

PROJECT MANUAL

Windfields Farm - Building B5
Retail - Shell

Oshawa, Ontario

Project No. 08.118P04

June 21, 2024
Issued For Tender

RIO  CAN™

**TURNER
FLEISCHER**
ARCHITECTS

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Consultants	
Name	Initials
<i>Turner Fleischer Architects Inc.</i>	<i>TFAI</i>
<i>STUDIO TLA Landscape Architects</i>	<i>TLA</i>

Issued / Revisions Log	
Item & Description	Date
<i>Issued for Review</i>	<i>10-05-2024</i>
<i>Issued for Pre-Permit/Tender Review</i>	<i>31-05-2024</i>

Material & Product & National Vendor Schedule

1.1 GENERAL

1.1.1 The future tenant, Petsmart, has established national accounts for preferred pricing, or established pre-determined pricing and preferences for certain materials. The General Contractor is to contact the applicable sources to get pricing information and must carry the price in their Bid.

1.1.2 See below full **Material & Product & National Vendor Schedule**.

Refer to applicable items for this project.

The information listed below supersedes what is listed in the specifications.

(FORM VERSION 33 UPDATED 4.1.24) MATERIAL & PRODUCT & NATIONAL VENDOR SCHEDULE			
SPEC. SECTION & TITLE	MATERIAL	PRODUCT(S)	MANUFACTURER(S) OR REQUIRED VENDOR (NO EXCEPTIONS)
04810 - REINFORCED CONCRETE MASONRY	INTEGRAL WATER REPELLENT ADMIXTURE	DRY-BLOCK	W.R. GRACE & CO.
07210 - BUILDING INSULATION	PERIMETER INSULATION BLANKET INSULATION	STYROFOAM SM FSK-25 FSK-25 THERMAFIBER	THE DOW CHEMICAL CO. JOHNS MANVILLE OWENS CORNING FIBERGLASS CO. U.S.G. INTERIORS
	SAFING INSULATION SOUND ATTENUATION INSULATION ACOUSTICAL SEALANT	THERMAFIBER MINERAL FIBER TYPE 1 ACOUSTICAL SEALANT	U.S.G. INTERIORS U.S.G. INTERIORS U.S.G. INTERIORS
07240 - EXTERIOR INSULATION AND FINISH SYSTEM	EXTERIOR INSULATION FINISH SYSTEMS DRAINAGE SYSTEM	STO-THERM ESSENCE NEXT - 7 YEAR WARRANTY OUTSULATION PLUS MD SYSTEM - 7 YEAR WARRANTY PAREX STANDARD WATERMASTER SYSTEM - 7 YEAR WARRANTY	STO CORP. DRYVIT PAREX E.F.I.S.

Material & Product & National Vendor Schedule

(FORM VERSION 33 UPDATED 4.1.24) MATERIAL & PRODUCT & NATIONAL VENDOR SCHEDULE			
SPEC. SECTION & TITLE	MATERIAL	PRODUCT(S)	MANUFACTURER(S) OR REQUIRED VENDOR (NO EXCEPTIONS)
07842 - FIRE RESISTIVE JOINT SYSTEM SEALANT	FIRE RETARDANT SEALANT	FIRE BARRIER PENETRATING SEALING SYSTEM	3M (LOCAL DISTRIBUTOR IS CRB SUPPLY, INC., PHOENIX, AZ P. (602) 271-0180
07920 - JOINTS SEALANTS	RESTROOM SEALANT WET AREAS (BATHING, DRYING, RECEIVING)	SILICONE BASE, TYPE II, CLASS A PREMIUM GRADE HIGH PERFORMANCE POLYURETHANE BASED SEALANT - SIKAFLEX 1A	DOW CORNING OR GE SIKA
08110 - HOLLOW METAL DOORS AND FRAMES 08111 - PRE-FINISHED FRAMES 08710 - FINISH HARDWARE	HOLLOW METAL DOORS & FRAMES INTERIOR PRE-FORMED METAL DOOR FRAMES DOOR HARDWARE	PER SPECIFICATIONS & SHEET A6.0 PER SPECIFICATIONS & SHEET A6.0 PER SPECIFICATIONS & SHEET A6.0	COOK AND BOARDMAN 345 MASON RD. LA VERGNE, TN 37086 PRIMARY CONTACT: ANDREW CALIENTE C. (615) 903-9040 P. (855) 447-8600 EXT. 4554 ACALIENTE@COOKANDBOARDMAN.COM PETSMART@COOKANDBOARDMAN.COM
	RODENT RESISTANT DOOR SWEEPS	PER SPECIFICATIONS & SHEET A6.0	GMT / XCLUDER 750 W. LAKE COOK RD., SUITE 480 BUFFALO GROVE, IL 60089 PRIMARY CONTACT: BEN CHANNON P. (847) 495-4700, EXT. 1184 C. (847) 269-4005 BENC@GMT-INC.COM
08311 - ACCESS DOORS AND FRAMES	METAL ACCESS DOOR & RELATED ITEMS	KRVB, KDW, DSC-214PL & DSC-214M	KARP ASSOCIATES, MASPETH N.Y. EQUAL BY BILCO

Material & Product & National Vendor Schedule

SPEC. SECTION & TITLE	MATERIAL	PRODUCT(S)	MANUFACTURER(S) OR REQUIRED VENDOR (NO EXCEPTIONS)
08411 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS	EXTERIOR ALUMINUM STOREFRONT FRAMING	FG 3000	VISTAWALL
08461 - SLIDING AUTOMATIC ENTRANCE DOORS	AUTOMATIC SLIDING DOORS AND CONTROLS	MODEL #SL500 EXTERIOR DOORS W/ TRANSOM & PREPPED FOR 1" INSULATED GLASS	ASSA ABLOY ENTRANCE SYSTEMS INC 4020B SLADEVIEW CRESCENT, UNITS 3&4 MISSISSAUGA, ON L5L 6B1 PRIMARY CONTACT: FAHIM UMID P. (905) 569-5221 C. (416) 452-7447 FAHIM.UMID@ASSAABLOY.COM
08800 - GLAZING	1" INSUL. EXT. TEMPERED PERFORMANCE GLASS	SOLARGRAY + SOLARBAN (60) C (CLEAR)	PPG INDUSTRIES
09260 - GYPSUM BOARD ASSEMBLIES	GYPSUM WALLBOARD		U.S.G. INTERIORS OR GEORGIA PACIFIC
	METAL STUD FRAMING SOUND ATTENUATION INSULATION WATER RESISTANT INTERIOR PANEL	PER SHEET A9.0 TYPE 1 DENSARMOUR PLUS	U.S.G. INTERIORS U.S.G. INTERIORS GEORGIA PACIFIC
09910 - PAINTING	PAINTING	PER SHEETS A3.0, A3.1, A4.0, A7.0	PPG PAINTS 1100 ARLINGTON CT. INDIANAPOLIS, IN 46280 PRIMARY CONTACT: RICK GARLIN C. (317) 318-5800 GARLIN@PPG.COM

Material & Product & National Vendor Schedule

SPEC. SECTION & TITLE	MATERIAL	PRODUCT(S)	MANUFACTURER(S) OR REQUIRED VENDOR (NO EXCEPTIONS)
08363 - SECTIONAL OVERHEAD DOORS	SECTIONAL OVERHEAD DOOR	SECTIONAL 592 SERIES	BLUE GIANT CORP 410 ADMIRAL BLVD. MISSISSAUGA, ON L5T 2N6 PRIMARY CONTACT: ROSS TRIMBLE P. