General contractor to supply and install units in accordance with manufacturers' recommendations and reviewed shop drawings complete with all frames, cut outs, face panels, etc., to provide a complete installation.
- .2 Electrical trade to supply and install all electrical devices in each unit as per schedule in accordance with manufacturers' recommendations and reviewed shop drawings. Coordinate all work with the general and mechanical contractor.

3.7 PUBLIC ADDRESS SYSTEM ROUGH-IN

- .1 Conduits terminated into ceiling spaces must be within 1m (10') of cable management hangers.
- .2 Outlets are to be installed complete with 25 mm (1") conduit to corridor ceiling space.
- .3 Provide insulated bushings on all conduits terminated in ceiling space.

3.8 SECURITY AND ACCESS CONTROL ROUGH-IN

- .1 Outlets are to be provided for devices with 21mm (1") conduit to corridor ceiling space.
- .2 Conduits terminated into ceiling spaces must be within 1m of cable management.

3.9 UPS SYSTEM

- .1 Install in accordance with manufacturer's instructions.
- .2 Electrical contractor to install UPS and associated components in a new 4 post rack. Coordinate and confirm placement with School Board IT representative.
- .3 UPS and components to be commissioned by manufacturer representative on site. UPS manufacturer shall include the following on site visits:
 - .1 Pre-energize visit to inspect installation and provide guidance to installing contractor as required.
 - .2 Start up and commissioning visit for operator training and commissioning certificate.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This contractor is responsible to supply and install all equipment and control wiring as specified for the digital occupancy for the classrooms, corridors and offices. This contractor must coordinate these control systems with the lighting fixtures being supplied for the project to ensure intended function as specified.
- .2 Control Intent: Control Intent includes, but is not limited to:
 - .1 Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
 - .2 Initial sensor and switching zones
- .3 All equipment must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

1.2 REFERENCES

- .1 American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE).
- .2 Underwriter Laboratories of Canada (ULC).
- .3 International Electrotechnical Commission.
- .4 International Organization for Standardization (ISO).
- .5 National Electrical Manufacturers Association (NEMA).

1.3 DEFINITIONS

- .1 Do not duplicate common acronyms, abbreviations, and terms defined in Section 260010 "Supplemental Requirements for Electrical."
- .2 Retain terms that remain after this Section has been edited for a project. Include only essential definitions or acronyms not well understood by the affected industry or trade.
- .3 Data Bus: A wired interface used to communicate with connected devices.
- .4 Device: A collective term for bus or wireless connected devices, including fluorescent ballasts, LED drivers, incandescent luminaires, manual switches, switching relays, sensors, and similar.
- .5 Global: Communication between devices in otherwise separate spaces using a bridging device or system controller.
- .6 Group: A set of devices that communicate together.
- .7 Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.
- .8 Scene: Digital light level associated with a preset.
- .9 System Backbone: Devices used to connect and manage otherwise separate spaces, including bridging devices and gateways or system controllers. Used to expose devices to software configuration via TCP/IP.

1.4 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 26 05 00.
- .2 Product Data:
 - .1 Bill of Materials necessary to install the networked lighting control system.
 - .2 Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
 - .3 Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems.
 - .4 Other Diagrams and Operational Descriptions - as needed to indicate system operation or interaction with other system(s).
- .3 Shop Drawings:
 - .1 Riser Diagrams showing device wiring connections of system backbone and typical per room/area type.

1.5 LIGHTING CONTROL APPLICATIONS

- .1 Provide a minimum application of intended lighting control functions as detailed on design drawings and specified herein. Control functions shall include the following:
- .2 Space Control Requirements – Provide occupancy with Manual-ON functionality in all spaces except toilet rooms, storerooms, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors.
- .3 Bi-Level Lighting – Provide single zone, multi-level controls in any enclosed office, conference room, meeting room, and training room in all enclosed spaces except where variable dimming or multi-zone switching is used.
- .4 Daylit Areas – All luminaires closest to the daylight source, and zoned separately from other fixtures in the space, shall be controlled separately from luminaires outside of daylit zones. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.

1.6 WARRANTY

- .1 Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.
 - .1 Failures include, but are not limited to, the following:
 - .1 Faulty operation of lighting control hardware.
 - .2 Faulty operation of lighting control firmware.
 - .2 Minimum Warranty Period: Five years from date of shipment.

1.7 QUALITY ASSURANCE

- .1 Manufacturer Qualifications:

- .1 Phone Support: Toll-free technical support available from manufacturer through an online tool to schedule a technical support appointment and provide 24/7 emergency support.
- .2 Remote Support: Manufacturer capable of providing remote support and ability to virtually connect with customers to address issues with visual guidance overlaid on images of real-world objects.
- .3 Cellular Connectivity: Manufacturer capable of cellular connectivity to a networked lighting control systems available to provide remote support within Canada.
- .4 On-Site Support: Manufacturer capable of providing a 72-hour, on-site response time within Canada.

Part 2 Products

2.1 SYSTEM COMPLIANCE

- .1 System components manufactured in accordance with UL 916 and UL 924 standards where applicable.
- .2 System components manufactured in accordance with CFR Title 47, Part 15 standards where applicable.
- .3 System components manufactured in accordance with ISED Canada RSS-247 standards where applicable.
- .4 System components manufactured in accordance with IFT-008-2015 and NOM-208-SCFI-2016 standards where applicable.
- .5 Performance Criteria:
 - .1 Regulatory Requirements:
 - .1 Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2

2.3 MANUFACTURERS

- .1 Basis of design product: Acuity Controls (nLight). Alternates will not be accepted.

2.4 SYSTEM ARCHITECTURE

- .1 System architecture based upon the following concepts:
 - .1 Networkable intelligent lighting control devices.
 - .2 Standalone lighting control zones using distributed intelligence.
 - .3 System backbone for remote, time-based, and global operation.
- .2 Intelligent lighting control devices with individually addressable network communication capability and having one or more basic lighting control components including: occupancy sensor, photosensor, relay, dimming output, contact closure input, analog 0-10 V(dc) input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure permissible to minimize overall system device count.
- .3 System capable of interfacing directly with luminaires for dimming purposes.

- .4 Lighting control zones consisting of one or more intelligent lighting control devices capable of providing automatic control from sensors (occupancy) and manual control from local wall stations without requiring connection to a higher-level system backbone.
 - .1 Lighting control zones (wired) support at least 128 devices per zone.
 - .2 Capable of being networked with a higher-level system backbone to provide time-based control, control from inputs or systems external to control zone, and remote configuration and monitoring through a software interface.
- .5 Intelligent lighting control devices with distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones operate according to their defined default settings and sequence of operations.
- .6 System to include one or more system controllers that provide time-based control.
- .7 System controller provides means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP or BACnet MS/TP protocol.
- .8 System controller supports both low-voltage wired and wireless RF communication within a single controller device.
- .9 System devices support firmware update, either remotely or from within the application space, for purposes of upgrading functionality at a later date.
- .10 System capable of reporting lighting system events and performance data to management software for display and analysis.

2.5 WIRED NETWORKED CONTROL ZONE CHARACTERISTICS:

- .1 Connections to devices within a wired networked lighting control zone and to backbone components accomplished with a single type of low-voltage network cable, compliant with CAT5e specifications or higher. Use of mixed types of low-voltage network cables is unacceptable.
- .2 Devices connected in "daisy-chain" topology. "Hub-and-spoke" topology, requiring all individual networked devices to be connected to a central component, is unacceptable, to reduce the total amount of network cable required for each control zone.
- .3 Pre-terminated, plenum-rated, low-voltage network cabling supplied with hardware.
- .4 Following proper installation and provision of power, all networked devices connected with low-voltage network cable must automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g. software application, handheld remote, pushbutton).
 - .1 The "out of box" default sequence of operation is intended to provide typical sequence of operation to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
- .5 System software capable of automatic discovery of all connected devices without requiring any provisioning of system or zone addresses.
- .6 Networked devices capable of detecting improper communication wiring and LED notification to alert installation/startup personnel.

- .7 Networked control devices suitable for control of egress or emergency light sources without additional, externally mounted UL 924 shunting or 0-10 V(dc) disconnect devices, to provide a compliant sequence of operation while reducing the overall installation and wiring costs of the system. Capable of supporting the following sequence of operation:
 - .1 Low-Voltage Power Sensing: Devices automatically provide 100 percent light level upon detection of loss of power sensed via low-voltage network cable connection where applicable.
 - .2 Line-Voltage Power Sensing: Devices listed as UL 924 emergency relays which automatically close load-control relay and provide 100 percent light output upon detection of loss of power sensed via line voltage connection to normal power.
- .8 Global Control Zones: Intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.
- .9 Wired Networked Wall Station Scene-Control Capabilities:
 - .1 Preset Scenes that activate a specific combination of light levels across multiple local and global channels.
 - .2 Local Profile Support: Profile Scenes that modify the sequence of operation for devices in the area (group) in response to a button press to dynamically optimize occupant experience and lighting energy usage.
 - .1 Wall stations able to manually start and stop local profiles, or local profile capable of ending after a specific duration of time between five minutes and 12 hours.
 - .2 Configurable Parameters:
 - .1 Fixture light level.
 - .2 Occupancy time delay.
 - .3 Response to occupancy sensors (including enabling/disabling response).
 - .4 Response to daylight sensors (including enabling/disabling response).
 - .5 Enabling/disabling wall stations.
 - .3 Three-Way or Multi-Way Control: Multiple wall stations capable of controlling the same local and global control zones, to support "multi-way" preset scene and profile scene control.

2.6 SYSTEM INTEGRATION CAPABILITIES:

- .1 Capable of interface with third-party building management systems (BMS) to support two-way communication using BACnet/IP protocol, BACnet MS/TP protocol, and RESTful API including the following system integration capabilities:
 - .1 "Write" messages for control of individual devices, including control of relay and dimming output.
 - .2 "Write" messages for control of groups of devices through a single command, including control of relay and dimming output of all devices.
 - .3 "Read" messages for individual device status information.
 - .1 Available status will vary based on device type and capabilities, which may include relay state, dimming output, power measurement, occupancy sensor status, and photosensor light measurement.

- .4 "Read" messages for group status information for occupancy, relay state, and dimming output.
- .5 Activation of pre-defined system Global Profiles.
- .2 Activation of Global Profiles from third-party systems via dry contact closure output signals or digital commands via RS-232 or RS-485.

2.7 SUPPORTED SEQUENCE OF OPERATIONS:

- .1 Control Zones:
 - .1 Local Control Zones: Intelligent lighting control devices installed in an area (also referred to as a group of devices) capable of transmitting and tracking occupancy sensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within area. These will also be referred to as local control zones.
 - .1 Global Control Zones: Intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span across multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.
- .2 Wall Station Capabilities:
 - .1 Wall stations support the following capabilities:
 - .1 On/Off of a local or global control zone.
 - .2 Continuous dimming control of light level of a local or global control zone.
 - .2 Multi-Way Control: Multiple wall stations capable of controlling the same local or global control zones, to support "multi-way" switching and dimming control.
- .3 Occupancy Sensing Capabilities:
 - .1 Occupancy sensors configurable to control a local or global zone.
 - .2 Multiple occupancy sensors capable of controlling the same local or global zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones.
 - .3 Occupancy sensing sequence of operation modes:
 - .1 On/Off Occupancy Sensing.
 - .2 Partial-On Occupancy Sensing.
 - .3 Partial-Off Occupancy Sensing.
 - .4 Vacancy Sensing (Manual-On / Automatic-Off).
 - .4 On/Off, Partial-On, and Partial-Off Occupancy Sensing Modes Sequence of Operation:
 - .1 Occupancy automatically turn lights on to a designated level when occupancy is detected. Designated occupied light level support at least 100 dimming levels.
 - .2 Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
 - .3 System capable of combining Partial-Off and Full-Off operation by dimming lights to a designated level when vacant and turning the lights off completely after an additional time delay.
 - .4 Wall station activation changes the dimming level or turn lights off as selected by the occupant. Lights optionally remain in this manually specified light level

until the zone becomes vacant. Upon vacancy, normal sequence of operation resumes.

- .5 Vacancy Sensing or Manual-On/Automatic-Off Mode Sequence of Operation:
 - .1 Activation of a wall station is required turn lights on. System capable of programming the zone to turn on to either a designated light level or previous user-set light level. Initially occupying the space without using a wall station must not result in lights turning on.
 - .2 Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
 - .3 System capable of dimming the lights when vacant and then turning the lights off completely after an additional time delay.
 - .4 System capable of an "automatic grace period" immediately following detection of vacancy, during which time any detected occupancy results in the lights reverting to the previous level. After the grace period has expired, the use of a wall station is required to turn lights on.
 - .5 Wall station interaction changes the dimming level or turn lights off as selected by occupant. Lights remain at manually specified light level until zone becomes vacant; normal sequence of operation resumes upon vacancy.
- .6 Occupancy time delays before dimming or shutting off lights separately programmable for all control zones from 15 seconds to 2 hours.
- .4 Schedule Capabilities:
 - .1 System capable of time schedules for time-of-day to override devices including offsets from dusk and dawn.
 - .2 System capable of providing a visible "blink warning" five minutes prior to the end of the schedule.
 - .3 Wall stations may be programmed to provide timed extensions/overrides that turn the lights on for an additional time period.
 - .1 Timed override/extension duration programmable for each individual device, zone of devices, or customized group of devices, from five minutes to 12 hours.
- .5 Global Profile Capabilities:
 - .1 System capable of automatically modifying the sequence of operation for selected devices in response to any of the following:
 - .1 Time-of-day schedule.
 - .2 Contact closure input state.
 - .3 Manually triggered wired wall station input.
 - .4 RS-232/RS-485 command to wired input device.
 - .5 BACnet input command.
 - .2 Global Profile Capabilities:
 - .1 Global Profiles stored within and executed from the system controller (via internal timeclock). Dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles.
 - .2 Global Profile time-of-day schedules capable of recurrence settings including daily, specific days of week, every "n" number of days, weekly, monthly, and yearly. Lighting control global profile schedules support definition of start date, end date, end after "n" recurrences, or never ending.

- .3 Daylight savings time adjustments capable of being performed automatically, if desired.
- .4 Global Profile holiday schedules follow recurrent settings for specific U.S. holiday dates regardless if they always occur on a specific date or are determined by day/week of the month.
- .5 Global Profiles capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times automatically derived from location information using an astronomical clock.
- .6 Software management interface capable of displaying a graphic calendar view of profile schedules for each control zone.
- .7 Global Profiles capable of manual activation directly from system controller, specially programmed wired input devices, scene-capable wired wall stations, and software management interface.
- .8 Global Profiles selectable to apply to a single device, zone of devices, or customized group of devices.
- .9 Global Profile Configurable Parameters:
 - .1 Fixture light level.
 - .2 Occupancy time delay.
 - .3 Response to occupancy sensors (including enabling/disabling response).
 - .4 Response to daylight sensors (including enabling/disabling response).
 - .5 Enabling/disabling of wall stations.
- .3 Local and Global Profiles backed up and stored on software's host server such that Profile backup can be applied to a replacement system controller or wired wall station.

2.8 SYSTEMS SOFTWARE INTERFACES

- .1 Management Interface:
 - .1 Web-based management interface for remote system control, live status monitoring, and configuration of lighting control settings and schedules.
 - .2 Compatible with industry-standard web browser clients.
 - .3 Minimum of 100 unique password-protected user accounts.
 - .4 Minimum of three user permission levels: read-only, read and change settings, and full administrative system access.
 - .5 Capable of restricting access for user accounts to specific devices within the system.
 - .6 All system devices capable of being given user-defined names.
 - .7 Device identification information displayed in the Management interface including:
 - .1 Model number.
 - .2 Model description.
 - .3 Serial number or network ID.
 - .4 Manufacturing date code.
 - .5 Custom label.
 - .6 Parent network device.
 - .8 Management interface capable of displaying live status of a networked luminaire or intelligent control device including:
 - .1 Luminaire on/off status.
 - .2 Dim level.

- .3 Power consumption.
- .4 Device temperature.
- .5 PIR occupancy sensor status.
- .6 Microphonic occupancy sensor status.
- .7 Remaining occupancy time delay.
- .8 Photosensor reading.
- .9 Active Profiles.
- .9 Management interface capable of displaying and modifying the current active settings of a networked luminaire or intelligent control device including:
 - .1 Dimming trim levels.
 - .2 Occupancy sensor and photosensor enable/disable.
 - .3 Occupancy sensor time delay and light level settings.
 - .4 Occupancy sensor response (normal or vacancy).
 - .5 Photosensor setpoints and transition time delays.
- .10 Management interface capable of applying settings changes for a zone of devices or a group of selected devices using a single action that does not require the user to apply settings changes for each individual device.
- .11 Management interface capable of compiling a printable network inventory report.
- .12 Management interface capable of compiling a printable report detailing all system profiles.
- .13 All sensitive information stored encrypted.
- .14 System software updates available for automatic download and installation via the Internet.
- .2 Visualization and Programming Interfaces:
 - .1 System provides an optional web-based visualization interface that displays a graphical floorplan.
 - .2 Graphical floorplan will offer the following types of system visualization:
 - .1 Full Device Option: Master graphic of entire building, by floor, showing each control device installed with zones outlined including:
 - .1 Controls devices not embedded in light fixtures.
 - .2 Occupancy sensors.
 - .3 Wall switches and dimmers.
 - .4 Scene controllers.
 - .5 Networked relays.
 - .6 Wired bridges.
 - .7 System Controllers.
 - .8 Wired relay panels.
 - .9 Group outlines.
 - .2 Group-Only Option: Master graphic of the entire building, by floor, showing only control groups outlined.
 - .3 Pan and zoom commands supported to allow smaller areas to be displayed on a larger scale simply by panning and zooming each floor's master graphic.
 - .4 Selecting any control device displays the following as applicable:
 - .1 Device catalog number.

- .2 Device name and custom label.
 - .3 Device diagnostic information.
 - .4 Link to further information on device including status or current configuration.
- .3 Programming capabilities through the application will include the following:
 - .1 Switch, occupancy sensor zone configuration.
 - .2 Manual-on or automatic-on modes.
 - .3 Turn-on and dim to dimming levels.
 - .4 Occupancy sensor time delays and PIR sensitivity.
 - .5 Dual technology occupancy sensors sensitivity.
 - .6 Trim level settings.
 - .7 Preset scene creation and copy for scene-capable devices.
 - .8 Fade rate settings.
- .3 Smartphone Programming Interface for Wired and Wireless Devices:
 - .1 Interface provided for both Apple iOS and Android operating systems that allows configuration of lighting control settings.
 - .2 Application supports configuration of wireless networked control devices.
 - .1 Application access granted with valid user name and password.
 - .2 Access to program information governed by permission system that allows users to share access with other users and restrict access to those who should not be able to reconfigure the equipment.
 - .3 Indication of signal strength where multiple Bluetooth Low-Energy Programming Devices are available for configuration.
 - .3 Application supports configuration or wired networked control devices.
 - .1 Connected device access granted through user-defined passcode at initial install.
 - .4 Programming Capabilities:
 - .1 Switch, occupancy sensor, and photosensor group configuration.
 - .2 Manual-on or automatic-on modes.
 - .3 Turn-on and dim to dimming levels.
 - .4 Occupancy sensor time delays and PIR sensitivity.
 - .5 Dual technology occupancy sensors sensitivity.
 - .6 Photosensor calibration adjustment and auto-setpoint.
 - .7 Trim level settings.
 - .8 Preset scene creation.
 - .9 Application of custom device labels for individual connected lighting control devices.
 - .10 Fade rate settings.

2.9 SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

- .1 System Controller: Multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
 - .1 Basis-of-Design Product: Provide nLight; Acuity Brands Lighting, Inc.; nECY
 - .2 System Controller Processor: 32-bit microprocessor operating at a minimum of 1 GHz.

- .3 System Controller Memory: Minimum of 512MB memory, with a minimum of 4GB non-volatile flash, to support operating system and databases.
- .4 System Controller Functions:
 - .1 Time-based control of downstream wired network devices.
 - .2 Linking into an Ethernet network.
 - .3 Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
 - .4 Connection to various software interfaces, including management interface, historical database and analytics interface, and visualization interface.
- .5 Integral web server to support system controller configuration and diagnostics with control and visualization of connected devices.
 - .1 Web Server Control Interface:
 - .1 Display associated devices within the context of a graphical floorplan.
 - .2 Provide control of output-capable devices through virtual sliders, toggle buttons, preset level widgets, and transparent layers on floorplan.
 - .3 Control Capabilities:
 - .1 Control of individual output devices, including control of relay state and analog dimming level where applicable.
 - .2 Control of local lighting control zones, including control of relay state and analog dimming level where applicable.
 - .3 Control of global lighting control zones, including control of relay state and analog dimming level where applicable.
 - .4 Control of Global Profiles.
 - .2 Visualization Interface:
 - .1 Customizable display with the ability to superimpose colored, transparent layers representing real-time property values, including occupancy status, dimming level status, light level status, and online or offline status where applicable.
 - .2 Ad hoc display of trended information via an intuitive values-over-time graph.
 - .3 Report Creation:
 - .1 Reports accept and graphically display trended status datasets for creator selected devices or zones of devices.
 - .2 Report information displayed over a user-defined interval and date range.
 - .3 Reports exportable to a standard CSV format.
- .6 Graphical touch screen to support configuration and diagnostics.
- .7 Minimum of three RJ-45 networked lighting control ports for connection to any of the following:
 - .1 Graphical touch screen.
 - .2 Wired communication bridges.
 - .3 Direct connection to intelligent lighting control devices (up to 128 total devices per port).
- .8 Device will automatically detect all network-connected devices.
- .9 Capable of managing and operating a minimum of 750 networked devices (wired or wireless) per system controller.

- .10 Multiple System Controllers capable of connection via LAN for scalability to a minimum of 20,000 networked devices.
- .11 Supports BACnet/IP and BACnet MS/TP protocols to directly interface with BMS and HVAC equipment without additional protocol translation gateways.
 - .1 BACnet MS/TP Connection Speed: 9600 to 115200 baud rate.
 - .2 BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.
- .12 Integral FIPS 140-2, Level 1 cryptographic module.
- .13 Supports RESTful API for control of BACnet objects, user management, date and time, and file management.
- .14 NEMA 1 enclosure with Class 1 and Class 2 separation.
 - .1 Power Supply Voltage: 120V(ac).
- .15 Automatic algorithm to eliminate redundant, wireless networked paths to streamline communication between the system controller and end devices.
- .16 System Controller Security Provisions:
 - .1 Disallow the use of default passwords and require passwords to be updated prior to use.
 - .2 Support user role-based access, such as administrator, user, and viewer.
 - .3 Signed firmware to ensure that unmodified, authentic software is always installed.
 - .4 IP-based communication protected with strong encryption algorithms such as AES or TLS1.2+.
 - .5 Prevent rollback of firmware to firmware versions with known, critical vulnerabilities.
 - .6 Valid cybersecurity listing through a third party.
- .17 Cellular Remote Access: Cellular router and modem for remote access.
 - .1 Router supports remote access to at least five system controllers on its local area network or network subnet.
 - .2 Remote access capable of device setting updates, schedule updates, system performance optimization, and diagnostics.
 - .3 Remote access enabled through outbound communication from router to an outside source. Solutions that begin communication via inbound requests for network access are unacceptable.
 - .4 Router supports outbound communication to manufacturer-hosted portal using TLS1.2 or greater in-transit encryption over a cellular or Ethernet connection.
 - .5 Router with integral firewall to prevent unauthorized access to devices connected to its local area network port.
 - .6 Router includes cellular SIM capable of connection to AT&T, T-Mobile, Sprint, US Cellular, Alaska Wireless, Telefonica, Tellus, Bell, or Sasktel networks where carrier service is available.
 - .7 Outbound communication from the router limited to whitelisted endpoints. Devices that allow unrestricted communication are unacceptable.
 - .8 Outbound communication from router includes only lighting control system information.

2.10 WIRED NETWORKED DEVICES

- .1 Wired Networked Wall Switches, Dimmers, Scene Controllers:
 - .1 Provide nLight; Acuity Brands Lighting, Inc.; nPODM, nPODM xS, nPODM xL, nPODMA, nPODMA xS, nPODMA xL.
 - .2 Mounting: Suitable for installation in single-gang switch box.
 - .3 Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
 - .4 All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
 - .5 Devices with mechanical push buttons provide tactile and LED user feedback.
 - .6 Devices with mechanical push buttons manufactured with custom button labeling.
 - .7 Wall switch and dimmer options:
 - .1 Number of control zones: 1.
 - .2 Control Types Supported:
 - .1 On/Off.
 - .2 On/Off/Dimming.
 - .3 Color: White.
 - .8 Scene Controller Options:
 - .1 Number of Scenes: 1, 2, 4.
 - .2 Control Types Supported:
 - .1 On/Off.
 - .2 On/Off/Dimming.
 - .3 Preset Level Scene Type.
 - .4 On/Off/Dimming/Preset Level for Correlated Color Temperature.
 - .5 Reprogramming of other devices within daisy-chained zone to implement user-selected lighting scene including manual start/stop from the scene controller, or optionally programmed automatic stop after a user-selectable duration between five minutes and 12 hours.
 - .6 Selecting a lighting profile to be run by device's upstream controller to implement a selected lighting profile across multiple zones including manual start/stop from the scene controller or optionally programmed automatic stop after a user selectable duration between five minutes and 12 hours.
 - .3 Color: White.
- .2 Wired Networked Occupancy and Daylight Sensors:
 - .1 Provide nLight; Acuity Brands Lighting, Inc.; nCM PDT 10.
 - .2 Photosensor Sensing Capabilities (Automatic Daylight Sensing): nLight nCM ADCX
 - .1 Photosensor devices configurable to control a local zone.
 - .2 Photosensor-Based Control:
 - .1 Continuous Dimming: Control zone automatically adjusts dimming output in response to photosensor readings, to maintain a minimum light level consisting of both electric light and daylight sources. Photosensor response configurable to adjust set point and dimming rates.

- .3 Detect the presence of human activity within space and fully control the on/off function of lights.
- .4 Utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
- .5 Dual technology sensors used in locations where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions).
- .6 Dual technology sensors must have one sensing technology not motion dependent to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT), which detects both occupant motion and sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) are unacceptable.
- .7 All sensing technologies are acoustically passive, meaning they do not transmit sound waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers and hearing devices). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonic technology. Ultrasonic and Microwave-based sensing technologies are unacceptable.
- .8 Ceiling, fixture, recessed, and corner mounted sensors available, with multiple lens options available customized for specific applications.
- .9 Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
- .10 All sensors detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
- .11 Sensor programming parameter available and configurable remotely from the software and locally via the device push button.
- .12 Ceiling mount occupancy sensors include one integrated dry contact switching relay, capable of switching 1 A at 24 V, resistive only.
- .13 Sensors available with one or two occupancy "poles," each of which provides a programmable time delay.
- .3 Wired Networked Wall Switch Sensors:
 - .1 Provide nLight; Acuity Brands Lighting, Inc.; nWSXA LV.
 - .2 Mounting: Suitable for installation in single-gang switch box.
 - .3 Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
 - .4 All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
 - .5 Devices with mechanical push buttons provide tactile and LED user feedback.
 - .6 Wall Switch Sensor Options:
 - .1 User Input Control Types: On/Off, On/Off/Dimming.
 - .2 Occupancy Sensing Technology: Dual technology acoustic.
 - .3 Color: White.
- .4 Wired Networked Power Packs:
 - .1 Provide nLight; Acuity Brands Lighting, Inc.; nPP16 series for lighting control.

- .2 Provide nLight; Acuity Brands Lighting, Inc.; nPP20 PL series for automatic receptacle control.
- .3 Plenum rated.
- .4 Communication will be delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
- .5 Supply Voltage: 120V(ac).
- .6 Relay Output: Class 1 relay rated for 1/2 HP at 120 V(ac).
- .7 Dimming Output: 0-10 VDC Dimming output.
- .8 Sink Current: 100 mA at 0-10 V(dc).
- .9 Mounting: Integral 1/2-inch (16-mm) chase nipple. Plastic clips into junction box are unacceptable.
- .5 Wired Networked Bluetooth Low-Energy Programming Device:
 - .1 Provide nLight; Acuity Brands Lighting, Inc.; nLO BT.
 - .2 Plenum rated, inline wired, and screw mountable.
 - .3 Communication and low-voltage power delivered to device via standard low-voltage network cabling with RJ-45 connectors.
 - .4 Bluetooth communication allows connection from smartphone application for programming device settings within the local daisy-chain zone.
 - .5 Device provides visual indication of remote Bluetooth connection via LED integrated into device enclosure such that it is visible from all angles while the zone is being programmed.
- .6 Wired Networked Communication Bridge:
 - .1 Provide nLight; Acuity Brands Lighting, Inc.; nBRG.
 - .2 Suitable for surface mount to a standard 4 by 4-inch (100 by 100 mm) square junction box.
 - .3 Communication Ports: Eight RJ-45 ports for connection to lighting control zones (up to 128 devices per port), additional network bridges, and System Controller.
 - .4 Capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to System Controller.
 - .5 Power Input: Class 2 low-voltage supplied locally via a directly wired power supply.
 - .6 Wired Bridge capable of redistributing power from its local supply and connected lighting control zones with excess power to lighting control zones with insufficient local power. Architecture enables loss of power to a particular area to be less impactful on network lighting control system.

Part 3 Execution

3.1 INSTALLATION

- .1 Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.
- .2 When using wire for connections other than the DLM local network (LMRJ Cat 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements.
- .3 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

- .1 Adjust time delay so that controlled area within individual rooms remains lighted for 5 minutes after occupant leaves area. Corridors and open areas shall remain lighted for 20 mins after occupants leave.
- .4 Install power packs in accessible maintenance areas unless noted otherwise. Provide access doors if power packs are installed above drywall ceilings.
- .5 It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.
- .6 Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
 - .1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.
 - .2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
 - .3 Load Parameters (e.g. blink warning, etc.)
- .7 Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

3.2 INSTALLATION OF WIRING

- .1 Wiring Method: Comply with Section 260521 "Wires and Cables (0-1000V)". Minimum conduit size is 1/2 inch (13 mm).
 - .1 Comply with requirements for raceways and boxes specified in Section 260533.13 "Conduit, Conduit Fastenings and Conduit Fittings" and Section 260532 "Outlet Boxes, Conduit Boxes and Fittings"
- .2 Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 IDENTIFICATION

- .1 Identify system components, wiring, cabling, boxes, cabinets, and terminals. Comply with identification requirements specified in Section 260500 "Common Work Results for Electrical".
- .2 Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with Section 260500 "Common Work Results for Electrical".
- .3 Identify all controls with device address.
- .4 Label each device cable within 6 inch (152 mm) of connection to bus power supply or termination block.

3.4 FIELD QUALITY CONTROL

- .1 Acceptance Testing Preparation:

- .1 Test continuity of each circuit.

3.5 REMOTE ACCESS

- .1 Digital network lighting control system capable of remote access by manufacturer with the following features:
 - .1 System diagnostics including detection of fault condition in hardware or connected devices.
 - .2 Access to all connected devices for complete programming including scheduling of time-of-day events and device parameters necessary to meet required sequence of operations.
 - .3 Browser-based interface to verify system functionality.
 - .4 On-demand access to manufacturer technical support for remote troubleshooting, diagnostics, configuration, and programming.
 - .5 Owner training on the digital network lighting control system available remotely.
- .2 Remote access system fully functional over commercial cellular connection or Internet-connected ethernet network.
- .3 All hardware associated with remote access including cellular modem and cellular antenna are to remain on-site regardless of warranty or cellular contract status.

3.6 SYSTEM STARTUP

- .1 Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.
 - .1 Complete installation and startup checks in accordance with manufacturer's published instructions.
 - .2 Activate luminaires and verify that all maximum output levels match output levels detailed in an Owner-approved sequence of operations.
 - .3 Confirm correct communications wiring, initiate communications between control devices and controller/gateways, and program the lighting control system in accordance with approved configuration schedules, time-of-day schedules, and input override assignments.
 - .4 Program network devices to meet required sequence of operations.
 - .5 Program and verify all sequence of operations.
 - .6 Create backup of system programming.
 - .7 Assist in installation of system software on customer-provided workstation or server.
 - .8 Verify bidirectional communication of manufacturer-provided cellular router with manufacturer-managed remote access portal.
- .2 The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.
- .3 Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.
- .4 Factory commissioning shall include functional testing and documentation of the control system conforming to the "Functional Testing" requirements included in the current ASHRAE standard. This cost shall be included in the Tender Price.

.5 Lighting controls Manufacturer to include for the following visits to site:

- .1 Pre-wiring visit.
- .2 System setup and BAS integration visit.
- .3 ASHRAE functional testing coordination visit.
- .4 System commissioning visit.

3.7 CLOSEOUT ACTIVITIES

- .1 Enhanced Documentation: Engage lighting system manufacturer to provide comprehensive system documentation including detailed programming, sequence of operation data per Project specifications, and related code requirements.
- .2 Training: Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.8 PROTECTION

- .1 After installation, protect digital network lighting controls from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.9 MAINTENANCE

- .1 Engage a factory-authorized service representative to perform on-site system adjustments.
 - .1 On-Site Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site settings adjustments to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - .2 Prepare and submit report after each visit that details activities performed.
- .2 Engage a factory-authorized service representative to perform remote system adjustments.
 - .1 Remote Occupancy Adjustments: When requested within 12 months from date of Substantial Completion and project registration with lighting control system manufacturer, provide remote settings adjustments to suit actual occupied conditions. Provide up to 2 sessions to Project during other-than-normal occupancy hours for this purpose.
 - .1 System to include manufacturer-provided cellular communication hardware and connection to the system for a minimum of 12 months after substantial completion to allow for factory representative assistance with settings adjustments and system sustainment.
 - .2 For the remaining duration of the maintenance term, or in the event cellular connectivity is not available, manufacturer assistance must be available through an Owner-provided, Internet-connected network.
 - .2 Prepare and submit report after each session that details activities performed.
- .3 Maintenance Service Agreement:
 - .1 Beginning at Substantial Completion, verify that maintenance service agreement includes 12 months' full maintenance by manufacturer's authorized service representative.

- .2 Include monthly remote preventive maintenance.
- .3 Preventative maintenance to include:
 - .1 System diagnostic reports.
 - .2 System performance checks.
 - .3 Device firmware updates.
 - .4 Programming adjustment as required for proper lighting system operation.
 - .5 Expedited factory direct warranty processing, replacement, and programming of defective components.
- .4 Verify that parts and supplies are manufacturer's authorized replacement parts and supplies.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for service entrance board.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCES

- .1 CAN/CSA-C22.2 No.31-M89(R2000), Switchgear Assemblies.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate on shop drawings.
 - .1 Floor anchoring method and foundation template.
 - .2 Dimensioned cable entry and exit locations.
 - .3 Dimensioned position and size of bus.
 - .4 Overall length, height and depth.
 - .5 Dimensioned layout of internal and front panel mounted components.
- .3 Include time-current characteristic curves for circuit breakers and fuses.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for service entrance board for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Include:
 - .1 One can of touch-up paint.

Part 2 Products

2.1 SERVICE ENTRANCE BOARD

- .1 Service Entrance Board: to CAN/CSA-C22.2 No.31.
- .2 Rating: 208V, 3 phase, 4 wire, 1000 A, short circuit current 50kA (rms symmetrical).
- .3 Cubicles: free standing, dead front, size as indicated, hinged access panels with captive knurled thumbscrews (front access only) EEMAC 2 rating (sprinkler hood).
- .4 Main section to contain:
 - .1 Breaker as noted complete with 65kA interrupting capacity.
 - .2 Barrier metering section from adjoining sections.
 - .3 Provision for installation of power supply authority metering in barriered section.

- .4 Digital metering unit as specified.
- .5 Distribution section to contain breakers as noted complete with 65kA interrupting capacity.
- .6 Bus bars and main connections: copper.
- .7 Bus from load terminals of main breaker through metering section to main lugs of distribution section.
- .8 Identify phases with colour coding.
- 2.2 MOULDED CASE CIRCUIT BREAKERS**
 - .1 Refer to Moulded Case Circuit breakers section for specification regarding required breakers.
- 2.3 GROUNDING**
 - .1 Copper ground bus extending full width of cubicles and located at bottom.
 - .2 Lugs at each end for grounding cable. Contractor to size lug.
- 2.4 POWER SUPPLY AUTHORITY METERING**
 - .1 Separate compartment and rigid metal raceway for exclusive use of power supply authority metering.
 - .2 Mounting accessories and wiring for metering supplied by power supply authority:
 - .1 3 current transformers.
- 2.5 FINISHES**
 - .1 Apply finishes in accordance with Section 26 05 00 - Common Work Results - Electrical.
 - .1 Service entrance board exterior: grey.
- 2.6 EQUIPMENT IDENTIFICATION**
 - .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
 - .2 Nameplates:
 - .1 Black plate, white letters, size 7.
 - .2 Complete board labelled: " 208V."
 - .3 Main disconnect labelled: "Main Breaker".
 - .4 Branch disconnects labelled: as indicated.
- 2.7 ACCEPTABLE PRODUCTS**
 - .1 Quick ship
 - .1 Siemens Cat# SMP
 - .2 Cutler Hammer Cat# CMP series.
 - .3 Schneider Electric Cat #SS12
 - .2 Digital Metering Units
 - .1 Siemens Cat# PAC 4200
 - .2 Cutler Hammer Cat# IQ 260 (MOD BUS)
 - .3 Schneider Electric Cat# PM-820

- .3 Digital metering units shall be complete with MOD BUS communication module for interface of monitored parameters to BAS. Coordinate output with BAS contractor.
- .4 Manufacturer is to include for representative to visit the site to fully commission the meter.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate service entrance board and fasten to wall/housekeeping pad.
- .2 Connect main secondary service to line terminals of main breaker.
- .3 Connect load terminals of distribution breakers to feeders.
- .4 Check factory made connections for mechanical security and electrical continuity.
- .5 Run grounding conductor from ground bus to building ground to suit Electrical Safety Code.
- .6 Check trip unit settings and/or fuse sizes against co-ordination study to ensure proper working and protection of components.
- .7 Co-ordinate with local supply authority and board manufacturer for shipping and installation of metering components at board manufacture's fabrication plant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 00 - Common Work Results - Electrical.
- .3 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.29-M1989(R2000), Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand. Series rating is acceptable – submit information with shop drawings.
- .2 Bus and breakers rated for 10,000A (symmetrical) interrupting capacity or as indicated.
- .3 200% neutral bus and 200% rated feeder neutral.
- .4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating as mains.
- .8 Mains must be suitable for bolt-on breakers. Provide main and branch breakers as bolt-on style.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked grey enamel.
- .11 All panels regardless of voltage and amperage must be provided with a lockable door.
- .12 Branch circuit panelboards (200A or smaller) must be one of the following:
 - .1 Cutler Hammer Cat#POW-R-LINE PRL-1 or PRL-2
 - .2 Schneider Electric Cat# NQ series

.3 Siemens Cat# Sentron P1 Series.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for fire alarm, emergency, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved, description as indicated. In finished areas install label on inside of panel, and in service areas install label on exterior of panel.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved "name of load" as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit. Include a copy of the directories in the maintenance manuals.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 All lighting and branch circuits from SPD protected panels are to be provided with separate neutrals. Size branch circuits accordingly. All lighting branch circuit connections in classrooms, and similar rooms with multiple lighting zones shall not be looped. Provide junction boxes and BX pigtail to each fixture individually.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-M1986(July 2001), Special Use Switches.
 - .4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section [01 33 00 - Submittal Procedures].

Part 2 Products

2.1 SWITCHES

- .1 15 or 20A, 120 V, single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.111.
- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Toggle Style (Rocker Style. Architect to select colour.
- .3 Switches of one manufacturer throughout project.
- .4 Acceptable materials:
 - .1 Single pole: Hubbell Cat# HBL1201 Series.
 - .2 Three-way: Hubbell Cat# HBL1203 Series.
 - .3 Four-way pole: Hubbell Cat# HBL1204 Series.
 - .4 Keyed: Hubbell Cat# HBL1221 Series complete with 2 keys per switch.
 - .5 (Keys): Hubbell Cat# HBL1209.
 - .6 Motor Rated: Hubbell Cat# HBL1221PL c/w pilot light (20A).
- .5 Acceptable alternate manufacturers include:
 - .1 Pass & Seymour
 - .2 Leviton

2.2 RECEPTACLES

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

Tamper Resistant Receptacle	Hubbell Cat# BR15TR
Tamper Resistant T-Slot Receptacle	Hubbell Cat# BR20TR
Tamper Resistant ground fault protected Receptacle	Hubbell Cat# GFTR15
Tamper Resistant ground fault protected T-Slot Receptacle	Hubbell Cat# GFTR20 complete with Decora style coverplate
Tamper Resistant Duplex Receptacle c/w dual USB ports	Hubbell Cat# USB15XXX
Automatically Controlled Tamper Resistant Receptacles (Green)	Hubbell Cat# BR15C2GNTR (Green)

- .6 Acceptable alternate manufacturers include:
 - .1 Pass & Seymour
 - .2 Leviton

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, brushed, 1 mm (1/32") thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof cover plates complete with gaskets and "heavy-duty in use" covers in conformance with the Electrical Safety Authority. Provide product equal to Intermatic Cat. #WP5100C.
- .7 Where noted on plans for exterior weatherproof GFCI receptacles at grade, provide extra-duty single gang horizontal die cast receptacle covers. Nema 3R rated complete with lockable hasp and reinforced hinge. Suitable for use with 12-gauge cord sets. Intermatic Cat. #WP1010HMXD.

Part 3 Execution

3.1 INSTALLATION

- .1 Switches and Dimmers:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height [in accordance with Section 26 05 00 - Common Work Results - Electrical.
 - .4 Dimmer switches must be installed with the "most downward" position of slider corresponding to zero light intensity and the "highest" position of slider corresponding toto full light intensity.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height [in accordance with Section 26 05 00 - Common Work Results - Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2No.248.12-94, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).
 - .2 CSA C22.2 No. 106-M92 (latest edition)

1.3 DELIVERY AND STORAGE

- .1 Ship fuses in original containers.
- .2 Store fuses in original containers in moisture free location.

1.4 MAINTENANCE MATERIALS

- .1 Three spare fuses of each type and size installed.

Part 2 Products

2.1 FUSES GENERAL

- .1 Fuses: product of one manufacturer for entire project.
- .2 Fuses specified below must conform to CSA C22.2 No. 106 (latest edition). Fuses conforming to standard C22.2 No. 106-1953 will be rejected.
- .3 Fuses must provide a fully co-ordinated system for both overload and fault conditions.

2.2 FUSE TYPES

- .1 Class J fuses (formerly HRCI- J).
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .2 Type J2, fast acting.
- .2 Class R -R fuses (formerly HRCI- R). For UL Class RK1 fuses, peak let-through current and its² peak let-through values not to exceed limits of UL 198E-1982, table 10.2.

2.3 ACCEPTABLE PRODUCTS

- .1 Motor Protection: 1-600A: Mersen Type AJT
- .2 Other acceptable manufacturers:
 - .1 GEC
 - .2 Little Fuse

Part 3 Execution

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
 - .1 Install Class R rejection clips for HRCI-R fuses.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 24 02 - Service Entrance Board.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5.1-M91, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers must conform to CSA C22.2 No. 5.1
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Unless otherwise indicated moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .5 Moulded case circuit breakers 250Amps and above are to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase and ground fault short circuit protection (if indicated or applicable by the Electrical Safety Code versus the breaker amperage). Unless otherwise specified, complete system selective co-ordination shall be provided by the individually adjustable time/current curve shaping elements as following:
 - .1 Breakers shall have fixed rating plug determining breaker continuous current rating.
 - .2 All breakers shall have adjustable long delay pickup and time, L.
 - .3 All breakers shall have individual adjustments for short delay pickup and time, S; including I2t settings in time adjustment.
 - .4 Breakers shall have adjustable instantaneous pickup, I; that if required by coordination study can be turned off, (I).
 - .5 If required by Electrical Safety Code breakers shall have individually adjustable ground fault current pick-up and time, G; including I2t settings in time adjustment.
 - .6 Unless otherwise specified, for the low voltage systems, provide an electronic trip unit as specified above for the following moulded case circuit breakers:

- .1 Main or ties in main switchboard: LS trip unit with fixed instantaneous over-rider exceeding maximum value of fault at the point of installation.
- .2 Feeders exceeding 250A trip setting: LS trip unit with fixed instantaneous over-ride exceeding maximum value of fault at downstream panelboard.
- .3 Branch circuits or feeders for MCCs with fusible combination starters: LSI trip unit where instantaneous trip setting allows for maximum size downstream fuse total clearing time.

Part 3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated complete with all necessary mounting hardware and filler panels if necessary.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.
.2 Section 26 28 13.01 - Fuses - Low Voltage.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.
.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 DISCONNECT SWITCHES

- .1 Fusible and/or non-fusible, horsepower rated disconnect switches size as indicated.
.2 Provision for padlocking in off switch position by three locks.
.3 Mechanically interlocked door to prevent opening when handle in ON position.
.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.
.5 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.
.6 Quick-make, quick-break action.
.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
.2 Indicate name of load controlled on size 4 nameplate.

2.3 ACCEPTABLE MANUFACTURERS

<u>Manufacturer</u>	<u>General Purpose</u>	<u>Weatherproof</u>
Cutler Hammer	IHD Series	3HD Series
Schneider Electric	Type A Series	Type R Series
Siemens	ID Series	NFR/FR Series

Part 3 Execution

3.1 INSTALLATION

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 The specifications in this section describe the electrical and mechanical requirements for a protection system provided by high-energy transient voltage surge suppressors. The specified system shall provide effective, high-energy surge current diversion and be suitable for application in ANSI/IEEE C62.41 Category A, B and C environments (as tested by ANSI/IEEE C62).

1.2 STANDARDS

- .1 The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:
 - .1 Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41, C62.45)
 - .2 American National Standards Institute
 - .3 National Electrical Manufacturer Association (NEMA LS-1 1992 Peak Current Testing)
 - .4 Electrical and Electronic Mfg. Association of Canada (EEMAC)
 - .5 National Fire Protection Association (NFPA 75 and 780)
 - .6 MIL Standard 220A Method of Insertion Loss Measurement
 - .7 Ontario Electrical Code
 - .8 Underwriters Laboratories UL 1283 and UL 1449 (3rd edition)
 - .9 Canadian Standards (CUL)

1.3 ENVIRONMENTAL REQUIREMENTS

- .1 The operating temperature range shall be -40° to 70° C (-40° to 160° F).
- .2 No appreciable magnetic fields shall be generated.

1.4 SUBMITTALS

- .1 Product Data: Provide catalog sheets showing voltage, physical size, IEEE let through voltage for each waveform listed, UL1449 latest revision, latest edition, suppressed voltage ratings, dimensions showing construction, lifting and support points, enclosure details, per mode and per phase peak surge current, modes of discrete suppression circuitry, warranty period and replacement terms, conductor size, conductor type and lead length.
- .2 Submit product data for all components and accessories per section 26 01 16.
- .3 Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product. Indicate maximum size of circuit breaker or fuse to be connected for each unit.
- .4 List and detail all protection systems such as fuses, disconnecting means and protective features.
- .5 Provide verification that the SPD device complies with the required UL1449 latest edition, latest revision, and CSA approvals.
- .6 Provide actual let through voltage test data in the form of oscillograph results for the ANSI/IEEE C62.41 Category C3 & C1 (combination wave) and A1 (ringwave) tested in accordance with ANSI/IEEE C62.45.
- .7 Provide spectrum analysis of each unit based on MIL-STD-220A test procedures between 10 kHz and 100 kHz verifying the devices noise attenuation equals or exceeds 40 dB at 100 kHz.

- .8 Provide test report from a recognized independent testing laboratory verifying the suppressor components can survive published surge current rating on a per mode basis using the IEEE C 62.41, 8x20 microsecond current wave. Test data must be on a complete SPD with internal fusing in place. Test data on an individual module is not acceptable.

1.5 QUALITY ASSURANCE AND WARRANTY

- .1 The panel mounted SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of thirty (30) years from the date of substantial completion of service and activation of the system to which the suppressor is attached. Additionally, during the applicable warranty period, any SPD which fails due to any electrical anomaly, including lightning, shall be repaired or replaced by the manufacturer without charge. Special or optional warranties in excess of the unit's standard warranty for purposes of this bid are not acceptable.
- .2 The warranty must specifically provide for unlimited free replacements of the SPD in the event of failure caused by the effects of lightning and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only. Special warranties for the purpose of this bid are not allowed.

If the SPD units supplied do not meet the specifications as written, contractor will remove units and re-install approved SPD units to the satisfaction of the consultant. Contractor will be responsible for any and all costs associated with re-installation.

Part 2 Products

2.1 PERFORMANCE

- .1 The SPD shall be listed by ETL, UL, or other nationally recognized test laboratory to UL's 1283 and UL's 1449 standards (3rd edition, latest revision), and not merely the components or modules. All SPD's shall be Type 1 for use in Type 1 and Type 2 locations.
- .2 The SPD shall protect all modes L-G, L-N, L-L, and N-G, have discrete suppression circuitry in L-G, L-N and N-G, and have bidirectional, positive and negative impulse protection. Line-to-neutral-to-ground protection is not acceptable where line-to-ground is specified, and accordingly reduced mode units with suppression circuitry built into only 4 modes are not acceptable. In delta systems, line-to-ground-to-line protection is not acceptable where line-to-line is specified.
- .3 Obtain all surge suppression devices through one source from a single manufacturer.
- .4 The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 120% for 208 systems, and 115% for 347 and 600V systems.
- .5 All SPD's shall be equipped with a comprehensive monitoring system which shall include a visual LCD panel display providing information on unit status and phase loss/protection loss.
- .6 Each design configuration shall have the maximum single pulse surge current capacity per mode verified through testing at an independent, nationally recognized test laboratory. The manufacturer must submit a test report on a unit which was tested with internal over current fusing in place. The test shall include a UL1449 Second Edition surge defined as a 1.2 X 50 µsec 6000V open circuit voltage waveform and an 8 X 20 µsec 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current magnitude with an approximated 8 X 20 µsec waveform. To complete the test, another UL1449 surge shall be applied to verify the unit's survival. Compliance is achieved if the

suppression voltage found from the two UL1449 surges does not vary by more than +10%. Test data on an individual module is not acceptable.

2.2 SERVICE ENTRANCE PROTECTION

- .1 The SPD for this location shall be as indicated on project drawings. SPD shall be separate from panel board. Integral SPD shall not be acceptable. SPD's shall be certified to UL1283 and UL 1449 Third Ed. Type 1, 20k In for use in Type 1 or Type 2 locations.
- .2 Service entrance panels shall be protected by an externally mounted SPD, model TK-ST240-3Y200-L-B for 120/208 wye (4W+G) volt panels.
- .3 The manufacturer shall provide written specifications showing let-through voltage of the unit with six inches of lead length (at the module or at the lug data is not acceptable as it does not represent true "as installed" performance) pursuant to ANSI/IEEE C62.41 and C62.45, 2002, categories C1 and C3 bi-wave, 90 degree phase angle, positive polarity, measurements in peak voltage from the zero reference, all dynamic tests except N-G, and UL suppressed voltage ratings, all of which shall be no higher than:

ANSI/IEEE C62.41-1991 Measured Limiting Voltage

B3/C1 Impulse (6kV, 3kA)

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	502V	627V	864V	568V
347/600 (3Y600)	1090V	1144V	2017V	1155V

C3 Impulse (20kV, 10kA)

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	907V	1173V	1267V	1090V
347/600 (3Y600)	1537V	1707V	2470V	1800V

UL Voltage Protection Ratings

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	800V	800V	1200V	800V
347/600 (3Y600)	1500V	1500V	2500V	1500V

- .4 The unit shall have a peak surge current of no less than 240kA/mode, 8 X 20 us waveform, single impulse, independently verified.
- .5 Internal Fusing - Over current Protection
 - .1 Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Over current fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode over current fusing is not acceptable where there is more than one MOV per mode.
 - .2 For arc quenching capability, minimization of smoke and contaminants in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.
 - .3 Fusing shall be present in every mode, including Neutral-to-Ground.
 - .4 The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.

- .6 The suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability, and shall have at minimum a EEMAC 2 steel enclosure.
- .7 The SPD shall have an internal audible alarm with mute on front cover.
- .8 SPD's for service entrance locations shall have a transient event counter with LCD panel display and reset button on the front cover.
- .9 When SPD lead lengths exceed four (4) feet, low impedance cable (LIC) supplied by the SPD manufacturer shall be utilized. LIC shall have effective lead impedance min. 75% less than standard cable, and shall have nominal impedance, capacitance and inductance values that do not exceed the following:
 Nominal Impedance (@10kHz, ohms/ft) Nominal Capacitance
 (pf/ft) Nominal Inductance
 (µH/ft)
- .10

Line	0.009	35.6	0.098
Neutral	0.004	52.6	0.041
Ground	0.004	571	0.021

 SPDs shall be installed such that lead length is minimized.

2.3 SUBPANEL AND LIGHTING PANEL PROTECTION

- .1 SPD(s) for this location shall be as indicated on project drawings. SPD shall be separate from panel board. Integral SPD shall not be acceptable. SPD's shall be certified to UL1283 and UL1449 Third Ed. Type 1 for use in Type 1 and Type 2 locations.
- .2 Three-phase subpanels and lighting panels shall be protected by a panel mounted SPD, TK-LP120-3Y208-F-L for 120/208 (4W+G) volt panels.
- .3 Single-phase subpanels and lighting panels shall be protected by a panel mounted SPD, TK-LP120-1S240-F-L for 120/208 (3W+G) volt panels.
- .4 The manufacturer shall provide written specifications showing let-through voltage of the unit with six inches of lead length (at the module or at the lug data is not acceptable as it does not represent true "as installed" performance) pursuant to ANSI/IEEE C62.41 and C62.45, 2002, categories A1 & A3 ring wave, 180 degree phase angle, category B3 Ringwave, and UL suppressed voltage ratings, 90 degree phase angle, positive polarity, measurements in peak voltage from the zero reference, all dynamic tests except N-G, which shall be no higher than:

ANSI/IEEE C62.41-1991 Measured Limiting Voltage

A1 Ring Wave (2kV, 67A)				
Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	502V	627V	864V	568V
A3 Ring Wave (6kV, 200A)				
Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	56V	61V	88V	112V
B3 Ring Wave (6kV, 500A)				
Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	437V	592V	612V	324V
UL Voltage Protection Ratings				
Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/208 (3Y208)	700V	700V	1000V	700V

- .5 The unit shall have a peak surge current of no less than 120kA/phase, 60kA/mode, 8 X 20 us waveform, single impulse, verified by third party test reports.
- .6 Internal Fusing - Over current Protection
 - .1 Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Over current fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode over current fusing is not acceptable where there is more than one MOV per mode.
 - .2 For arc quenching capability, minimization of smoke and contaminants in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.
 - .3 Fusing shall be present in every mode, including Neutral-to-Ground.
 - .4 The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.
- .7 The SPD shall be capable of attenuating internally generated ringing type transients and noise, and shall have an enhanced transient filter supported by a specification sheet which lists the IEEE A1 Ring Wave let-through levels no higher than those set forth above.
- .8 Because of space limitation, the enclosure shall not exceed 4.0" D x 4.0" W x 10.3" H to allow close-to-the load installation on flush mount panels and between adjacent panel board. For recessed panels, a flush mount cover plate shall be provided with each unit.
- .9 The suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability, and shall have at minimum a Nema 1 steel enclosure.
- .10 The SPD shall have an internal audible alarm with mute on front cover.

2.4 PHONE LINE PROTECTION

- .1 The telephone line surge suppressors shall be Total Protection Solutions model TK-CT2-190TLP4-TB for 4 pair. Coordinate with owner IT representative for phone service characteristics. Provide a minimum of terminal block suppression units to handle a minimum of telephone lines.
- .2 The unit shall be listed under UL 497A, Standard for Secondary Protectors for Communications Circuits.
- .3 The unit shall have a data transmission rate up to 16.0Mbps.
- .4 Each conductor shall have less than 1 ohm of internal series resistance per wire
- .5 Each pair of conductors shall have a peak surge current of no less than 2,000 amps, 8 x 20 us waveform.
- .6 The suppressor shall come standard with not less than a ten year warranty which provides for unlimited free replacements of damaged units. Special warranties in excess of the unit's standard warranty for purposes of this bid are not acceptable.
- .7 The maximum let-through voltage on an IEC 10 x 700 us impulse (2kV/80A) shall be 240 volts tip-ring, 240 volts tip to ground, and 240 volts ring to ground.

- .8 The response time of the components of the unit shall be less than one nanosecond.
- .9 Obtain all surge suppression devices through one source from a single manufacturer.
- .10 For quality assurance, manufacturer must provide proof that manufacturer has been regularly engaged in the design, manufacturing and testing of SPD's of the types and ratings required for a period of not less than five years.

Part 3 Execution

3.1 INSTALLATION

- .1 Install the SPD's with the conductors as short and straight as practically possible.
- .2 Follow the SPD manufacturer's recommended installation practice as outlined in the equipment installation manual. The electrical contractor shall ensure that all neutral conductors are bonded to the system ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD.
- .3 Main service entrance units shall be installed on a 100-Amp breaker that meets or exceeds the fault current rating of the switchgear.
- .4 Distribution, branch panel, and motor control center units shall be installed on 30-amp dedicated circuit breakers, or, where indicated, shall be wired directly to the main lugs or feed through lugs, or wired directly to the bus bars.
- .5 The installing contractor shall comply with all applicable codes.
- .6 SPD units shall be wired such that connection cable lead lengths are minimized. SPD manufacturer to advise installing contractor on required locations of low impedance cables (LICs).
- .7 SPD manufacturer shall include in tender for pre-installation visit to the job site to confirm recommended installation methods. Indicate provision for this visit on shop drawing submission.
- .8 The entire SPD installation must be inspected by an authorized manufacturer's representative and supply certificate of completion. This cost shall be included in the tender price. Indicate provision for this inspection on shop drawing submission.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-[1991], Surge Voltages in Low-Voltage AC Power Circuits.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM F1137-[88(1993)], Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3 United States of America, Federal Communications Commission (FCC)
 - .1 FCC (CFR47) EM and RF Interference Suppression.
- .4 IESNA LM-79-08, IES Electrical Method for the Electrical and Photometric Measurements of Solid State Lighting Products.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.
- .3 Photometric data to include: VCP Table spacing criterion.

1.3 SCOPE

- .1 This contractor is responsible to supply and install all lighting fixtures as scheduled and/or indicated including lamp and those accessories required for a complete lighting system, This contractor must coordinate lighting installation with all other Divisions of this project.
- .2 All fixtures must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.
- .3 Coordinate with manufacturer all mounting equipment and requirements prior to ordering.

1.4 GUARANTEE

- .1 Guarantees shall be as follows from date of substantial completion.
 - .1 LED fixtures and driver: 5 years.
- .2 The labour required to replace these drivers must be included in the above guarantee.

Part 2 Products

2.1 LED FIXTURES

- .1 Fixture LED's must be tested conformance with IESNA LM80 standard.
- .2 Luminaire must be tested prior to shipping.
- .3 Luminaires must be ULC certified and approved for use in Canada.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated. Luminaires are not to be supported from the roof deck. Provide additional Unistrut support channel and/or support from structure. Coordinate with consultant on site.

- .2 Ball align hangers must be provided for rod suspended fixtures.
- .3 Plaster frames/flange kits must be provided by this Division for fixtures recessed in plaster and/or drywall ceilings.
- .4 Where specified, fixtures to be chain hung shall be hung using “jack” chain with a capacity to suit the fixture weight. Branch circuit wiring feeding these fixtures shall be AC90 cable “ty-wrapped” at 900mm (36”) intervals along length of drop, Final appearance must be neat and professional.
- .5 Special installation: Secure fixtures to structure to conform to the Electrical Safety Code using “jack chain” NOT ceiling suspension wire. Where coreslab is used, suspension point must be independent of the one used for suspension of the ceiling assembly. As an alternate to jack chain, the contractor may use a pre-manufactured aircraft cable suspension and fastening system as manufactured by Gripple (Gripple Cat. #HF02-10F2). Provide minimum 2 per fixture.

3.2 WIRING

- .1 Connect luminaires to lighting circuits.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations [support luminaires independently of ceiling] [support luminaires from ceiling grid in accordance with local inspection requirements].

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

- .1 Section 26 05 21 - Wires and Cables (0-1000 V).
- .2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-M1985(R1999), Unit Equipment for Emergency Lighting.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

Part 2 Products

2.1 EMERGENCY LIGHTING EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120V, ac.
- .3 Output voltage: 12V dc.
- .4 Operating time: 30 min.
- .5 Battery: sealed, maintenance free, 10-year life
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: 'AC Power ON' condition "charging" condition.
- .10 Lamp heads: integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: 4W LED.

Part 3 Execution

3.1 INSTALLATION

- .1 Install emergency lights.
- .2 Direct heads on units to illuminate paths of exit.
- .3 Install emergency lighting units and remote fixtures at 300mm (12") below finished ceiling, unless indicated otherwise.
- .4 Special installation: Secure fixtures to structure to conform to the Electrical Safety Code using "jack chain" NOT ceiling suspension wire. Where coreslab is used, suspension point must be independent of the one used for suspension of the ceiling assembly. As an alternate to jack chain, the contractor may use a pre-manufactured aircraft cable suspension and fastening system as manufactured by Gripple (Gripple Cat. #HF02-10F2). Provide minimum 2 per fixture.

3.2 TESTING/CERTIFICATION

- .1 At the completion of the project and in the presence of the consultant, test all exit and emergency fixtures. On company letterhead, the contractor is to prepare a chart indicating:
 - .1 Project
 - .2 Date
 - .3 Equipment type
 - .4 Certification of correct connection
 - .5 Certification of correct operation
 - .6 Duration of test in minutes (minimum 30)
 - .7 Actual period of testing (time of day)
- .2 Provide "Integrate Testing" of this life safety system in conformance with the noted specification section. Include all associated costs in tender.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.
 - .2 CSA C860-01(December 2002) Performance of Internally-Lighted Exit Signs.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: extruded aluminum housing, white finish].
- .3 Face and back plates: extruded aluminum.
- .4 Lamps: 2W LED.
- .5 Operation: 25 year.
- .6 Units are to be provided with (3) pictogram legends indicating "left from here", "straight from here", and "right from here"
- .7 Face plate to remain captive for relamping.

2.2 SELF-POWERED UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: extruded aluminum housing, white finish.
- .3 Face and back plates: extruded aluminum.
- .4 Lamps: 2W LED.
- .5 Operation: 25 year life.
- .6 Units are to be provided with (3) pictogram legends indicating "left from here", "straight from here", and "right from here".
- .7 Face plate to remain captive for relamping.
- .8 Supply voltage: 120V, ac.
- .9 Output voltage: 12V dc.
- .10 Operating time: 30 minutes minimum.
- .11 Recharge time: 12 hours
- .12 Battery: sealed, maintenance free 10-year life.
- .13 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.

- .14 Solid state transfer circuit.
- .15 Signal lights: 'AC Power ON' condition and "charging" condition.
- .16 Lamp heads: integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: minimum 4W LED.
- .17 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .18 Cabinet: finish: white.
- .19 Auxiliary equipment:
 - .1 Test switch.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Install exit lighting units with illuminated faces and chevrons/arrows indicating path(s) of exit as indicated. Unless otherwise noted install exit fixtures at 2400mm (8'0") above finished floor.
- .3 Connect fixtures to exit light circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.
- .5 Special installation: Secure fixtures to structure to conform to the Electrical Safety Code using "jack chain" NOT ceiling suspension wire. Where coreslab is used, suspension point must be independent of the one used for suspension of the ceiling assembly. As an alternate to jack chain, the contractor may use a pre-manufactured aircraft cable suspension and fastening system as manufactured by Gripple (Gripple Cat. #HF02-10F2). Provide minimum 2 per fixture.

3.3 TESTING/CERTIFICATION

- .1 At the completion of the project and in the presence of the consultant, test all exit and emergency fixtures. On company letterhead, the contractor is to prepare a chart indicating:
 - .1 Project
 - .2 Date
 - .3 Equipment type
 - .4 Certification of correct connection
 - .5 Certification of correct operation
 - .6 Duration of test in minutes (minimum 30)
 - .7 Actual period of testing (time of day)
- .2 Provide "Integrate Testing" of this life safety system in conformance with the noted specification section. Include all associated costs in tender.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 SYSTEM DESCRIPTION

- .1 Empty telecommunications raceways system consists of outlet boxes, cover plates, j-hooks, conduits, sleeves and caps, fish wires.
- .2 Conduit from IT rack to corridors

Part 2 Products

2.1 MATERIAL

- .1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Cable hangers in main corridors.
- .3 Fish wire: Nylon Twine.

Part 3 Execution

3.1 INSTALLATION

- .1 Install raceway system, including fish wire, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable hangers, miscellaneous and positioning material to constitute complete system. Coordinate all requirements and locations with Data contractor prior to any work.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Government of Canada
 - .1 TB OSH Chapter 3-03, [1997-01-28], Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.
 - .2 TB OSH Chapter 3-04, [1994-12-22], Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2001, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-1999, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-2002, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-1999, Control Units.
 - .5 CAN/ULC-S528-1991, Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529-2002, Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .8 CAN/ULC-S531-2002, Standard for Smoke Alarms.
 - .9 CAN/ULC-S536-S537-2004, Burglar and Fire Alarm Systems and Components.
 - .10 CAN/ULC-S537 (latest edition), Verification of Fire Alarm Systems.
- .4 National Fire Protection Agency
 - .1 NFPA 72-2002, National Fire Alarm Code.
 - .2 NFPA 90A-2002, Installation of Air Conditioning and Ventilating Systems.

1.2 SYSTEM DESCRIPTION

- .1 The existing Fire Alarm control panel to be replaced with a new standalone addressable single stage, zoned, integrated, non-coded, supervised, fire alarm system in accordance with all applicable local, municipal, and provincial regulations.
- .2 All signalling devices shall be Class B wired. All addressable loops shall be Class A wired.
- .3 The existing conventional circuits serving the existing school to be reconnected to the new fire alarm control panel. All new devices in the addition portion to be connected to the new addressable loop.
- .4 The existing NAC circuits serving the existing school to be reconnected to the new fire alarm panel.
- .5 All existing control circuits serving the existing school to be reconnected to the new fire alarm panel.
- .6 The drawings indicate the locations of the fire alarm system components. It is the electrical contractor's responsibility to provide all components necessary to ensure a complete and operating system in accordance with the intent of these documents. Contractor to provide as built drawings upon project completion.
- .7 The Fire Alarm system shall include but not be limited to the following main components:
 - .1 Main control panel
 - .2 Remote annunciators
 - .3 Trouble signal devices.

- .4 Power supply equipment.
- .5 Manual alarm pull stations
- .6 Automatic alarm initiating devices.
- .7 Audible and visual signal devices.
- .8 End of line devices
- .9 Passive graphic
- .8 Use only those components that are CSA and ULC listed.

1.3 SYSTEM OPERATION

.1 Alarm Operation

- .1 Upon the alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:
 - .1 The system shall remain in the alarm mode until all initiating devices are reset and the fire alarm panel is manually reset and restored to normal.
 - .2 The internal audible device shall sound at the control panel or command center.
 - .3 The LCD display shall indicate all applicable information associated with the alarm condition including; zone, device type, device location and time/date.
 - .4 All system activity/events shall be documented and logged into system history.
 - .5 Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.
 - .6 Activate visual strobe notification appliances throughout the building. The visual strobes shall continue to flash until the system has been reset. The visual strobes shall stop operating when the "Alarm Silence" is activated.
 - .7 Audible alarm signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
 - .8 All automatic events programmed to the alarm point shall be executed and the associated outputs activated per the input/output matrix.
 - .9 Transmit signal to the building automation system.
 - .10 Transmit an alarm signal to the central monitoring station.
 - .11 Activate automatic smoke control sequences.
 - .12 Activation of elevator lobby or elevator equipment room smoke detectors shall initiate recall of the bank of elevators to the 1st floor and lockout the elevator controls. Activation of the first floor elevator lobby smoke detector shall recall shall be to an alternate floor, and lockout the elevator controls.
 - .13 Activation of heat detectors in elevator shafts and machine rooms shall activate the elevator power shunt trip circuit breaker.
 - .14 All stairwell/exit doors shall unlock throughout the building.
 - .15 All self-closing fire/smoke doors held open shall be released.
 - .16 Transmit alarm text messages to "alpha-numerical" display pagers.

.2 Supervisory Operation

- .1 Upon supervisory activation of any sprinkler valve supervisory switch, fire pump control supervisory, clean agent fire suppression system supervisory, CO detectors the following functions shall automatically occur:
 - .1 The internal supervisory event audible device shall sound at the control panel.

- .2 The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.
 - .3 All system activity/events shall be documented and logged to system history.
 - .4 Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.
 - .5 Transmit a supervisory signal to the central monitoring station.
- .3 Trouble Operation
 - .1 Upon activation of a trouble condition or signal from any device or internal system integrity monitoring function on the system, the following functions shall automatically occur:
 - .1 The internal panel audible device shall sound at the control panel.
 - .2 The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.
 - .3 Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not prevent the logging of trouble events to the historical file.
 - .4 All system activity/events shall be documented and logged to system history.
 - .5 Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.
 - .6 Transmit a trouble signal to the central monitoring station.
- .4 Monitor Operation
 - .1 Upon activation of any device connected to a monitor circuit, the following functions shall automatically occur:
 - .1 The internal panel audible device shall sound at the control panel.
 - .2 The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.
 - .3 All system activity/events shall be documented <on the system printer> and logged to system history.
 - .4 Any remote or local annunciator LCD/LED's associated with the monitor circuit shall be illuminated.

1.4 QUALITY ASSURANCE

- .1 Each and all items of the fire alarm system shall be listed as the products of a single manufacturer under the appropriate category by the Underwriter's Laboratories of Canada and shall bear the "U.L.C." label.
- .2 Each and all items of the fire alarm system shall be covered by a one year parts and labour warranty covering defects resulting from faulty workmanship and materials. The warranty shall be deemed to begin on the date the system is accepted by the Project Manager on issuance of the substantial performance certificate for the project.
- .3 All control equipment must have Transient Protection Devices to comply with U.L.C. requirements.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

- .1 This system is subject to review by local building department officials, local fire department officials. Therefore, submission of verification certificate and field technician device verification sheets is required prior to inspection by these officials. Schedule accordingly.

1.6 SUBMITTALS

- .1 Shop Drawings: Provide annunciator layout and system wiring diagram showing each device and wiring connection required.
- .2 Product Data: Provide electrical characteristics and connection requirements.
- .3 Test Reports: Indicate satisfactory completion of required tests and inspections.
- .4 Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

1.7 PROJECT RECORD DOCUMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Record actual locations of initiating devices, signaling appliances, and end-of-line devices.

1.8 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for Fire Alarm System for incorporation into manual specified in Electrical General Requirements Section.
- .2 Include:
 - .1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings.
 - .4 List of recommended spare parts for system.

Part 2 Products

2.1 GENERAL

- .1 The fire alarm system shall be an addressable, single stage, zoned, non-coded, indicating, fully integrated fire alarm.
- .2 The fire alarm control panel shall allow for loading or editing of special instructions and operating sequences as required. The system shall be capable of on site programming to accommodate expansion, and changes required by local codes. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
- .3 The ability to selectively program input/output control functions based on ANDing, ORing, NOTing, Timing and Special Coded Operations is also to be incorporated in the resident software programming of the system.
- .4 The system shall have the ability to manually disable and enable any device/circuit individually for maintenance or testing purposes.

- .5 It shall be possible to reprogram selected or all smoke detector initiating zones for alarm verification.
- .6 It shall be possible to program an adjustable time delay circuit for each waterflow initiating circuit to prevent false alarms that may be caused by erroneous pressure surges in the sprinkler system.
- .7 All on site programming changes to the fire alarm system shall be password protected.
- .8 Wiring to any remote annunciator shall be supervised for open and ground conditions. A separate annunciator trouble indicator must be provided at the control panel, which shall illuminate and an audible trouble signal shall sound at the control panel upon the detection of an open or ground condition.
- .9 All Control Panels and Remote Annunciator Cabinets are to be properly grounded to building ground. Conduit ground will not be acceptable. The green-colored grounding loop shall be a minimum #14 AWG insulated copper conductor run in conduit. The ground loop shall be connected to building water supply to the line side of the water meter. Ground wire must not be run in the same conduit as the Fire Alarm wiring.

2.2 MANUFACTURERS

- .1 Edwards EST3X. No alternatives will be accepted.

2.3 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to CAN/ULC-S525.
- .4 Visual signal devices: to CAN/ULC-S526.
- .5 Control unit: to CAN/ULC-S527.
- .6 Manual pull stations: to CAN/ULC-S528.
- .7 Heat detectors: to CAN/ULC-S530.
- .8 Smoke detectors: to CAN/ULC-S529.

2.4 FIRE ALARM CONTROL PANEL

- .1 The control panel shall include all required hardware and system programming to provide a complete and operational system.
- .2 General
 - .1 All materials, equipment, accessories, devices and other facilities and appurtenances covered by these specifications or noted on the drawings shall be new, best suited for the intended use and shall conform to applicable and recognized standards for their use.
 - .2 The fire alarm control panel(s) shall be a multi-processor based networked system designed specifically for fire. The control panel shall be listed and approved for the application standard(s) as listed in the References section of this specification.
 - .3 The control panel shall include all required hardware, software, and site-specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified using software provided by the manufacturer. The control panel(s) operational

priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

- .4 The operating controls shall be located in a dead-front steel enclosure behind a locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. All panel modules shall be placement supervised for and signal a trouble if damaged or removed.
- .5 System Features
 - .1 Each control panel shall include the following capabilities:
 - .1 Up to 1500 analog/addressable input/output points.
 - .2 Electronic addressing of intelligent addressable devices.
 - .3 Network connections with up to 63 other control panels and/or annunciators.
 - .4 The ability to download all applications programming and firmware from the configuration computer at a single location on the fire network.
 - .5 Support multiple 24 VDC and Audio NACs.
 - .6 User configurable switches and LED indicators to support auxiliary functions.
 - .7 Control panel modules shall plug in to a chassis assembly for ease of maintenance.
 - .8 Field wiring support for 12 to 18 AWG conductors that connect to the panel using removable connectors.
 - .9 Two RS-232 serial communication ports.
 - .10 Alarm, trouble and supervisory relay contacts.
 - .11 History log of up to 1100 events.
 - .12 A real-time clock for time stamps and timed event control.
 - .13 Supervision of the system electronics, wiring, detection devices and software.
 - .14 Internal audible signal with different patterns to distinguish between alarm, supervisory, trouble and monitor events.
 - .15 Independent hardware watchdog to supervise software and CPU operation.
 - .6 User Oriented Features
 - .1 Each control panel shall include the following user oriented features:
 - .1 An LCD user interface control/display that shall annunciate and control system functions.
 - .2 Provide discreet system control switches for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details.
 - .3 A "lamp test" feature shall verify operation of all visual indicators on the panel.
 - .4 An authorized user shall have the ability to operate or modify system functions including system time, date, passwords, restart the system and clear control panel event history file.
 - .5 An authorized user shall have the ability to disable/enable devices, inputs, outputs, and timers.

- .6 An authorized user shall have the ability to activate/restore outputs, and simulate detector smoke levels.
- .7 An authorized user shall have the ability to enter time and date, reconfigure the communications port for download programming, initiate programming and change passwords.
- .8 An authorized user shall have the ability to test the functions of the installed system.
- .9 Service groups shall facilitate one-man walk testing. Service/test groups shall be capable of being configured with any combination of addressable devices, independent of DCL wiring. It shall be possible to program alternate device responses when the device's service group is active. Devices not in an active service group shall process all events normally.
- .10 Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
- .11 DCL loop controller diagnostics shall identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the supervised circuit wiring of remote addressable modules shall be identified by device address.
- .12 An authorized user shall have the ability to generate a history report for alarm, supervisory, monitor, trouble, smoke verification, watchdog events and restore activity.
- .13 System reports shall provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.
- .14 An authorized user shall have the ability to display/report the condition of addressable analog detectors. Reports shall include device address, device type, percent obscuration, and maintenance indication. The maintenance indication shall provide the user with a measure of contamination of a device upon which cleaning decisions can be made.

.7 Programmability

- .1 A Windows-based Configuration Utility (CU) shall be used to create the site-specific system programming. The utility shall facilitate programming of any input point to any output point. The utility shall allow customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms.
 - .1 Zoning of initiation devices.
 - .2 Initiation of events by time of day, day of week, day of year.
 - .3 Initiation of events by matrix groups (X-Y coordinate relationships) for releasing systems.
 - .4 Initiation of events using OR, AND, NOT and counting functions.
 - .5 Prioritizing system events.
 - .6 Programmable activation of detector sounder bases by detector, groups of bases, or all bases.

- .7 Directing selected device messages to specific panel annunciators
 - .8 Detector sensitivity selection by time of day
 - .9 Support of 256 Central Monitoring Station accounts and directing selected device messages to any one of ten Central Monitoring Stations.
 - .2 The configuration utility shall time and date stamp all changes to the site-specific program, and shall facilitate program versioning and shall store all previous program version data. The utility shall provide a compare feature to identify the differences between different versions of the site-specific program.
 - .3 The configuration utility shall be capable of generating reports which detail the configurations of all fire alarm panels, addressable devices and their configuration settings including generating electrical maps of the addressable device DCLs.
 - .4 The configuration utility shall support the use of bar code readers to expedite electronic addressing and custom programming functions.
 - .5 The fire alarm control panel shall be an EDWARDS EST3X.
- .3 Power Supply
- .1 System power supply(s) shall be a high efficiency switched mode design providing four (4) supervised power limited 24 VDC output circuits as required by the panel and external loads fed by the panel. Initial power supply loading shall not exceed 80% of power supply capacity in order to allow for future system expansion.
 - .2 Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.
 - .3 Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functionality. When powered from batteries, the power supply shall employ "Voltage Boost" technology to insure that output voltage never drops below 22.5 VDC regardless of battery voltage.
 - .4 All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.
 - .5 All standby batteries shall be continuously monitored by the power supply. The power supply shall be able to perform an automatic test of batteries and indicate a trouble condition if the batteries fall outside a predetermined range. Power supplies shall incorporate the ability to adjust the charge rate of batteries based on ambient temperatures. The power supply shall automatically disconnect the battery before low voltage damages the battery. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble.
 - .6 Batteries shall utilize sealed lead acid chemistry. Initial battery capacity shall provide 125% of calculated capacity requirements in order to allow for future system expansion.
 - .7 All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of the Canadian Electrical Code and CAN/ULC-S524. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside each control panel the disconnect serves.
 - .8 The power supply shall be an EDWARDS PS10-4B.
- .4 User Interface

- .1 Panel LCD and Common Controls
 - .1 The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the facility.
 - .2 Each fire alarm control panel (system node) shall be capable of supporting a backlit LCD display. The display on each system node shall be configurable to *display* the status of any and/or all combinations of all alarm, supervisory, trouble, monitor, or service group event messages on the network. Each LCD display on the system shall be capable of being programmed to allow *control* functions of any combination of nodes on the entire network.
 - .3 The LCD display shall provide separate alarm, trouble, supervisory, and monitor event queues of to minimize operator confusion. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.
 - .4 The LCD display shall contain the following system status indicators:
 - .5 System Power Indicator
 - .1 System CPU Fail Indicator
 - .2 Ground Fault Indicator
 - .3 Disabled Points Indicator
 - .4 System Common Alarm Indicator
 - .5 System Common Trouble Indicator
 - .6 System Common Supervisory Indicator
 - .6 The LCD display shall contain the following system switch/indicators:
 - .1 System Reset Switch with Indicator
 - .2 System Alarm Silence Switch with Indicator
 - .3 System Panel Silence Switch with Indicator
 - .4 Acknowledge Switch with Indicator
 - .7 The LCD display shall contain the following system function control:
 - .1 Rotary Controller/Switch - to scroll through the display and enter data
 - .8 960 Character Backlit LCD Text Display
 - .9 The user interface shall provide a backlit LCD that will allow custom event messages of up to 42 characters. The interface shall provide a minimum of 24 lines by 40 characters and provide the emergency user hands free viewing of the first seven (7) and last highest priority events. The last highest priority event shall always display and update automatically. Events shall be automatically placed in one of four queues: alarm, trouble, supervisory and monitor. The total number of active events by type shall be displayed. Visual indication shall be provided of any event type that has not been acknowledged. It shall be possible to customize the designation of all user interface LEDs and Switches for local language requirements.
 - .10 Instructional text messages support a maximum of 2,000 characters each.
 - .11 The system 960 character LCD display shall be an EDWARDS 4X-LCD
- .5 LEDs and Switches
 - .1 A modular series of switches and LED indicators shall be available to customize the fire alarm control panel operation in accordance with this specification. All LED and switch

functions shall be software programmable. Switches shall be configurable for momentary, maintained, toggle, or “exclusive or” operation as required by the application. LEDs shall be configurable for slow flash, fast flash or steady operation. LED/Switch modules shall be capable of mounting in any available fire panel module position. All LED/Switch modules shall be supervised. LEDs shall be available in a variety of colours to facilitate identification from a distance. The LED/Switch modules shall provide ample room for custom function text labels under a protective membrane.

- .2 The following common indicators and controls shall be provided on the main CACF panel:
 - .1 Alarm and Supervisory Zone LED indication
 - .2 Bypass Select Switches and Status LEDs
- .3 The LED/Switch modules shall be EDWARDS 3-24x series, 3-12xx series, and 3-6/3S1xxx series devices.

.6 System Printer

- .1 The event and status printer shall be a 9-pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. The printer shall be capable of serial or parallel communications protocol. The communications speed for RS-232 communications protocol shall be adjustable from 300 to 9600 Baud.
- .2 The printer output shall include the type of event, the circuit or device reporting including address, date, and event time. Event restoral conditions shall also be printed, including address, date, and event time.
- .3 In the event that the printer is off-line when an event is received, a panel buffer shall retain the data and it shall be printed when the printer is restored to service.
- .4 The system printer shall be an EDWARDS PT-15.

.7 Reports

- .1 The system shall provide the operator with system reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the main LCD, and shall be capable of being printed on any system printer.
- .2 The system shall provide a report that gives a sensitivity listing of all detectors that have less than 80% environmental compensation remaining. The system shall provide a report that provides a sensitivity (% Obscuration per foot) listing of any particular detector.
- .3 When addressable CO detectors are installed, performing a “sensitivity” check from the panel shall report the approximate number months of sensor life remaining.
- .4 The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given analog/addressable device loop within any given panel.
- .5 The system shall provide a report that gives a chronological listing of at least the last 1000 system events.
- .6 The system shall provide a listing of all of the firmware revision listings for all of the installed components in the system.

2.5 Data Communication Links

- .1 The Data Communication Link connecting panels/nodes to intelligent addressable devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection

modules and notification circuit modules shall be Class A (DCLA or DCLC). All Data Communication Links shall be supervised and power limited.

- .2 When the addressable devices on a Data Communication Link cover more than one designated fire/smoke compartment, a wire-to-wire short on the circuit shall not affect the operation of the addressable devices in other fire/smoke compartments.
- .3 Each DCL shall support 125 addressable detector addresses and 125 module addresses. The DCL shall support 100% of all addressable devices in alarm and provide support for a 100% compliment of detector isolator bases. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.
- .4 T-taps (branching) shall be permitted on Class B circuits. Where possible, the devices installed at the end of each branch should be easily accessible for troubleshooting, e.g. a pull station at normal mounting height.
- .5 The addressable device DCL module shall be ULC Listed for use with code compliant, electrically sound existing wiring.
- .6 Each intelligent addressable device shall transmit information about its location with respect to other devices on the circuit. This information shall be used to create an "As-Built" wiring diagram as well as provide enhanced supervision of a device's physical location. The device message and programmed system output function shall be associated with the device's location on the DCL circuit location and not a device address.
- .7 The DCL module shall allow replacement of "same type" devices without the need to address and reload the "location" parameters on replacement device.
- .8 The DCL/Panels shall notify the user when programmed devices are detected on the DCL circuit. The DCL/Panels shall notify the user when the wrong device type is installed at a location configured for a different device type on the DCL circuit.
- .9 Should an DCL Controller CPU fail to communicate, the DCL circuit shall go into the stand-alone mode. The circuit shall be capable of producing a loop alarm if an alarm type device becomes active during stand-alone mode to enhance system integrity.
- .10 The addressable device Data Communication Link module shall be EDWARDS 3-SDC1, 3-SDDC1 or 3-SSDC1 series.

2.6 Notification Appliance Circuits

- .1 All notification circuits shall be supervised and power limited. Non-power limited circuits are not acceptable. All notification appliance circuits shall be Class B (DCLB).
- .2 Initial circuit loading shall not exceed 80% in order to allow for future system expansion.
- .3 Notification appliance circuits shall utilize a "voltage boost" circuit to insure FACP terminal voltage never drops below 22.5VDC even under low battery conditions.
- .4 Notification appliance circuits shall have a minimum circuit output rating of 3amps @ 24 VDC
- .5 24VDC NACs shall be polarized and provide both strobe synchronization and a horn silence signals on a single pair of wires.

2.7 Initiating Device Circuits

- .1 Conventional (2-wire) initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be Class B (DCLB).
- .2 Initiating device circuits shall be configurable for latched or non-latched operation and configurable to initiate alarm, supervisory or monitor events.

2.8 External Communications

- .1 Fire Alarm Monitoring
 - .1 A ULC Fire Alarm Monitoring Transmitter shall be provided in a separate enclosure for sending system events to a Central Monitoring Station - Fire Signal Receiving Centre.
 - .2 The Fire Alarm Monitoring Transmitter is to be installed to CAN/ULC-S561 requirements with a dedicated 120VAC power source.
 - .3 The fire alarm monitoring transmitter is to be connected to a dedicated phone line supplied by the customer with backup communication via Cellular or IP (Internet).
 - .4 At minimum fire alarm, fire trouble and fire supervisory conditions are to be communicated to the Central Monitoring Station - Fire Signal Receiving Centre.
- .2 Building Management System Interface
 - .1 The system shall provide an interface from the fire/life safety system to the Building Management System (BMS). The interface shall be via Modbus RTU or BACnet MSTP. Confirm with BAS contractor all requirements.
 - .2 IP BACnet Ethernet protocol. The interface shall be software configurable to allow the selection of points from the fire systems to be provided to the BMS. The BMS interface shall be powered from the main fire alarm panel, and mounted in the panel or adjacent to it in a suitable enclosure.
 - .3 The BMS Interface shall be an EDWARDS FSB-PC Series.

2.9 ADDRESSABLE MANUAL ALARM STATIONS

- .1 Provide single action, single stage fire alarm stations at the locations shown on the drawings.
- .2 The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1-½ (38mm) deep 4 square boxes with 1-gang covers. If indicated as surface mounted, provide manufacturer's red surface back box.
- .3 The fire alarm station shall be of metal construction, shall be finished in red with silver "PULL IN CASE OF FIRE" lettering, shall include a plastic break rod, shall show visible indication of operation and incorporate an internal toggle switch.
- .4 The station shall be reset using a common tool.
- .5 Manual pull stations that initiated an alarm condition when opening the unit are not acceptable.
- .6 The single action, single stage fire alarm station shall be an EDWARDS 270-SPO series.
- .7 Guards
 - .1 Provide manual pull station guards at the locations shown on the drawings.

- .2 The guard shall consist of a factory-fabricated clear polycarbonate enclosure, hinged at the top. Lifting the cover shall provide access to the manual pull station and activate an integral battery powered audible horn intended to discourage false alarms.
- .3 The manual pull station guards shall EDWARDS STI Series.

2.10 CONVENTIONAL MANUAL ALARM STATIONS (FOR EXISTING SCHOOL)

- .1 New conventional devices to match existing manual pull stations and be compatible with new Edwards EST3X control panel.

2.11 INTELLIGENT DETECTORS-GENERAL OPERATION

- .1 General
 - .1 General Requirements for Intelligent Addressable Heat, Smoke and CO Detectors
 - .2 Each detector shall contain an integral microprocessor which shall determine if the device is normal, in alarm, or has an internal trouble. The microprocessor's non-volatile memory shall permanently store the detector's serial number, device type and system address. It shall be possible to address each intelligent device without the use of switches. Devices requiring switches for addressing in the detector or its base shall not be considered as equal. Detector memory shall automatically be updated with the hours of operation, last maintenance date, number of alarms and troubles, time of last alarm, and analog signal patterns for each sensing element just before the last alarm.
 - .3 Each detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.
 - .4 Each addressable detector on the Data Communication Link (DCL) shall transmit information regarding its location with respect to other intelligent devices on the data communication link to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the data communication link. An intelligent detector's programmed system response functions shall be associated with the detector's actual location on the data communication link and not with the detector's address. After system commissioning, detectors improperly installed in the wrong location shall function according to the mapped programmed response for its location on the circuit, not its detector's address.
 - .5 A status indicator shall be provided on each detector. Flashing green shall indicate normal operation; flashing RED shall indicate the alarm state. The indicator shall be visible from any direction.
 - .6 The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system or set addresses. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. The fire alarm system shall display an off-normal condition until the replacement detector of the same type is installed or a change in the device type profile has been made.
 - .7 Smoke detectors shall be listed to ULC-S529 and UL268 7th edition and be capable of rejecting nuisance sources and detect smoke in the full life safety window of 0.5% to 4.36% obscuration/foot. Detectors that have to operate in a "special application mode" that cannot achieve the full 0.5% to 4.36% life safety window shall not be considered equal.
 - .8 Smoke detectors shall be listed as a multi criteria detector without the use of other sensing elements and be individually programmable to operate at any one of five (5)

sensitivity settings. The detector shall also store pre-alarm and alternate pre-alarm sensitivity settings. Pre alarm sensitivity values shall be configurable in 5% increments of the alarm and alternate alarm sensitivity settings respectively. The detector shall be able to differentiate between a long-term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the ULC limits, a trouble signal shall be sent to the panel. It shall be possible to automatically change the sensitivity of each addressable smoke detector for day and night alternate sensitivity.

- .9 Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
 - .10 When smoke, heat and/or CO detectors are mounted on a sounder base, the detector shall initiate a temporal 3-3-3 when smoke or heat is detected or a temporal 4-4-4 when CO is detected.
 - .11 The electro-chemical CO sensors shall generate a CO alarm in compliance with UL 2034 and ULC Listed to CAN/CSA 6.19. The sensors shall have a nominal six-year life span. When the sensor approaches the end of its useful life, it shall transmit a maintenance condition to the control panel, indicating the CO sensor board replacement is required. Only when the sensor is no longer operational shall a trouble condition be sent to the control panel. Sensors that transmit a common trouble indication for both sensor end-of-life and other causes of detector trouble shall not be considered as equal. Performing a "sensitivity" check from the panel shall report the approximate number months of CO sensor life remaining. Placing the CO detector into test mode shall facilitate the use of direct injection of small quantities of CO to accelerate CO detector testing.
 - .12 The intelligent detectors shall be EDWARDS Signature Series devices.
- .2 Optical Smoke/Heat/CO Detector
- .1 Provide addressable optical smoke detectors at the locations shown on the drawings. Smoke detectors may be accompanied with integral heat and/or carbon monoxide sensors in the same device as shown on the drawings.
 - .2 The optical smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 4,000 ft/min. (0-20.32 m/sec) without requiring specific duct detector housings or supply tubes.
 - .3 Models shall be available with an optional rate-of-rise heat sensor that provides a 15°F (9°C) per minute function for the detection of fast-developing fires as well as a 135°F (57.2°C) fixed detection threshold.
 - .4 Models shall be available with optional Carbon Monoxide sensing that provides two independent signals (fire & CO) to the control panel for programming system responses. Detectors that transmit a common signal to the control panel for both smoke and CO alarms shall not be considered as equal.
 - .5 The optical smoke detector shall be an EDWARDS SIGA-OSD.
 - .6 The Combination smoke-heat detector shall be an EDWARDS SIGA-OSHD.
 - .7 The Combination smoke-CO detector shall be an EDWARDS SIGA-OSCD
 - .8 The Combination smoke-heat-CO detector shall be an EDWARDS SIGA-OSHCD.

.3 Heat and CO Detectors

- .1 Provide intelligent fixed temperature heat detectors at the locations shown on the drawings. Fixed temperature heat detectors may be accompanied with integral rate of rise temperature technology and/or carbon monoxide sensors in the same device as shown on the drawings.
 - .2 The heat sensor shall provide a 135°F (57.2°C) fixed detection threshold. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of thermistor data. Systems using central intelligence for alarm decisions shall not be considered as equal.
 - .3 The heat detector shall be rated for ceiling installation at a minimum of 50 ft (15.24m) centers and also be suitable for wall mount applications.
 - .4 Models shall be available with an optional rate-of-rise heat sensor that provides a 15°F (9°C) per minute function for the detection of fast-developing fires.
 - .5 Models shall be available with optional Carbon Monoxide sensing that provides two independent signals (fire & CO) to the control panel for programming system responses. Detectors that transmit a common signal to the control panel for both smoke and CO alarms shall not be considered as equal.
 - .6 The Intelligent fixed temperature detector shall be an EDWARDS SIGA-HFD.
 - .7 The Intelligent combination fixed temperature / rate-of-rise heat detector shall be an EDWARDS SIGA-HRD.
 - .8 The Combination heat & CO detector shall be an EDWARDS SIGA-HCD.
- .4 CO Detector
- .1 Provide addressable carbon monoxide (CO) detectors at the locations shown on the drawings.
 - .2 The CO detector shall provide an independent signal to the control panel for programming CO system responses. The CO detector shall be ULC Listed to CAN/CSA 6.19ULC-S530 and UL 2075.
 - .3 The CO detector shall be an EDWARDS SIGA-COD.
- .5 Detector Bases
- .1 Provide detector bases suitable for mounting on either North American 1-gang, 3-½ or 4 inch octagon box and 4 inch square box; at the locations shown on the drawings. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections. The base shall contain no active electronics and support all Signature series detector types.
 - .2 Models shall be available with integral relay. The relay shall be a bi-stable type and selectable for normally open or normally closed operation. The operation of the base relay shall be configurable for control by its respective detector or for independent programmable control from the fire alarm panel. Relay bases not configurable for detector or panel operation shall not be considered equal. The base relay shall provide form "C" contacts with a minimum rating of 1 amp @ 30 Vdc and be listed for pilot duty.
 - .3 Models shall be available with integral isolator technology. In the event the Class A data communication link on which the isolator bases are installed is shorted, each isolator base shall disconnect the DCL wiring. Isolator bases shall then sequentially reconnect the isolated circuit segments until only the segment with the short is left out of the circuit, leaving the balance of the circuit operational.

- .4 All bases shall be capable of supporting a Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.
 - .5 The addressable standard detector base shall be an EDWARDS SIGA-SB.
 - .6 The addressable relay detector base shall be an EDWARDS SIGA-RB.
 - .7 The addressable Isolator detector base shall be an EDWARDS SIGA-IB.
- .6 Sounder Base
- .1 Provide audible detector mounting bases suitable for mounting on a North American 2-1/2" deep 4 inch square or octagon box at the locations shown on the drawings.
 - .2 The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.
 - .3 Removal of the respective detector shall not affect communications with other detectors.
 - .4 The audible base shall support all detector types and shall be capable of single or grouped (programmed) operation.
 - .5 The audible base shall emit a temporal 3-3-3 fire alarm tone when smoke or heat has been detected. The audible base shall emit a temporal 4-4-4 CO alarm tone when CO has been detected.
 - .6 The audible bases shall provide a CAN/ULC-S525 anechoic chamber sound output of 91 dBA at 10ft (3m).
 - .7 The detector sounder base shall be an EDWARDS SIGA-AB4GT.
- .7 Smoke Detector Guards
- .1 Smoke detector guards shall be installed at the locations shown on the drawings.
 - .2 The guards shall be UL/ULC tested and listed for use with the smoke detectors they protect. Guard design shall not affect the detector operating sensitivity and shall not reduce the listed detector spacing.
 - .3 The design of the guard shall provide physical protection for the detector while preventing looped items from hanging from or threaded through the guard.
 - .4 The guards shall be constructed of 18-gauge steel with a baked white finish to match the detectors. Tamperproof mounting hardware shall be provided.
 - .5 The Smoke Detector Guards shall be EDWARDS SIGA-GRD.

2.12 CONVENTIONAL AUTOMATIC ALARM INITIATING DEVICES (FOR EXISTING SCHOOL ZONES)

- .1 New devices to match existing devices and be compatible with new Edwards EST3X control panel.
- .2 Heat Detectors
 - .1 Heat-Rate Comp
 - .1 Provide rate compensated heat detectors at the locations shown on the drawings.
 - .2 Detectors shall be rated for a maximum smooth 10 ft. ceiling rating of 2,500 sq. ft. and shall activate at 135°F.
 - .3 Detectors shall be hermetically sealed and automatically resetting. Detectors shall operate when ambient air temperature reaches detector setting, regardless of rate of temperature rise. Fixed temperature detectors without

- rate compensation or rate-of-rise detectors shall not be considered as equals. Detectors shall be equipped with screw terminals for each conductor
- .4 The rate compensated heat detectors shall be an EDWARDS 302 series devices.
 - .5 For explosionproof areas shown on drawings, heat detectors shall be suitable for use in Class I, Groups C & D; and Class II, Groups E, F, & G.
 - .6 The explosion proof rate compensated heat detectors shall be EDWARDS 302-EPM series devices.
- .2 Fixed Temperature/Rate of Rise Detectors
- .1 Provide dual-action type heat detectors at the locations shown on the drawings.
 - .2 Detectors shall respond to a rate of temperature increase at the ceiling of 15 degrees F (8.4C) per minute. The detectors shall also respond when the fixed temperature (non-restorable) threshold is exceeded. Dual-action heat detectors are installed in areas where rapid fluctuations in ceiling temperature are not expected.
 - .3 In areas where rapid increases in ceiling temperature are normal, use fixed temperature only devices.
 - .4 Detectors shall have a proven operating temperature range of -20F to +250F (-30C – 120C) exclusive of release temperature. Release temperature models shall include: 135F/57C, 165F/71C, 200F/93C and 285F/140C.
 - .5 Detectors shall be equipped with screw terminals for each conductor.
 - .6 The fixed temperature/rate of rise heat detectors shall be FDD CR/CF series devices.

2.13 AUDIBLE/VISUAL SIGNAL DEVICES

- .1 General
 - .1 All appliances supplied for the requirements of this specification shall be ULC listed for Fire Alarm and Life Safety System use. All appliances shall be compatible with the fire alarm control panel specified.
 - .2 All visual appliances shall be synchronized. Light and audible output levels shall be designed to meet Ontario Building Code and CAN/ULC-S524 Standard for the Installation of Fire alarm Systems requirements.
- .2 Horns and Horn-Strobes
 - .1 Compact Wall Mount LED Horns & Horn-Strobes
 - .1 Provide low profile single gang wall mounted horns and horn-strobes at the locations shown on the drawings.
 - .2 Low profile LED horns and horn-strobes shall mount in a North American 1-gang box, and protrude less than 1" from the mounting surface. Units shall support interchangeable covers with alternate markings and colours. Cover shall be removable while device is mounted on the wall.
 - .3 The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd. Selected strobe rating shall be visible when the strobe is in its installed position. Candela setting switch shall be accessible while device is mounted on the wall. Current draw shall not exceed 24 mA VDC (32 mA FWR) per device across all candela settings to maximize circuit lengths.

- .4 The horn shall provide an audible output of at least 86 dBA @ 10ft per CAN/ULC-S525, and have a selectable steady or synchronized temporal (3-3-3) output pattern and high/low dB settings.
- .5 Current draw shall not exceed 23 mA VDC (29 mA FWR) per device.
- .6 In and out screw terminals shall accommodate 18AWG to 12 AWG wiring. Units shall be equipped with a diagnostics port to allow for checking of supply voltage without removing device from the wall.
- .7 All horns and horn-strobes shall be red..
- .8 The compact horns and horn-strobes shall be EDWARDS Genesis G1 LED Series.
- .2 Wall Mount LED Horns & Horn-Strobes
 - .1 Provide low profile wall mounted horns and horn-strobes at the locations shown on the drawings.
 - .2 Low profile LED horns and horn-strobes shall mount in standard North American 1-gang, 2-gang, 4-inch octagon, and 4-inch square electrical boxes, and protrude less than 1.5" from the mounting surface. Units shall support interchangeable covers with alternate markings and colours. Cover shall be removable while device is mounted on the wall.
 - .3 The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd and 110cd. Selected strobe rating shall be visible when the strobe is in its installed position. Candela setting switch shall be accessible while device is mounted on the wall. Current draw for strobe shall not exceed 28 mA VDC (36 mA FWR) per device across all candela settings to maximize circuit lengths.
 - .4 The horn shall provide an audible output of at least 86 dBA @ 10ft per CAN/ULC-S525, and have a selectable steady or synchronized temporal (3-3-3) output pattern and high/low dB settings.
 - .5 Current draw for horn-strobe shall not exceed 28 mA VDC (38 mA FWR) per device.
 - .6 In and out screw terminals shall accommodate 18AWG to 12 AWG wiring. Units shall be equipped with a room side wiring plate including a diagnostics check bar for continuity verification.
 - .7 All horns and horn-strobes shall be red.
 - .8 The horns and horn-strobes shall be EDWARDS Genesis G4 LED Series.

2.14 FIRE ALARM WIRE AND CABLE

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
- .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
- .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.
- .5 Insulation 75 degrees C minimum with nylon jacket.
- .6 Color code wiring.
- .7 The system wiring must be FSA rated in conformance with the Electrical Safety Code to suit the type of installation.
- .8 Wiring shall be minimum #18 AWG twisted shielded pair in conduit. "Securex 2" armoured cable will be permitted to be used for "drops" to devices on accessible ceilings.

- .9 As indicated on system riser diagram initiating device wiring shall be run in a loop with a home run from the last device to the control panel (Class 'A' configuration). Wiring from the "loop" module to conventional devices must be supervised, run in conduit, and conform to the standards of the Electrical Safety Code.
- .10 Signal wiring is to be cross connected in a class 'B' configuration.
- .11 Install isolator modules and end of line resistors in service rooms no higher than 2.4 M AFF. Provide location of these devices at the time of shop drawing submission.
- .12 These are the basic wiring requirements for system operation. Prior to tender close manufacturer and contractor are to confirm all necessary wiring specifications and requirements.
- .13 Provide wiring for the fire alarm system with the following characteristics:
 - .1 All wires shall be new and copper conductors only.
 - .2 For alarm receiving circuits a maximum circuit resistance of 50 ohms and a minimum wire size as illustrated below. Contractor is advised to consult manufacturer for specific product requirements and recommendations.
 - .1 Pair of #18 AWG twisted wires for the addressable loop.
 - .2 Provide 1 pair of #16 AWG wire per signal circuit.
 - .3 Provide 1 pair of #18 AWG from monitor modules to supervisory valves and flow switches.
 - .4 Floor wiring (loop, signal circuits, etc) must be run separate conduits.
 - .5 Confirm quantity and size of all conductors for all circuits, main riser, between equipment, etc. from manufacturer as required to complete the installation.
 - .6 All wires and cables used in installation shall meet fire alarm equipment manufacturer's requirements and specifications
- .14 Wiring shall be protected from mechanical distraction, moisture, excessive heat or corrosive action in accordance with Class 1 requirements
- .15 All Fire Alarm System wiring shall be labelled for easy identification and service.

2.15 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signaling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel.
- .2 End-of- line resistors to be mounted in individual single gang box complete with stainless steel covers complete with tamper proof screws. They shall not be installed in the hallway but the closest electrical closet and accessible for service. Each end of line must be identified for purpose.
- .3 End-of-line resistors for signalling circuits shall be sized to ensure the correct supervisory current flows in each circuit.
- .4 End-of-line resistors shall be mounted on a stainless-steel plate for mounting on a standard single gang box and bear the ULC label.

2.16 REMOTE ANNUNCIATOR PANELS

- .1 Provide a ULC listed remote annunciator at the location(s) shown on the drawings. The annunciators shall be surface mounted in key-locked metal enclosures. Annunciator must be keyed similar to control panel.

- .2 The annunciator shall display the same text information on the 80 character back-lit LCD as the FACP to which it is connected.
- .3 The following common indicators shall be provided on the annunciator.
 - .1 Annunciator Power, Fire Alarm, Supervisory, Ground Fault, Trouble, Controls Enabled and Ack/Silence LEDs; and an internal buzzer.
- .4 The following common controls shall be provided on the annunciator:
 - .1 Silence, Trouble Silence, Drill , System Reset, and Lamp Test push buttons. The common controls shall be enabled using a key switch.
- .5 The annunciators shall be capable of driving up to 24 pairs of LEDs for point annunciation.
- .6 The annunciator shall be powered by a battery backed up ULC listed 24 VDC power source.
- .7 The fire alarm remote annunciator shall be EDWARDS R-Series annunciator.

2.17 GRAPHIC ANNUNCIATOR PANEL (PASSIVE)

- .1 Provide passive graphics at locations shown on the drawings.
- .2 The fire alarm zone passive graphic display shall indicate the building floor plans and respective fire alarm zones with the description corresponding to the zone indication at the fire alarm control panel and annunciator(s). The fire alarm zones indicated for each floor shall be clearly defined with borders to indicate zone separation. <All fire alarm zone areas are to be solid color filled.
- .3 Include the following information on the graphic display:
 - .1 A north indicator in the upper left corner of the graphic.
 - .2 A "You are here" location indicator in Red oriented to the viewers location
- .4 The graphic display shall:
 - .1 Be printed on water/moisture resistant 2mm vinyl using UV resistant dye.
 - .2 Include vandal resistant mounting
- .5 Passive graphic approval drawings are to be submitted in electronic PDF format for review by the Owner, the Engineer's Representative and the local AHJ.
- .6 The passive graphics shall be minimum size of 24"x36".

2.18 ADDRESSABLE INTELLIGENT MODULES

- .1 General
 - .1 Intelligent addressable multifunction modules shall be provided at the locations shown on the drawings to provide the specific system input and output functions described by the operation section and functional matrix found elsewhere in this specification.
 - .2 The operation of multifunction modules shall be software configurable at the site to meet operational conditions and may be changed at any time by downloading changes from the control panel. The intelligent multifunction modules shall utilize electronic addressing. Modules using rotary or DIP switches, memory chips and / or jumpers for addressing shall not be considered as equal.

- .3 Each intelligent multifunction module on the data communication link (DCL) shall transmit information regarding its location with respect to other intelligent devices on the data communication link to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the data communication link. An intelligent device's programmed system response functions shall be associated with the device's actual *location* on the data communication link and *not with the device's address*. After system commissioning, devices improperly installed in the wrong location shall function according to the mapped programmed response for its *location* on the circuit, not its device address.
- .4 All input /output status decisions shall be made by the microprocessor within the module. Communications with a control panel shall not be required in order for the module to identify off-normal input/output conditions. Modules with supervised input or output circuits shall be capable of identifying ground fault conditions specific to the module address level.
- .5 Each module shall be equipped with two (2) diagnostic indicators; a green LED to confirm communications and a red LED to display active status. LEDs shall be visible through the finished cover plate. The module shall be capable of storing a unique serial number and up to 24 diagnostic codes, hours of operation, number of alarms and troubles, and time of last alarm in its memory which can be retrieved for troubleshooting.
- .6 Where multiple modules are mounted in close proximity to each other, plug-in modular versions of the modules and motherboards shall be available to minimize field wiring, reduce space and facilitate troubleshooting.
- .7 The addressable multifunction modules shall EDWARDS Signature Series devices.
- .2 Multifunction Input Modules
 - .1 Provide addressable single and dual input multifunction modules at the locations shown on the drawings.
 - .2 The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.
 - .3 Each module shall provide one or two supervised Class B normally-open input circuits, configurable as Alarm or Supervisory, latching, non-latching or delayed latching for waterflow.
 - .4 Each module shall report any associated circuit faults (grounds, opens, etc) by device address to the control panel. Single function modules or modules without individual ground fault detection identification shall not be considered as equal.
 - .5 The Addressable Multifunction Input Modules shall be an EDWARDS SIGA-CT/MCT series.
- .3 Notification Circuit Modules
 - .1 Provide addressable notification appliance circuit (NAC) modules at the locations shown on the drawings.
 - .2 The module shall be suitable for mounting in North American 2 ½" (64mm) deep 2-gang boxes and 1½" (38mm) deep 4" square boxes with 2-gang covers.
 - .3 The addressable NAC modules shall provide for Class A or B, with one or two riser inputs and strobe synchronization capability as required.
 - .4 The addressable notification appliance circuit modules shall be an EDWARDS SIGA-CC/MCC series.
- .4 Control Relay Modules

- .1 Provide addressable control relay modules at the locations shown on the drawings.
- .2 The module shall be suitable for mounting on a North American 2-½" (64mm) deep 1-gang box or 1-½" (38mm) deep 4" square box with 1-gang covers.
- .3 The module shall provide one (1) form C dry relay contacts rated at 2 Amps @ 24Vdc (pilot duty) and 0.5 Amps @ 120 Vac to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The relay coil shall be magnetically latched to reduce wiring and ensure 100% of the relays on the DCL can be energized at the same time.
- .4 The addressable control relay module shall be an EDWARDS SIGA-CR/MCR series.
- .5 High Power Control Relay Modules
 - .1 Provide addressable high power control relay modules at the locations shown on the drawings.
 - .2 The module shall be suitable for mounting in North American 2-1/8" (54mm) deep 2-gang boxes and 2-1/8" (54 mm) deep 4" square boxes with 2-gang covers.
 - .3 The module shall provide one (1) relay with two (2) Form C contacts rated for 24Vdc - 6 Amps resistive, 120Vac - 7 Amps (PF 0.75), 3 Amps (PF 0.35), and 240Vac - 7 Amps (PF 0.75), 1.5 Amps (PF 0.35) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The relay coil shall be magnetically latched to reduce wiring and ensure 100% of the relays on the DCL can be energized at the same time.
 - .4 The addressable control relay module shall be an EDWARDS SIGA-CRH.
- .6 Isolator module
 - .1 Provide addressable isolator modules at the locations shown on the drawings.
 - .2 The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.
 - .3 In the event the Class A data communication link on which the isolator modules are installed is shorted, each isolator module shall disconnect the DCL wiring. Isolator modules shall then sequentially reconnect the isolated circuit segments until only the segment with the short is left out of the circuit, leaving the balance of the circuit operational.
 - .4 The addressable Isolator Module shall be an EDWARDS SIGA-IM2.
- .7 Universal modules
 - .1 Provide intelligent universal Class A/B multifunction modules at the locations shown on the drawings.
 - .2 The module shall be suitable for mounting on North American 2½" (64mm) deep 2-gang boxes and 1½" (38mm) deep 4" square boxes with 2-gang covers.
 - .3 Each universal module shall be configurable as any one of 15 module "personalities" including: Alarm or Supervisory, Class A or B, Latching, non-latching or delayed latching, Form C relay contact, 2-wire conventional smoke input, 24Vdc or 70Vrms NAC control.
 - .4 Each module shall report any associated circuit faults (grounds, opens, etc) by device address to the control panel. Single function modules or modules without individual ground fault detection identification shall not be considered as equal.
 - .5 The Universal Class A/B Module shall an EDWARDS SIGA-UM/MAB series.

2.19 SPRINKLER AND SUPERVISED VALVE CONNECTIONS

- .1 Sprinkler and standpipe system contacts shall be provided by the mechanical/sprinkler contractor but connected into the fire alarm system by this Division.

2.20 REMOTE TROUBLE INDICATOR

- .1 A system remote trouble indicator where noted on the drawings shall be provided complete with the following features:
 - .1 Flush mounted in a double gang box.
 - .2 Trouble LED.
 - .3 Trouble buzzer.

Part 3 Execution

3.1 ACCEPTABLE INSTALLER

- .1 The fire alarm / life safety system specified herein shall be installed by an Authorized Electrical Contractor who is CFAA certified.

3.2 EXAMINATION

- .1 Prior to the commencement of any of the work detailed herein, an examination and analysis of the area(s) where the Fire Alarm / Life Safety System and all associated components are to be installed shall be made.
- .2 Any of these area(s) which are found to be outside the manufacturers' recommended environments for the particular specified products shall be noted on a Site Examination Report which shall be given to the Building Owners Representative, and the Consultant.
- .3 Any shorts, opens, or grounds found on existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.

3.3 INSTALLATION

- .1 The entire system shall be installed in accordance with CAN/ULC-S524 (latest edition) and approved manufacturers manuals and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the Electrical Safety Code, approved by local authorities having jurisdiction for the purpose, and shall be installed in dedicated conduit throughout.
- .2 The contractor shall be responsible for supplying a full set of drawings and specifications to the fire alarm manufacturer's representative for confirmation.
- .3 Wiring for fire detection/alarm and voice communications systems shall be the type and size as recommended by the manufacturer's representative with consideration given to circuit loading and distances.
- .4 Wire counts indicated on the drawings are for general estimating purposes only. Exact number and type of conductors shall be as required by actual system being installed final layout of devices, etc., and as recommended by the manufacturer's representative.

- .5 Final layout of devices, routing of conduit, etc., shall be coordinated between the installing contractor and the manufacturer's representative. This information should be indicated on schematic wiring diagrams and on as installed drawings.
- .6 Fire alarm riser junction boxes where indicated shall be painted red and sized to accommodate number, size and type of conductors installed.
- .7 Wiring shall be multi conductor cable listed and approved for use as fire alarm system wiring.
- .8 Install main control panel and connect to ac power supply and dc standby power.
- .9 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .10 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .11 Connect alarm circuits to main control panel.
- .12 Locate and install horns and strobes and connect to signalling circuits.
- .13 Connect signalling circuits to main control panel.
- .14 Install end-of-line devices at end of alarm and signalling circuits.
- .15 Install remote annunciator panels and connect to annunciator circuit wiring.
- .16 Locate and install door releasing devices.
- .17 Locate and install remote relay units to control fan shut down.
- .18 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

3.4 FIELD QUALITY CONTROL

- .1 System Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - for Electrical and CAN/ULC-S537.
 - .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, heat and smoke detectors, sprinkler system devices transmit alarm to control panel and actuate first stage alarm.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
 - .4 Class A circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

- .5 Class B circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .3 The control panel shall continuously perform as automatic self-test routine on each sensor, which will functionally check the sensor electronics and ensure the accuracy of the valves being transmitted to the control panel.
- .4 Automatic testing will occur at a rate of one sensor every four minutes.
- .5 The sensor's average analogue value is the average of the last 2000 recorded analogue entries of its chamber.
- .6 Any sensor that fails this test shall indicate a 'SELF-TEST ABNORMAL' trouble condition with the sensor's address at the control panel.
- .7 The system shall automatically indicate when an individual sensor needs cleaning. When the sensor's average value reaches a predetermined value, a 'DIRTY SENSOR' trouble condition shall be audibly and visually indicated at the local control panel for that sensor. IF a 'DIRTY SENSOR' indication is left unattended and its average value increases to a second predetermined value, an 'EXCESSIVELY DIRTY SENSOR' trouble condition shall be indicated at the local control panel for that sensor. To prevent false alarms, these 'DIRTY' conditions shall in no way decrease the amount of smoke obscuration necessary to generate an alarm condition.
- .8 An operator having a proper access level, shall have the capability to manually access the following information from the control panel:
 - .1 Primary Status
 - .2 Device Type
 - .3 Present Average Value
 - .4 Present Sensitivity Selected*
 - .5 Highest Peak Detection Values (HVP)*
 - .6 Sensor Range (Normal, Dirty, Excessively Dirty)
- .9 Provide "Integrated Testing" of this life safety system in conformance with the noted specification section. Include all associated costs in tender.

3.5 AUDIBILITY TESTING

- .1 Audibility Testing:
 - .1 The contractor is to coordinate an audibility test prior to occupancy of the facility. The test is to be performed by the representatives of the fire alarm manufacturer in the presence of the consultant. The test report is to be in chart form indicating:
 - .1 Project
 - .2 Date of test
 - .3 Room name and number
 - .4 Ambient dB level
 - .5 Alarm dB level
 - .6 Name of testing technician
 - .2 The test results are to be submitted to the consultant for review prior to issuing to owner's representatives and/or authorities having jurisdiction.

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

3.6 TRAINING

- .1 The fire alarm manufacturer's representative shall schedule and execute system training for the building owner which details the proper operation of the installed fire alarm system. The instruction shall also cover the schedule of maintenance required by CAN/ULC-S536 Standard for the Inspection and Testing of Fire Alarm Systems, and any additional maintenance recommended by the system manufacturer.
- .2 The instruction shall be presented in an organized and professional manner by a person manufacturer trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.
- .3 The fire alarm manufacturer's representative shall provide operations manuals or any other materials that may enhance the instruction of the owner's in the operation and maintenance of the system.

3.7 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

31 23 10-Excavating, Trenching And Backfilling

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

Excavation, trenching and backfilling shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and briefly described as follows:

- .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
- .2 Strip the site as required by the Work. Topsoil that is approved for reuse to be stockpiled for re-grading purposes. All topsoil, granular materials etc. not suitable for reuse shall be disposed of off the site by the contractor.
- .3 Excavating, loading and disposal of all materials as required by the work.
- .4 Excavations for foundations, footings, beddings, etc. Loading and disposal of all materials as required by work. Trench and pour foundations are proposed and detailed on drawings. See geotechnical investigation for further sub-grade information.
- .5 Supply, installation and compaction of all aggregate materials.
- .6 Placing and compacting of granular fill for interior and exterior building areas.
- .7 Placing and compacting fill of excavated areas at all areas of the work to finish grades as indicated on drawings.
- .8 Placing and compacting of granular fill at exterior areas as specified and required under asphalt paving, slabs, walks, trenches, etc. As noted on the drawings.
- .9 Backfill for mechanical and electrical trades inside of the building.
- .10 Trenching and excavation for storm and sanitary sewers inclusive of all catch basins, clean-outs, manholes etc.
- .11 Trenching and excavation for domestic water lines/fire suppression water service. Removal of all excavated material. Provide all new compacted granular fill at all trench locations.
- .12 Trenching and excavation for Mechanical/Electrical trades within the building and beyond the building foundations for duct banks, site lighting poles etc. Removal of

all excavated material. Provide all new compacted granular fill at all trench locations.

- .13 Inspection and testing.
- .14 Co-ordination of work to achieve completion of the project as contractually outlined.

1.2 RELATED WORK

- .1 Refer to Div 3 – Concrete works
- .2 Refer to Section 07 21 13 – Board Insulation
- .3 Refer to Section 31 23 13: Rough Grading.
- .4 Refer to Section 32 12 18 - Asphalt and curbs
- .5 Refer to Section 32 92 23 - Sod and seeding
- .6 Refer to Section 32 11 23: Aggregate Base Courses
- .7 Refer to Section 33 05 14: Manholes and Catch Basin Structures
- .8 Refer to Section 33 46 17: Subgrade Drainage and Sewers
- .9 Concrete works and Landscaping

1.3 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to “Instructions to Bidders”, “Examination of Site”.

1.4 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.5 SOIL INVESTIGATION

- .1 A soil report of the site was conducted. Refer to Section 01 22 00.
- .2 This information is made available solely as a guide and no responsibility is accepted by the Consultant or Owner for its contents. The accuracy or otherwise of the report shall not affect the provisions of the contract.

1.6 SHORING AND BRACING

- .1 Provide approved shoring and bracing as required to prevent settlement, caving of banks, etc. Shoring and other temporary work shall be so placed so as to not interfere with new permanent work remaining in place until backfilling is done and removed in sections. This Contractor shall be responsible for any damage resulting from improper or inadequate protection, and all excavations must conform to all governing codes and regulations.

Note: Construction Safety Act, Trench Excavator's Section for Shoring Requirements and the Ontario Building Code.

1.7 PROTECTION FROM WEATHERING

- .1 Protect excavated banks, floors, etc. against freezing. In cases where bearing earth is allowed to freeze, it shall be removed and replaced with approved fill.
- .2 Keep excavations free from water providing and operating pumps to conduct water a sufficient distance away to keep excavations dry. Do not allow water to wash freshly laid concrete or masonry.

1.8 CO-OPERATION

- .1 This Contractor shall make himself familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.9 LINES

- .1 All lines and levels for the excavation will be furnished by the General Contractor.

2.0 PRODUCTS

2.1 GRANULAR FILL MATERIAL

- .1 Type 'A' shall be granular 'A' material that meets Ontario Specifications 1010 for granular 'A' material.
- .2 Type 'B' shall be Granular 'B', Type 2 material and meeting the physical requirements of OPSS 1010 for Granular 'B'.
- .3 Type 'C' shall be 19 mm clear stone material.

2.2 DRAIN TILE / WEEPING TILE

- .1 Drain tile / Weeping tile shall be perforated corrugated plastic sub-drains with geotextile cover, Big-O drain tile or equal. Drains shall be to details indicated on drawings and shall be assembled complete with manufacturer's couplings and fittings including corners and T's as required.
- .2 Sizes as indicated on the drawings.

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractors shall visit the site to ascertain special conditions which affect his work.

3.2 STRIPPING

- .1 Strip site to remove the existing TOPSOIL, vegetation, FILL, granular material, asphalt paving or weathered soil as indicated on the test holes. Stripping operations to be inspected full time by the assigned geotechnical engineer. All materials to be removed and disposed of from the site by this contractor.
- .2 All costs for inspection shall be paid by the General Contractor from Inspection and Testing Allowance. Inspection and Testing Company will report findings to the Architect, Owner and General Contractor.
- .3 Proof-roll exposed sub-grade for all building and areas to be paved using a non-vibratory steel smooth drum roller in the presence of the Geotechnical Engineer. Give adequate notice to testing company prior to proof-rolling. Any softened areas encountered shall be removed under the direction of the Geotechnical Engineer and the Consultant shall be notified. Do additional work as extras to contract based on agreed upon unit prices. A Change Directive will be issued accordingly so as not to delay the work.
- .4 The subgrade for paved areas to be sloped or crowned at a rate of 2% to the catch basin locations.
- .5 In order to protect the integrity of the foundation soils, no construction traffic (trucks, loaders, graders, etc.) is to travel over unprotected subgrade. In areas where slab on grade and pavement will be constructed, a minimum thickness of 10" granular fill to be spread before construction traffic can proceed over the construction areas.

3.3 EXCAVATION

- .1 Excavation shall be made to elevations and dimensions indicated or required by the work plus sufficient space to permit erection of forms, shoring and inspection of foundations, drains, pits, pads, etc.
- .2 All excavation shall be carried out with a smooth edge bucket.
- .3 All lines and levels for excavations will be furnished by the General Contractor. Co-ordinate with mechanical all interior trench elevations.
- .4 **Note:**
 - .1 *Excavate for all asphalt paving, walks, curbs, etc. as required and noted on drawings.*

- .2 *Proof-roll sub grade under all building and paved areas with a non-vibratory steel roller.*
- .3 *Excavating shall be done in a manner that will prevent any settlement or movement of banks.*
- .4 *Excavate for exterior sewers, cleanouts, catch basins, manholes, waterlines, flagpole, curbs, all concrete platforms, footings, foundations, etc., and as noted on drawings.*
- .5 *If footings are not completed as dig and pour install 2"± lean concrete mud mat over all excavations for footings after inspection by Geotechnical Engineer. Refer to Section 03 30 00.*
- .5 Footings to be placed on lean concrete mud mat over firm undisturbed approved earth. Excavations for all footings and foundations shall be carried to solid bottoms. If satisfactory load bearing solid is not reached at depths indicated, the excavations shall be extended deeper as directed by the Geotechnical Engineer. The additional work will be paid for through the Provisional Cash Allowance.
- .6 Refer to structural drawings for lean fill application to underside of footings.
- .7 Do all excavation work required for new asphalt, building, drive, services, walks etc...
- .8 This Contractor to employ the assigned geotechnical engineer, an independent testing company to inspect and ensure the exposed foundation bearing material is consistent with the recommendations of the geotechnical report. All costs for these inspections shall be paid by the General Contractor from the Inspection and Testing Allowance.

3.4 SHORING & SHEETING

- .1 Provide approved shoring and sheeting as required to prevent settlement, caving of banks, etc. Be responsible for any damage resulting from improper, inadequate protection.
- .2 Wales, struts, shoring, timers, steel and other items used in the construction of the shoring or sheeting where required to complete excavation work for this project shall be entirely satisfactory for the project.
- .3 The bracing and shoring strutting shall be as required by the job conditions and the requirements of the Ontario Building Code and the Construction Safety Act, Trench Excavator's Act Section for Shoring Requirements and other legislation governing work carried out in excavations and cofferdams.
- .4 Shoring and other temporary work shall be so placed that it will not interfere with new permanent work.
- .5 Leave shoring in place until backfilling of lean concrete, granular material, etc. is done and then remove it in section in approved engineering principles.

- .6 Make good any damage resulting from failure of supports or lack of making necessary provisions to prevent settlement, caving or other damage.

3.5 REMOVAL OF OBSTRUCTIONS

- .1 The Contractor shall remove all existing obstructions as required for new construction and all other obstructions of whatever nature encountered, (e.g.: trees, bush, existing roots, boulders, etc.) in the course of excavation.
- .2 Existing trees which are located on or in proximity of the Public Right of Way or the existing structures on site shall be removed by an insured professional tree service.
- .3 Root balls from removed trees shall be excavated out and backfilled in accordance with the requirements of fill placement in this Section.

3.6 UNAUTHORIZED EXCAVATION

- .1 Excavations to a greater than required depth shall be corrected by the Contractor at own expense by use of concrete or by other means as directed by the Consultants after an inspection of the conditions.

3.7 NOTIFICATION OF AUTHORITIES

- .1 The Contractor shall notify the Architect, Building Inspector and any other agency having jurisdiction that the excavation for foundations is ready for inspection. All approvals must be obtained before placing foundations.
- .2 Notify local Utilities Commission in advance of water main work.

3.8 PLACING AND COMPACTION OF FILL

- .1 All interior wall side backfill, under floor slabs, etc. to be backfilled with a sub-base of compacted granular Type 'B' and a top layer of 8" minimum well compacted granular Type 'A' material, all to O.P.S.S. 1010 compressed to 100% of its maximum Standard Proctor dry density.

Note: All interior trenches for mechanical shall be backfilled with granular Type 'A' material.

- .2 Exterior side foundation wall backfill under paved, concrete walks, platforms, etc. other than paved areas to be backfilled with Type 'B' compacted to 100% of its Standard Proctor maximum dry density and have top 6" below slabs backfilled with granular Type 'A' material, compacted to 100% standard Proctor density. Backfill under areas to be landscaped adjacent to foundations to be backfilled as for walls but the top 18" is to be filled with clean earth fill.

Refer to Section 32 12 18 for thicknesses of granular base and asphalt surface thicknesses.

- .3 All interior and exterior backfill of granular material shall be laid in maximum 12" loose lifts and layers compressed to 100% of optimum standard proctor density,

except earth fill in landscaped areas to be 90% of optimum standard proctor maximum dry density.

Tamp all fillings in thin layers and take special care to tamp and puddle filling outside of enclosing walls and around edges of foundations mats and other foundations.

Where any excavation is necessary in close proximity to and below any footings, the Contractor shall backfill with 10 MPa concrete to the level of the top of the adjacent footing.

- .4 Granular bedding shall be uniformly compacted in layers not exceeding 6" in thickness. Compaction shall conform to the requirements of OPSS 501 with a density of 95 percent of the maximum dry density.
- .5 At pipe joints, bedding materials shall be left clear of the joints to permit their completion as specified elsewhere. After the connection has been completed, approved bedding material shall be placed under the joint and thoroughly tamped to the compaction specified. Bedding material shall not be taken from completed portions of the trench for this purpose.

3.9 INSPECTION AND TESTING

- .1 A proctor test by an independent testing company approved by the Architect shall be taken on all interior fill at the rate of one for every 500 sf. of floor area and 1,000 sf. of pavement or sidewalk area.

Results of all tests must be forwarded to the Architect for approval before construction can proceed on compacted areas.

- .2 All footing excavations shall be inspected by a Geotechnical Engineer prior to any placement of concrete in excavated areas.
- .3 This Contractor shall make all arrangements with testing company for tests and inspections. Payment by General shall be from Testing Allowance.

3.10 EXCESS MATERIAL

- .1 All excess material not required for backfilling or grading shall be removed from the property. Refer to Civil drawings for additional information.
- .2 Existing roads damaged by this operation shall be repaired and paid for by the Contractor. Permits, if required by local authority, shall be obtained by the Contractor.

3.11 EXTERIOR DRAINS

- .1 Provide and install all field drains to as located and indicated on drawings.
- .2 OPSS 405 shall apply and govern this work except as amended herein.

- .3 Where shown on the drawing, install and connect to catch basins as indicated on drawings. The sub drains will be bedded in $\frac{3}{4}$ " clear stone.
- .4 All work shall be done in accordance with manufacturer's recommended installation procedures using all necessary fittings and accessories.

3.12 MISCELLANEOUS EXCAVATION & BACKFILLING

- .1 This Contractor shall do all excavating, backfilling, compaction, etc. for the following:
 - .1 Excavation for exterior pipe bumpers, flag poles, light standards, bench supports etc.
 - .2 Excavate and backfill for curbs, walks, etc. as required and shown on the drawings including walks, curbs.
 - .3 Excavate for Mechanical and Electrical.
 - .4 Depressed floor slabs, thickened slabs and stepped footing as indicated on the drawings.

3.13 CLEANING

- .1 Contractor shall be responsible for good housekeeping during the work of this section. All refuse must be removed from the site at least on a weekly basis.
- .2 All municipal roads to be cleaned on a daily basis at a minimum. When weather and site conditions cause roads to be soiled, clean additionally as needed.

END OF SECTION

31 23 15-Site Grading And Topsoil

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

Excavation, trenching and backfilling shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and described as follows:

- .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
- .2 Distribution of existing topsoil (if applicable) on the site as required by the Work.
- .3 Supply and install soil infill and topsoil as required to meet the intended grades as indicated on the documents.
- .4 Refer to the drawings, Site Plans, Grading/Drainage Plans, Landscape Plans as applicable to the documents for all finish grade elevations of the work.
- .5 Site Grading shall be completed in accordance with the intended final drainage and landscape requirement of the work.
- .6 Inspection and testing.

1.2 RELATED WORK

- .1 Refer to Section 32 12 18: Asphalt and curbs
- .2 Refer to Section 32 92 23: Sod
- .3 Refer to Section 32 31 13: Fencing
- .4 Refer to Section 31 03 31: Soil Stripping and Stockpiling
- .5 Refer to Section 31 23 10: Excavation, Trenching and Backfill

1.3 SUBMITTALS

- .1 For topsoil as indicated in this section, provide a pre-import sieve and screening report letter stating that there are no stones in soil as indicated above.

1.4 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to “Instructions to Bidders”, “Examination of Site”.

1.5 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.6 SOIL INVESTIGATION

- .1 A soil report of the site was conducted. Refer to Section 01 22 00.
- .2 This information is made available solely as a guide and no responsibility is accepted by the Consultant or Owner for its contents. The accuracy or otherwise of the report shall not affect the provisions of the contract.

1.7 SHORING AND BRACING

- .1 Provide approved shoring and bracing as required to prevent settlement, caving of banks, etc. Shoring and other temporary work shall be so placed so as to not interfere with new permanent work remaining in place until backfilling is done and removed in sections. This Contractor shall be responsible for any damage resulting from improper or inadequate protection, and all excavations must conform to all governing codes and regulations.

Note: *Construction Safety Act, Trench Excavator's Section for Shoring Requirements and the Ontario Building Code.*

1.8 PROTECTION FROM WEATHERING

- .1 Protect excavated banks, floors, etc. against freezing. In cases where bearing earth is allowed to freeze, it shall be removed and replaced with approved fill.
- .2 Keep excavations free from water providing and operating pumps to conduct water a sufficient distance away to keep excavations dry. Do not allow water to wash freshly laid concrete or masonry.

1.9 CO-OPERATION

- .1 This Contractor shall make himself familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.10 LINES

- .1 All lines and levels for grading will be furnished by the General Contractor.

2.0 PRODUCTS

2.1 GRANULAR FILL MATERIAL

- .1 Type 'A' shall be granular 'A' material that meets Ontario Specifications 1010 for granular 'A' material.
- .2 Type 'B' shall be Granular 'B', Type 2 material and meeting the physical requirements of OPSS 1010 for Granular 'B'.
- .3 Type 'C' shall be 19 mm clear stone material where required.

2.2 IMPORTED TOPSOIL

- .1 Topsoil to be friable natural loam with an acidity range from 6.0 pH to 7.5 pH: containing a minimum of 4% organic matter for clay loams and a minimum 2% for sandy loams, free of stone over 15mm diameter and roots 25mm diameter, vegetation, subsoil, clay clumps and other foreign materials.
- .2 Provide a pre-import sieve and screening report letter stating that there are no stones in soil as indicated above.

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractors shall visit the site to ascertain special conditions which affect his work.

3.2 PREPARATION OF SUBGRADES

- .1 Cut, fill and grade the site and sub-base to meet intent of Civil drawings.
- .2 Confirm sub-grade density requirements for paved areas are consistent with the requirements (geotechnical report if applicable) pavement design.
- .3 The sub-grade for paved areas to be sloped or crowned as indicated on the Civil drawings.
- .4 Cultivate entire area to receive topsoil, landscaping; sod and/or seed and planting etc. no less than 150mm (6"). Repeat cultivating in areas compacted by construction access and traffic.
- .5 Cultivate placed topsoil compacted by vehicle traffic to perform the work.

3.3 FINISH GRADING, TOPSOIL APPLICATION AND PLANTING AREAS

- .1 Spread topsoil after Consultant has inspected sub-grades.
- .2 Place topsoil in loose lifts not exceeding 200mm (8") in depth. Allow for settlement and finish grade elevations.
- .3 Do not place frozen or wet topsoil. Do not place topsoil over frozen or excessively wet sub-grade.

- .4 Apply no less than following depths of topsoil:
 - .1 150mm (6") for sod or seed areas
 - .2 600 mm (24") for planting bed areas
- .5 Fine grade topsoil to remove rough areas and ensure proper drainage elevations.
- .6 Roll to consolidate topsoil to permit the activities of sod, seed and planting.
- .7 Remove excess material from the Place of the Work.

END OF SECTION

32 01 91-Tree And Shrub Preservation

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 Protection and maintenance of existing tree, shrubs plant material etc.

1.2 RELATED WORK

- .1 Refer to Section 32 12 18: Asphalt and curbs
- .2 Refer to Section 32 92 23: Sod
- .3 Refer to Section 32 31 13: Fencing
- .4 Refer to Section 32 11 23: Excavation, Trenching and Backfilling

1.3 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to "Instructions to Bidders", "Examination of Site".

1.4 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.5 CO-OPERATION

- .1 This Contractor shall make himself familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.6 LINES

- .1 All lines and levels for the excavation will be furnished by the General Contractor.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Snow Fencing shall be standard 1200 mm (48”) high orange safety fence, as manufactured by Dupont Ltd., Type L-60 or L-70 or approved equal.
- .2 T-rails, 37mm x 37mm x 5 mm steel stakes painted black in accordance with CGSB Specification 1-GP-181
- .3 Straw bales for soil stabilization and additional bails as required or directed by the Consultants.

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractors shall visit the site to ascertain special conditions which affect his work.

3.2 TREE AND SHRUB PROTECTION

- .1 Protect Trees, Shrubs and Vegetation from damage during the construction and make good and/or replace any damaged tree, shrub, vegetation etc. at no expense to the owner.
- .2 Confine the traffic pattern of the construction and storage of materials away from root systems of trees and vegetation.
- .3 Install snow fencing and straw bales to detour the construction activities away from the tree and plant material and root system.
- .4 Root systems that are exposed or damaged during stripping and/or excavation shall be treating with wound dressing by an experienced contractor. Backfill and protect the area of damage as directed.

3.3 CLEANING

- .1 Upon completion of the work, remove all temporary snow fencing, plywood, framing, stakes, bales etc. and make good all landscaping.

END OF SECTION

32 12 18-Asphalt Paving and Concrete Curbs

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

The work under this section of the specifications shall include all labour, equipment and material in the forming, handling, furnishing, placement and protection of all asphalt work as indicated on drawings and briefly described as follows:

- .1 All asphalt paving as shown on Drawings.
- .2 Granular base for all paved areas.
- .3 Concrete formed curbs.
- .4 Painted lines and logo's as shown on drawings and specified. Refer to Site Plan, civil plans and landscape plans for all line work. Each discipline may show separate lines. All lines from all documents to be provided.

1.2 RELATED WORK

- .1 Refer to Section 31 23 10: Excavation, Trenching & Backfilling
- .2 Refer to Section 32 11 23: Aggregate Base Material

1.3 PROTECTION

- .1 The Contractor shall protect adjacent property from any damage caused by his operations.

2.0 PRODUCTS

2.1 SUB-BASE FILL

- .1 Sub-base fill to be supplied and installed under Section 31 23 10 shall be Recycled Concrete material to Ontario Provincial Standard Specifications 1010.

2.2 GRANULAR BASE FOR ASPHALT

- .1 Granular base material shall be granular Type 'A' material to Ontario Provincial Standard Specifications 1010.

2.3 ASPHALT

- .1 All asphalt shall be H.L. #4 and H.L. #3, mixed and applied according to latest O.P.S. SPECIFICATIONS and O.P.S.S. 1150 as follows:
 - .1 Asphalt for all paved areas shall consist of a base course of 2" of H.L. #4 and a surface course of 1½" of H.L. #3.
 - .2 All asphalt surfacing and base course for road approaches, shall be done in accordance with local municipal standards and requirements.

2.4 PAINTING

- .1 Painting of parking lot lines as indicated on plan to be one coat of water borne traffic paint in designated colours. YELLOW
- .2 Handicap parking stalls logo: BLUE

2.5 CONCRETE CURBS

- .1 Concrete Placement
 - .1 The concrete shall be placed either by an approved form/extrusion machine, by the formed method, or combination of these methods.
 - .2 Curb profiles as indicated on drawings. Combination curb/gutter type is an acceptable alternate along drives and parking areas.
 - .3 Form handicap drop curbs in locations indicated.
- .2 Machine Placement
 - .1 The slip form/extrusion machine approved shall be so designed as to place, spread, consolidate, screed and finish the concrete in one complete pass in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous concrete section.
 - .2 The machine shall shape, vibrate and/or extrude the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible. All operations of mixing, delivery and spreading concrete shall be so co-ordinated as to provide uniform progress with stopping and starting of the machine held to a minimum.
- .3 Form Materials
 - .1 Form materials for concrete surfaces which will be exposed to view or which require smooth and uniform surfaces for applied finishes or other purposes shall consist of square edged smooth panels of plywood, metal or plastic. The panels shall be square and made in a true plain, clean, free of holes, surface markings and defects.
 - .2 The quality and strength of formwork materials shall comply with the requirements set forth in this specification and C.S.A. Standard A23.1.

- .4 Expansion Joint Strips & Saw Cuts
 - .1 Expansion joint strips shall be ½" thick fibre expansion joint filler as manufactured by Meadows or Architect's approved equal.
 - .2 Refer to typical curb details for spacing of expansion joints.
- .5 Cement
 - .1 Cement shall conform to C.S.A. Standard A-5 type as scheduled under "Strength of Concrete".
- .6 Aggregates
 - .1 Aggregates shall conform to C.S.A. Standard A23.1, Part 5.
- .7 Water
 - .1 Water shall be clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material.
- .8 Admixtures
 - .1 Admixtures shall not be used unless prior written approval is obtained from the Architect. All admixtures shall conform to the appropriate A.S.T.M. and C.S.A. Standards. Air entraining admixtures shall conform to the requirements of the latest issue of A.S.T.M. Standard C260.
- .9 Curing Compounds
 - .1 Curing compounds shall conform to the requirements of the latest issue of A.S.T.M. Standard C309.
- .10 Strength of Concrete
 - .1 Unless otherwise noted all exterior concrete shall be Type 1 Portland Cement having a minimum compression strength of 32 MPa at 28 days and have a minimum 5% to 7% entrainment and maximum 0.45 water/cementing materials ratio.
- .11 Concrete Admixtures
 - .1 For all exterior exposed concrete an air entraining admixture, Master Builder's Company Limited, W. R. Meadows Sealtight AEA, Sternson Construction Products N.V.R., or approved equal shall be placed in the concrete mix in quantity required to produce an air content of 6% (more or less 1%) by volume as measured with an air meter.
 - .2 No other admixture shall be used without the written permission of the Architect.

- .12 Concrete Curing and Sealers
 - .1 Concrete sealers shall be applied to all concrete.
 - .2 Exterior concrete walks and pavement shall be W. R. Meadows, Sealtite 1200 or Architect's approved equal.
 - .3 Concrete curing and sealing treatments must be applied in strict accordance with manufacturer's labelled instructions.

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractor shall visit the site to ascertain special conditions which affect his work.

3.2 BACKFILL AND GRADING

- .1 The General Contractor shall strip existing surfaces as required for new work and all top soil and cultivated soil shall be removed from the areas to be paved.
- .2 Sub-base backfill to be installed to a height below the finished surface of the asphalt paving to allow for the various pavement base course thickness specified below and graded to suit the drainage as outlined on the drawings. All sub-base material to be Recycled Concrete O.P.S.S. 1010 Standards. Refer to Section 31 23 10 – Excavation, Trenching and Backfilling.

3.3 GRANULAR BASE COURSE

- .1 This Contractor shall fine grade and compacted granular 'A' material. All granular 'A' base material to Ontario Provincial Standard Specification 1010 and shall be compacted to 100% of its maximum standard proctor dry density.

Granular 'A' Base Course Required for Asphalt Areas

- .1 At all pavement locations Granular 'A' base course shall be 12" thick.

3.4 CONCRETE CURBS

- .1 This contractor shall construct curbs around paved drives and parking areas as indicated and distributed on drawings by either an approved for/extrusion machine, by the form method or a combination of these methods.

3.5 SURFACING

- .1 Asphalt surfacing shall consist of a base layer of H.L. #4 and a top layer of H.L. #3 mixed and applied according to the latest O.P.S. 310 specifications and O.P.S.S. 1150.
- .2 All asphalt shall be placed to finished thicknesses specified under 2.3 for all paved areas.

- .3 No patented type or other pavement shall be accepted as an alternative.
- .4 Maximum allowable surface tolerance shall be ¼" in 50 feet.
- .5 Asphalt paving to be compacted to 97% of its Marshall mix design density.

3.6 PATCHING & MATCHING

- .1 Do all patching and matching of existing asphalt pavements as indicated on the Site Plan.
- .2 At interface of new and existing pavements saw cut and remove the edge of the existing asphalt surface so that new pavements properly and cleanly interface with the existing pavement.

3.7 DRAINAGE OF PAVING

- .1 All paved areas shall be uniformly pitched towards catch basins or to edge of pavement as indicated on Site Plan. Slopes shall be of such grade necessary so as not to allow any water to remain in pools on paved areas. This Contractor will be held responsible for the re-paving of any areas that retain water in pools on their surfaces.

3.8 CLEANING

- .1 Contractor shall be responsible for good housekeeping during the work of this section.

END OF SECTION

32 15 60-Roadway Dust Control

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

- .1 The protection and maintenance of existing services, buildings and property adjacent to and on the site.
- .2 Provide all required labour, material and equipment to control and clean internal roadway and municipal roads dust and construction soil debris, dust from soil, granular and granular dust etc. caused by construction vehicles and related construction activities.

1.2 RELATED WORK

- .1 Refer to Section 32 12 18: Asphalt and curbs
- .2 Refer to Section: 32 92 23: Sod
- .3 Refer to Section 32 31 13: Fencing
- .4 Refer to Section 31 23 10: Excavation, Trenching and Backfill

1.3 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.
- .2 Refer to Execution Requirements and Examination of Site.

END OF SECTION

32 31 13-Chain Link Fencing and Gates

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED:

- .1 The work involves the supply and installation of chain link fencing, including but not limited to, posts, rails, fabric, and gates, as per the drawings and specifications provided herein.

1.2 RELATED SECTIONS:

- .1 Section 03 30 00: Cast-in-Place Concrete.

1.3 REFERENCES:

- .1 CAN/CGSB-138.1-M80, Fence, Chain Link, Fabric.
- .2 CAN/CGSB-138.2-M80, Fence, Chain Link, Framework, Zinc-Coated, Steel.
- .3 CAN/CGSB-138.3-M80, Fence, Chain Link-Installation.
- .4 CAN/CGSB-138.4-M82, Fence, Chain Link, Gates.
- .5 CSA G164-M1981, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .6 ASTM A90-81, Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- .7 ASTM A53-88a, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .8 CGSB 1-GP-181M-77, Coating, Zinc-Rich, Organic, Ready Mixed.

2.0 PRODUCTS

2.1 MATERIALS

- .1 All concrete work as per the Drawings and Specification, Section 03 30 00 Cast-in-Place Concrete.
- .2 Fencing: sizes and locations as indicated on Site Plan Drawings.
- .3 Chain-link fence fabrics: to CAN/CGSB-138.1.

- .1 All fencing fabric is to be Galvanized, Vinyl Coated, black, commercial, heavy grade, and 6 gauge with 2" (50 mm) openings. Top and bottom selvage to have knuckled finish.
- .2 Install chain link fence in accordance with CAN/CGSB - 138.3-96 unless noted & otherwise specified.
- .4 Finish: All fence components other than vinyl coated chainlink fabric to be paint treated with one coat Sterling Red Primer #1734, followed by one coat Sterling semi-gloss black enamel #3813, by electrostatic process.
- .5 Terminal posts – 3 ½" (89 mm) outside diameter standard butt-welded schedule 40 galvanized pipe. Length 3'-6" (1066 mm) longer than height of fabric. Minimum weight per foot 3.42kg (7.55 pounds). Terminal posts shall be used for end, corner, and gate and straining posts.
- .6 Line posts - 2⅝" (60.3 mm) outside diameter standard butt-welded galvanized schedule 40 pipe.
- .7 Top rails and bottom rails: 1 11/16" (42.8 mm) outside diameter standard butt-welded Schedule 40 galvanized pipe. Galvanized couplings of the outside sleeve type at least 7" (177.8 mm) long will be used to join top rails. The top rail is to pass through the line posts and form a continuous brace for each stretch of fence. The top rail is to be secured to each terminal post with receptacle fittings.
- .8 Gates:
 - .1 Gate frames shall be made of 1 11/16" (42.8 mm) outside diameter hot dipped galvanized pipe or high strength hollow structural section .100" (2.5 mm) wall with mechanical properties similar to ASTM Specification A-36.
 - .2 Frames shall be electrically welded at all joints. Gates shall be complete with malleable iron hinges, latch and latch catch. Gate latches shall be suitable for a padlock which can be attached and operated from either side. Hinges shall permit gate to swing back against fence 180 degrees if required. Gate braces where required shall be 1 15/16" (49.2 mm) outside diameter galvanized steel pipe.
- .9 Fittings to be hot dipped galvanized pressed steel, aluminum or non-metallic moldings of sufficient strength to ensure the integrity of the installation.
- .10 Fabric Bands:
 - .1 Fabrics shall be fastened to top rail and braces including bottom rail with galvanized tie wire approximately 18" (450mm) intervals between line posts. Fabric shall be secured to line posts at approximately 12" (300mm) intervals.
- .11 Tension bars 3/16" x ¾" (4.5 x 19 mm) galvanized steel.

- .12 Tension wire - No. 6 gauge single strand 2 ounce galvanized wire, stretched and fastened at intervals of 18" (450mm). Use tension wire for fence without bottom brace.

3.0 EXECUTION

3.1 ERECTION OF FENCE

- .1 Refer to details shown on Drawings. Construct various fences as shown.
- .2 Erect fences along lines as indicated on the Site Plan and in accordance with CAN/CGSB-138.3.
- .3 Space line posts 8'-0" (2400 mm) maximum apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not exceeding 500' if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade if greater than 500'.
- .5 Install end posts at end of fence and at changes in fence alignment. Install gate posts on both sides of gate openings. Construct maze entrances to fenced areas at locations indicated.
- .6 Embed posts into concrete to depths indicated. Slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .7 Do not install fence fabric until concrete has cured a minimum of 5 days.
- .8 Install brace between end and gateposts and nearest line post, placed in centre of panel and parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner.
- .9 Install rails between posts and fasten securely to terminal posts and secure waterproof caps.
- .10 Lay out fence fabric. Stretch tightly to tension, recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 12" (300 mm) intervals. Knuckled selvedge at top and bottom.
- .11 Provide clearances between bottom of fence and adjacent grade neither less than $\frac{3}{4}$ " nor more than 1 $\frac{1}{2}$ ". The clearance under all rails is to be consistent.
- .12 Secure fabrics to rails and line posts with tie wires at every knuckle. Give tie wires a minimum of two twists.

3.2 TOUCH UPS

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of high gloss organic zinc-rich paint to damaged areas, allowing the manufacturer's recommended drying time between coats. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.
- .2 Wire brush, clean, and paint all welds with two coats of high gloss zinc rich paint.

3.3 PROTECTION

- .1 The Contractor is responsible for the protection of all existing facilities from damage as a result of the work. Protect all surfaces and walkways from disfiguration from the processes of the work.
- .2 Any damage must be repaired promptly and to the original condition of the facility prior to the damage. Acceptance of the repair is the sole discretion of the Consultant. All repairs must be completed and accepted prior to substantial completion.

3.4 CLEANING

- .1 Upon completion of the work, remove all containers, surplus materials, and installation equipment, excess material, and debris. Project area must be left in a clean and orderly condition.

END OF SECTION

32 32 16-Precast Concrete Components

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT LIMITED TO

The work under this section of the specifications shall include all labour, equipment and materials required in the supply and installation of precast concrete retaining wall system and related base and drainage as indicated on the drawings and as follows:

- .1 Preparation of sub grade, redistribution of topsoil and stockpiled topsoil.
- .2 Compacted base foundation.
- .3 Free draining backfill, filter cloth and drainage tile.

1.2 RELATED WORK

- .1 Refer to Section 31 23 10: Excavation, Trenching & Backfill
- .2 Refer to Section 31 23 13: Site Grading and Topsoil
- .3 Refer to Section 32 11 23: Aggregate Base Material

1.3 SUBMITTALS

- .1 Issue shop drawings in accordance with Section 01 33 00, Submittals.
- .2 If required by the municipality provide at no additional cost, engineering calculations certified by an Engineer in the Province of Ontario of the retain wall system as intended for the scope of work herein intended.

1.4 QUALITY ASSURANCE

- .1 Provide inspection reports by third party testing agency confirming the strength and composition of the concrete for the units to be delivered.

1.5 DELIVERY, STORAGE & HANDLING

- .1 The precast units shall be designed with lifting devices for the units to ensure they can be safely handled without warping, distortion, cracking or deflection that would adversely affect the units structurally or their appearance.
- .2 Allow for storage and protection from disfigurement prior to installation.

- .3 Maintain protection of the final installation to insure no damage or staining of the exposed face of the units.

1.6 WARRANTY

- .1 Provide a written 5 year warranty for the precast retaining wall system from failure as a retaining wall, spalling, visible cracking, changes in colour, warping of units and any other visible deficiency. The warranty shall include all labour, material and equipment necessary to remove and replace the defective material.

2.0 PRODUCTS

2.1 PRECAST CONCRETE RETAINING WALL SYSTEM

- .1 Precast concrete retaining wall system shall be EASY BLOCKS Retain Wall System as manufactured by Underground Specialties.
- .2 Refer to drawings for scope of the required retaining wall system. All walls to include cap stones and be suitable for railing mounting.
- .3 The precast wall system shall consisting of 20 Mpa concrete having 6% +/- 1.6% air entrainment of the following:
 - .1 Precast Base with 5:1 batter. Weight 1 Tonne
 - .2 Full Blocks having a stamped limestone finish. Weight 1100 KG
 - .3 Full (and partial) Cap with a stamped limestone finish. Weight 275 KG / 550 KG

2.2 FILTER CLOTH

- .1 Filter Cloth, THRACE-LINQ GTF-270, high-tenacity polypropylene silt film, UV stabilized yarn.

3.0 EXECUTION

3.1 PREPARATION

- .1 Verify that rough grades are correct. If discrepancies occur notify Consultant and do not commence work until corrections, if required, are made.

3.2 RETAINING WALL BASE

- .1 The base for the retaining wall system shall be 8" (200mm) thick compacted Granular 'A' commencing 20" (450mm) below the finish grade. The granular base shall extend a minimum of 6" (150mm) from each face of the base unit. The total width of the compacted granular base is 36" (900mm) wide. Use compacted granular fines to provide a level setting bed for the first course Precast Base.

- .2 Set Precast Base units and Full Blocks assembled with staggered joints. Complete the wall with matching Cap system.
- .3 Apply filter cloth to backside of the retaining wall to receive drainable backfill and weeping tile within clear stone, as indicated on the drawings.
- .4 Co-ordinate the work with the drainage system, grading and all other requirements of the Architectural and Civil drawings.

END OF SECTION

32 92 23-Sodding

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT LIMITED TO

The work under this section of the specifications shall include all labour, equipment and materials required in the supply, installation, grading and preparation of topsoil, sod application as indicated on the drawings and as follows:

- .1 Preparation of sub grade, redistribution of topsoil and stockpiled topsoil.
- .2 Fine grading to grades and profiles indicated and specified.
- .3 Soil preparations.
- .4 Sod all areas indicated on drawings and/or effected by the work in the Place of the Work.
- .5 Maintenance.
- .7 Grade Prep all areas affected by the work.
- .8 Co-ordinate work with completion of project as stated in documents.

1.2 RELATED WORK

- .1 Site Grading and Topsoil. Refer to Section 31 23 15.

1.3 PROTECTION

- .1 Locate and identify all on site utilities and features.
- .2 Prevent damage to any fencing, trees, landscaping, natural features, bench marks, pavement, walks, surface or underground utility lines, etc. Make good any damage incurred during or as a result of the construction operation.

1.4 QUALITY ASSURANCE

- .1 Test site topsoil prior to stripping and stockpiling for N, P, K, Mg, Soluble Salts, pH, growth inhibitors and soil sterility.
- .2 Submit soil analyses to Consultant for review.

1.5 ACCEPTANCE

- .1 The entire work shall be done in a manner such that the appearance on completion shall be as nearly as possible that of a good natural growth in place.
- .2 The contractor shall be responsible for the protection and care of all completed sod application for a period of up to the time of acceptance by the Consultant and the second complete grass cutting.
- .3 Sod areas will be accepted by Consultant provided that:
 - .1 Sod areas are properly established.
 - .2 Sod to be free of bare and dead spots and without weeds.
 - .3 No surface soil is visible when grass has been cut to a height of 38mm.
 - .4 Sod areas have been cut at least twice after Substantial Performance of the contract.
 - .5 Areas with sod application in fall will be accepted in following spring one month after start of growing season provided acceptance conditions (1) to (4) are fulfilled.

1.6 DELIVERY, STORAGE & HANDLING

- .1 Cut, delivery and install sod within a 24 hour period.
- .2 Do not harvest or transport sod when moisture content may adversely affect sod survival.
- .3 Do not tear, stretch or drop sod during handling and installation.

2.0 PRODUCTS

2.1 TYPE AND CONDITION OF SOD

- .1 Sod shall be No. 1 Kentucky Bluegrass Sod grown solely from seed of a minimum of three cultivars of Kentucky Bluegrass. At time of sale, the sod should contain not less than 50% Kentucky Bluegrass cultivars licensed for sale in Canada by the Canadian Department of Agriculture.
- .2 Mosses and clovers shall not be apparent in the turf and no more than 2 broadleaf weeds or 10 other weeds per 40 square meters shall be present. Sod shall be of sufficient density that no surface soil will be visible if mowed to a height of 12 mm (0.5 in.).
- .3 The mowing height limit should be 40 to 60 mm (1.5 - 2.5 in.) and not more than one half of the blade shall be cut at any one mowing. The thickness of the soil portion of the sod should not exceed 15 mm (0.6 in.) unless otherwise specified. The sod should be in a good, health, weed free condition with no sign of decay and contain sufficient moisture to maintain its vitality during transportation and placing.

- .4 Sod may be rolled to facilitate handling and transportation and shall be in widths not less than 300mm or more than 450mm, in lengths not less than 400mm and thickness not less than 25mm.
- .5 Sod shall be of such a size and condition that each may be lifted and handled without breaking or tearing and without loss of soil.
- .6 All sod must be delivered to the job within 24 hours of being cut and shall be placed within 36 hours of being cut. Sod must not be allowed to dry out. Any sod permitted by the Contractor to dry out shall be rejected whenever in the judgment of the Consultant its survival after placing shall have been rendered doubtful.

2.2 FERTILIZER

- .1 Commercial (8-32-16) fertilizer applied at a rate of 6 lbs. per 1000 sq. ft. (3 kg/100 m²).

3.0 EXECUTION

3.1 PREPARATION

- .1 Verify that rough grades are correct. If discrepancies occur notify Consultant and do not commence work until corrections, if required, are made.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious material. Dispose of removed material.

3.2 TOPSOIL

- .1 Make all final topsoil touch-ups prior to application of the sod.
- .2 Apply fertilizer at a rate of 6 lbs. per 100 sq. ft. (3 kg/m²) and work thoroughly into the upper 50mm of topsoil. All fertilizer to be applied by a licensed contractor in accordance with municipal and provincial guidelines and bylaws.
- .3 Roll to consolidate topsoil for areas to be sod application leaving surface smooth and uniform, firm against deep foot printing and with a fine loose texture to approval of the Consultant.

3.3 PLACING SOD

- .1 The finished surface shall be smooth, firm against footprints, with a fine, loose texture. Obtain approval of topsoil grading and depth before sod is placed. Sod shall be laid closely knit together in such a manner that no open joints are visible or pieces are overlapping. Cut out irregular or thin sections with a sharp knife. Sod shall be laid smooth and flush with adjoining grass areas and paving and top surface of curbs. Joints in adjacent rows shall be staggered.

- .2 No sod shall be laid when in a frozen condition, nor upon frozen ground, nor under any other condition not favourable to transplanting or growth of the sod or when not allowed by the Consultant.
- .3 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.
- .4 Water sod immediately after laying to obtain moisture penetration into top 100mm of topsoil and as required for the sod to take root.

3.4 MAINTENANCE

- .1 General: The turf shall be cut when it reaches a height of 63mm. The cutting height shall be 38mm. Water shall be applied using equipment acceptable to the Consultant and in a manner that the newly sod application surfaces shall not be eroded, washed out, or damaged in any way. During this period any break which may occur through slipping of sod, shall be repaired and any sod which is dead shall be removed and replaced by the contractor with fresh, live sod. Continue watering and cutting sod until acceptance.
- .2 Remove all grass clippings after each cut.

END OF SECTION

33 05 14-Manholes And Catch Basin Structures

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

Excavation, trenching and backfilling shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and briefly described as follows:

- .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
- .2 All Manhole, Catch Basin, Cleanouts and accessories.
- .3 All Manhole and Catch Basin structures within the right of way as noted on the drawings in compliance with municipal standards and requirements.
- .4 Inspections and testing.

1.2 RELATED WORK

- .1 Refer to Section 32 12 18: Asphalt and curbs
- .2 Refer to Section 32 92 23: Sod
- .3 Refer to Section 32 31 13: Fencing
- .4 Refer to Section 32 11 23: Aggregate Materials
- .5 Refer to Section 31 23 10: Excavation, Trenching and Backfilling

1.3 SHOP DRAWINGS

- .1 Prepare shop and installation drawings for work of this Section and submit to the consultant for review in accordance with Section 01 33 00, Submittals.

1.4 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to "Instructions to Bidders", "Examination of Site".

1.5 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.6 SOIL INVESTIGATION

- .1 A soil report of the site was conducted. Refer to Section 01 22 00.
- .2 This information is made available solely as a guide and no responsibility is accepted by the Consultant or Owner for its contents. The accuracy or otherwise of the report shall not affect the provisions of the contract.

1.7 PROTECTION FROM WEATHERING

- .1 Protect excavated banks, floors, etc. against freezing. In cases where bearing earth is allowed to freeze, it shall be removed and replaced with approved fill.
- .2 Keep excavations free from water providing and operating pumps to conduct water a sufficient distance away to keep excavations dry. Do not allow water to wash freshly laid concrete or masonry.

1.8 CO-OPERATION

- .1 This Contractor shall become familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.9 LINES

- .1 All lines and levels for the excavation will be furnished by the General Contractor.

2.0 PRODUCTS

2.1 CATCH BASINS

- .1 Catch basins shall be precast concrete catch basins in accordance with OPSD 705.010 with 'CB' trap, complete with cast iron frame and cover OPSD 400.100 and sub drains and all necessary drainage fittings to be used to meet the requirements and standards of the local municipality.
- .2 Provide sump pit catch basin c/w safety cover at all locations noted "SPCB".
- .3 Refer to Civil Drawings for various types of catch basin requirements.

2.2 MANHOLES

- .1 Manholes shall be made of precast concrete manhole sections in accordance with OPSD-701.01 as detailed on drawings. Manhole to be complete with precast

concrete base and standard cast iron cover and frame and 19mm aluminum rung steps on inside face as detailed.

Note: Storm manholes to have 24" of sump from inverts indicated as required by Municipal Public Works Department.

- .2 Manholes to be provided with grade ring adjustment units.

2.3 CLEANOUTS

- .1 Cleanouts shall be complete with cast iron and concrete pipe casing and #1734 "Josam Company" cleanout plugs or Domestic Foundries Ltd. frame and cover for 6" cleanouts.
- .2 Cleanouts in paved areas Domestic Foundries Ltd. cast iron cleanout cover, nominal 8" x 8" purpose made for asphalt and concrete pavements.

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractors shall visit the site to ascertain special conditions which affect his work.

END OF SECTION

33 11 17-Domestic And Fire Suppression Water Distribution

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 SCOPE OF WORK

Excavation, trenching and backfilling shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and briefly described as follows:

- .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
- .2 All labour and material for the 'T' connection or tapping of the Domestic / Fire suppression Water service to the municipal main.
- .3 All connections to the municipal water service within the right-of-way shall be in accordance with the requirements of the municipality standards.
- .4 Supply labour, accessories and material for the water main piping and hydrants as required by the Work.
- .5 All testing, flushing and disinfecting of the water main.
- .6 Obtain and distribute all reports mandated by governing requirements.

1.2 RELATED WORK

- .1 Refer to Section 32 12 18: Asphalt and curbs
- .2 Refer to Section 32 92 23: Sod
- .3 Refer to Section 31 23 10: Excavation, Trenching and Backfill
- .4 Refer to Section 32 11 23: Aggregate Materials

1.3 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to "Instructions to Bidders", "Examination of Site".

1.4 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.5 SOIL INVESTIGATION

- .1 A soil report of the site was conducted. Refer to Section 01 22 00.
- .2 This information is made available solely as a guide and no responsibility is accepted by the Consultant or Owner for its contents. The accuracy or otherwise of the report shall not affect the provisions of the contract.

1.6 SHORING AND BRACING

- .1 Provide approved shoring and bracing as required to prevent settlement, caving of banks, etc. Shoring and other temporary work shall be so placed so as to not interfere with new permanent work remaining in place until backfilling is done and removed in sections. This Contractor shall be responsible for any damage resulting from improper or inadequate protection, and all excavations must conform to all governing codes and regulations.

Note: Construction Safety Act, Trench Excavator's Section for Shoring Requirements and the Ontario Building Code.

1.7 PROTECTION FROM WEATHERING

- .1 Protect excavated banks, floors, etc. against freezing. In cases where bearing earth is allowed to freeze, it shall be removed and replaced with approved fill.
- .2 Keep excavations free from water providing and operating pumps to conduct water a sufficient distance away to keep excavations dry. Do not allow water to wash freshly laid concrete or masonry.

1.8 CO-OPERATION

- .1 This Contractor shall make himself familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.9 LINES

- .1 All lines and levels for the excavation will be furnished by the General Contractor.

2.0 PRODUCTS

2.1 WATER SERVICE

- .1 OPSS 441 shall apply and govern this work and meet all governing municipal regulations and standards for the local Utilities Commission.

- .2 Fittings shall be suitable for and compatible with the class and type of pipe with which they shall be used. Provide standard 2" blow-off complete with valve stop, thrust blocks and backflow preventer and anchor systems, fittings, gate valve and all required appurtenances.
- .3 Polyvinyl Chloride (PVC) Pipe, Class 150 to sizes indicated on drawings.
 - .1 Polyvinyl chloride (PVC) pipe shall be supplied from a plant certified by CSA and shall conform to the requirements of CSA B137.3-M, and AWWA C-900, Class 150, D.R. 18, Cast Iron O.D., Blue in colour.
 - .2 Fitting shall be Ductile Iron, cement or epoxy lined, Class 250, meeting current A.W.W.A. Specification C-100 mechanical joint or tyton joint, Ductile Iron gland rings.
 - .3 Fasteners to include Duratrom sacrificial nuts or bolt caps. All sacrificial anodes to meet A.S.T.M. B-418-73 Type II purity standard.
- .4 Gate valves shall be push-on joint and epoxy coated inside with maximum 8 mil thickness, resilient seat, fully encapsulated wedge with elastomer, bronze non-rising stem with 316 stainless steel assembly bolts. Open by turning right (red top) with 2" (Zin.) square operating nut, conforming to A.W.W.A. C-509 and C-550 standard.
 - .1 Tapping valves (if applicable) shall be epoxy coated inside with minimum 8 mil. thickness, resilient seat, fully encapsulated wedge with elastomer, bronze non-rising stem with 316 stainless steel assembly bolts, conforming to A.W.W.A. C-509 and C-550 standard.
 - .2 Valve box shall be cast iron, screw type, Bibbi VB3000 or equivalent in specification and interchangeability.
- .5 All fittings, valves and directional changes must be restrained from moving using concrete thrust blocks and as approved by the Local Utilities Commission, use restraining devices by Uni-Flange series 1300, 1350, 1360 or 1390 in accordance with P.V.C. pipe. Fasteners must be 316 stainless steel.
- .6 Tracer wire shall at all plastic pipe to be "#12 AWG conductor, solid white, TWU flameseal wire". Splice, using "Burndy" KS-90, 16-10 connectors.
- .7 Pipe couplings shall be Ford FC2A and FC1 series, epoxy coated to A.W.W.A. C-550 standards, stainless steel bolts and nuts fluorocarbon coated or teflon coated to prevent galling.
- .8 Clamps shall be FS1 of FS3 series, all stainless steel conforming to A.W.W.A. C-207. Stainless steel bolts and nuts fluorocarbon or teflon coated to prevent galling.

2.2 FIRE HYDRANTS

- .1 150 mm size as indicated, conforming to AWWA C502 and local Utilities Commission Standards.

- .2 Hydrant operating nuts, cap nuts and hose and streamer threads to local Utilities Commission Standards.
- .3 Acceptable Products:
 - .1 Canada Valve
 - .2 McAvity
 - .3 Darling Century

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractors shall visit the site to ascertain special conditions which affect his work.

3.2 FIRE MAIN WATER SERVICE FOR DOMESTIC, SPRINKLER & HYDRANT

- .1 OPSS 701 shall apply and govern this work unless otherwise noted.
- .2 Tie-in of water main at Shield in accordance with Municipal requirements. Excavation, backfill, supply of material by this contractor.
- .3 Supply and install fire main water service to building for domestic and sprinkler systems as indicated on drawings and installation of new fire hydrants.
- .4 Terminate all water services in building for domestic and sprinkler system above finish floors with gate valves and ductile iron couplings for ductile to ductile iron piping connections. The riser section up into the building for domestic water and fire protection is to be ductile iron pipe. Coordinate all water service installations in building with Mechanical Contractor.
- .5 Site Preparation
 - .1 When the water main is to be installed beyond the limits of general grading operations, site preparation shall conform to the requirements of OPSS 503.
- .6 Preservation & Protection of Existing Facilities
 - .1 Existing facilities shall be preserved and protected in conformance with OPSS 504.
- .7 Protection Against Flotation
 - .1 Damage to the water main and/or service connections due to hydrostatic pressure shall be prevented during construction and until completion of the works.
- .8 Cold Weather Work

- .1 All work shall be protected from freezing. Pipes and bedding materials shall not be laid on frozen ground.
- .9 Transporting, Unloading & Storing Pipe
 - .1 Delivery and unloading of pipes and fittings at the job site shall cause the least possible delay to traffic.
 - .2 All pipes, specials, fitting and gaskets that are unsound or damaged shall be removed from the site and replaced.
 - .3 Mechanical equipment shall be used to unload the pipe.
 - .4 Materials shall be placed in safe storage.
 - .5 Manufacturer's handling and storage recommendations shall be followed.
- .10 Dewatering
 - .1 Dewatering shall conform to the requirements of OPSS 517.
- .11 Trenching, Backfilling & Compacting
 - .1 Trenching, backfilling and compacting shall conform to the requirements of OPSS 514.
- .12 Pipe Bedding
 - .1 The bed shall be shaped true to line and grade, free from sags and high points. Bedding shall be shaped to a cylindrical surface with the radius conforming to the pipe in accordance with pipe manufacturer's recommendations. Bedding materials shall be placed simultaneously on each side to the spring line of the pipe.
 - .2 Granular bedding shall be uniformly compacted in layers not exceeding 6" in thickness. Compaction shall conform to the requirements of OPSS 501 with a density of 95 percent of the maximum dry density.
 - .3 At pipe joints, bedding materials shall be left clear of the joints to permit their completion as specified elsewhere. After the connection has been completed, approved bedding material shall be placed under the joint and thoroughly tamped to the compaction specified. Bedding material shall not be taken from completed portions of the trench for this purpose.
- .13 Installation of Pipes
 - .1 Pipes shall be handled with special care during temperatures below freezing. Pipes shall not be exposed to localized high temperatures.
 - .2 Ends of pipe shall be kept clean.

- .3 Pipes shall be laid on the prepared bed, true to the line and grade. The barrel of each pipe shall be in contact with the shaped bed throughout its full length. The ends of the pipe shall abut against each other so that there is no unevenness along the inside.
- .4 Pipe shall be kept clean as work progresses. Water shall not be allowed to flow through the pipe during construction. The trench shall be kept dry and pipe shall not be laid in water. A removable watertight bulkhead shall be installed at the open end of the last pipe laid whenever work is suspended.
- .5 Pipe shall not be laid until the preceding pipe joint has been completed and the pipe is carefully embedded and secured in place.
- .14 Jointing
 - .1 Joint surfaces shall be clean. Pipe ends shall be poured around the assembled joint. Ensure that the diaper is carefully placed around the joint recess.
 - .2 Tie-back joints shall be bell-bolted or harnessed joints.
 - .3 Joints shall be installed to manufacturer's instructions.
 - .4 If gaskets are supplied separately, they shall be inserted in the groove of the bell end of the pipe.
 - .5 The spigot shall be lubricated. The spigot end shall be inserted and pushed into the bell up to, but not beyond the depth of the stop reference mark.
- .15 Placing Cover Material
 - .1 Cover materials shall be placed in uniform layers not exceeding 8". Compaction shall conform to the requirements of OPSS 501 with a density of 95% of the maximum dry density.
 - .2 A 12" layer of cover material shall be provided above the pipe before using a mechanical compactor on top of the pipe.
- .16 Installation of Valves
 - .1 Valves shall be installed at the locations shown on the Contract Drawings. Valves and connecting pipes shall be aligned accurately and supported as specified.
 - .2 All bolts, nuts, couplings, rubber rings and connecting pieces shall be cleaned thoroughly.
- .17 Installation of Hydrants

- .1 Hydrants shall be installed at location shown on the Contract Drawings and shall meet local Utilities Commission standards and requirements.
- .2 A key operated gate valve shall be installed on the hydrant lead.
- .3 The hydrant shall be plumb with the nozzles parallel to the edge of pavement or curb line and the pumper connection facing the roadway. Each hydrant shall be supported with concrete blocking between the hydrant and solid earth as specified. The base of each hydrant shall be packed with 0.5 m³ of ¾" clear stone to at least 3'-4" in height.
- .4 The hydrant valve shall be installed with a flanged or tie rod connection to the water main tee.
- .18 Shutting Down or Charging Mains
 - .1 The Contractor shall not at any time shut down or charge and water main or operate valves unless permission is granted by the local Utilities.
- .19 Connections to Existing Water Main
 - .1 All connections to existing water main shall be installed under the supervision of the local Utilities Commission and the Consultant or his representative. The removal of a plug or blow off from an existing water main or fitting and reconstruction of the joint will be considered part of the work of constructing the new water main.
- .20 Thrust Restraints
 - .1 All connections, caps and bends that are liable to "draw" or blow-off shall be protected by means of concrete blocking, tie-rods, bell-bolted or harness joints as specified. Concrete for thrust blocks shall be placed against undisturbed ground and joints and couplings shall remain free from concrete.
 - .2 Alternatively, thrust restraint devices may be used if approved by the local Utilities Commission.
- .21 Hydrostatic Testing
 - .1 General
 - .1 Hydrostatic pressure and hydrostatic leakage tests shall be conducted under the supervision of the Consultant or his representative upon completion of the water main including services and backfilling.
 - .2 Hydrostatic pressure and hydrostatic leakage tests may be conducted either simultaneously or separately. If tests are performed simultaneously, the duration of the test shall be two

hours or longer if so directed by the Architect. The duration of the leakage test shall be two hours or longer if so directed.

.3 The test pressure shall be 150 psi The test pressure shall not exceed 1.5 times the series or class number of polyvinyl chloride pipe expressed in p.s.i.

.4 A test section shall be either a section between valves or the completed water main.

.2 Hydrostatic Pressure Test

.1 The test section shall be filled slowly with water and all air shall be removed from the pipeline. A period of 24 hours shall be allowed before starting the test except for plastic pipe.

.2 The test section shall be subjected to the specified continuous test pressure for one hour or as directed by the Architect..

.3 All parts of the test section shall be examined while it is under pressure. If the test pressure is maintained with no pressure drop for the specified test duration, the test result is satisfactory.

.4 If the test result is not satisfactory, all deficient parts of the section shall be repaired until a satisfactory result is attained.

.3 Hydrostatic Leakage Test

.1 The test section shall be filled slowly with water and all air shall be removed from the pipeline. A period of 24 hours shall be allowed before starting the test except for plastic pipe.

.2 The test section shall be subjected to the specified continuous test pressure for two hours or as directed by the Engineer.

.3 The leakage is the amount of water added to the test section to maintain the specified test pressure for the test duration. The measured leakage shall be compared with the allowable leakage as calculated for the test section. The allowable leakage is 2.22 L per mm of pipe diameter per km of pipe per day.

.4 If the measured leakage exceeds the allowable leakage, all leaks shall be located and repaired and the test section shall be retested until a satisfactory result is obtained.

.4 Disposal of Waste Water

.1 All chlorinated water used for testing, flushing or disinfecting water mains shall be disposed of safely. The acceptable chlorine residual of water discharged to storm sewers or water courses is 0.5 mg/l maximum.

- .5 Flushing & Disinfecting Water Mains
 - .1 All portions of the potable water system shall be sterilized in accordance with the best standard practice by placing the required amount of H.T.H. in each length of pipe as it is installed and filling the system with water on completion and allowing it to stand for at least 36 hours and then blowing out.
 - .2 Have samples taken, pay costs for bacteriological tests, submit samples for tests and have results submitted to the Architect. If results are unsatisfactory, system shall be recharged and tested until it meets the requirements for potable water system.

END OF SECTION

33 46 17-Subgrade Drainage And Sewers

GENERAL NOTE

Comply with Instructions to Bidders, the General Conditions as amended and with Division 1 requirements.

1.0 GENERAL

1.1 WORK INCLUDED BUT NOT LIMITED TO

Excavation, trenching and backfilling shall include the furnishing of all labour, materials and equipment to perform the work as indicated on the drawings and briefly described as follows:

- .1 Protection and maintenance of existing services, buildings and property adjacent to and on the site.
- .2 All storm and sanitary sewers.
- .3 All general site drainage.
- .4 Connection to municipal services within the right of way as noted on the drawings in compliance with municipal standards and requirements.
- .5 Inspection and testing.

1.2 RELATED WORK NOT INCLUDED

- .1 Refer to Section 32 12 18: Asphalt and curbs
- .2 Refer to Section 32 92 23: Sod
- .3 Refer to Section 32 31 13: Fencing
- .4 Refer to Section 32 11 23: Aggregate Materials
- .5 Refer to Section 31 23 10: Excavation, Trenching and Backfilling

1.3 PROTECTION

- .1 The Contractor shall protect existing buildings and adjacent property from any damage caused by his operation.

Note: Refer to "Instructions to Bidders", "Examination of Site".

1.4 EXISTING UTILITIES, ETC.

- .1 Prior to commencing any excavation work, the Contractor shall establish as near as possible the location and state of use of all buried utilities or services as shown

on drawings or known to be in existence. The locations shall be clearly and unmistakably marked to prevent accidental disturbance during the work.

1.5 SOIL INVESTIGATION

- .1 A soil report of the site was conducted. Refer to Section 01 22 00.
- .2 This information is made available solely as a guide and no responsibility is accepted by the Consultant or Owner for its contents. The accuracy or otherwise of the report shall not affect the provisions of the contract.

1.6 PROTECTION FROM WEATHERING

- .1 Protect excavated banks, floors, etc. against freezing. In cases where bearing earth is allowed to freeze, it shall be removed and replaced with approved fill.
- .2 Keep excavations free from water providing and operating pumps to conduct water a sufficient distance away to keep excavations dry. Do not allow water to wash freshly laid concrete or masonry.

1.7 CO-OPERATION

- .1 This Contractor shall become familiar with the work of other Contractors working in conjunction with his work and shall assist in such work as must be done together.

1.8 LINES

- .1 All lines and levels for the excavation will be furnished by the General Contractor.

2.0 PRODUCTS

2.1 SEWER PIPE

- .1 Storm and sanitary sewer pipe shall be as follows to sizes indicated on drawings:
 - .1 P.V.C. pipe shall be P.V.C. Pipe SDR and fitting, meeting C.S.A. Standards B182.1-96.
- .2 All pipe and fittings shall be in accordance with A.S.T.M. Standard Specifications.

2.2 DRAIN TILE

- .1 Shall be perforated corrugated plastic sub-drains with geotextile cover, Big-O drain tile or equal. Drain shall be to size indicated on drawings and shall be assembled complete with manufacturer's couplings and fittings including corners as required.
- 2 Sizes as indicated on the drawings.

2.3 CLEANOUTS

- .1 Cleanouts shall be complete with cast iron and concrete pipe casing and #1734 "Josam Company" cleanout plugs or Domestic Foundries Ltd. frame and cover for 6" cleanouts.
- .2 Cleanouts in paved areas Domestic Foundries Ltd. cast iron cleanout cover, nominal 8" x 8" purpose made for asphalt and concrete pavements.

3.0 EXECUTION

3.1 EXAMINATION OF SITE

- .1 Contractors shall visit the site to ascertain special conditions which affect his work.

3.2 TRENCHING, PIPE INSTALLATION AND BACKFILLING

- .1 Provide approved shoring and sheeting as required to prevent settlement, caving of banks, etc. Be responsible for any damage resulting from improper, inadequate protection.
- .2 Wales, struts, shoring, timers, steel and other items used in the construction of the shoring or sheeting where required to complete excavation work for this project shall be entirely satisfactory for the project.
- .3 The bracing and shoring strutting shall be as required by the job conditions and the requirements of the Ontario Building Code and the Construction Safety Act, Trench Excavator's Act Section for Shoring Requirements and other legislation governing work carried out in excavations and cofferdams.
- .4 Shoring and other temporary work shall be so placed that it will not interfere with new permanent work.
- .5 Trenching, backfilling and compacting shall conform to the requirements of OPSS 401. Backfilling of trenches in all paved areas to be Granular 'B' and 'A' engineered fill to match the requirements of the pavement base requirements.
- .6 Pipe Bedding
 - .1 The bed shall be shaped true to line and grade, free from sags and high points. Bedding shall be shaped to a cylindrical surface with the radius conforming to the pipe in accordance with pipe manufacturer's recommendations. Bedding materials shall be placed simultaneously on each side to the spring line of the pipe.
 - .2 Granular bedding shall be uniformly compacted in layers not exceeding 6" in thickness. Compaction shall conform to the requirements of OPSS 501 with a density of 95 percent of the maximum dry density.
 - .3 At pipe joints, bedding materials shall be left clear of the joints to permit their completion as specified elsewhere. After the connection has been completed, approved bedding material shall be placed under the joint and

thoroughly tamped to the compaction specified. Bedding material shall not be taken from completed portions of the trench for this purpose.

- .7 All costs for inspection shall be paid by the General Contractor from Inspection and Testing Allowance. Inspection and Testing Company will report findings to the Architect, Owner and General Contractor.

3.3 DRAINAGE PIPING

- .1 Place perforated drainage piping c/w manufacturer recommended fitting and final fitting to connector piping.
- .2 Place a minimum of 12" (300 mm) depth of Granular 'C' aggregate surround to bottom of trench.
- .3 Supply and install field/yard drain basins where indicated on the drawings.
- .4 Test piping for flow to pits and/or catch basins.

3.4 CLEANING

- .1 The Contractor shall be responsible for good housekeeping during the work of this section. All refuse must be removed from the site daily.

END OF SECTION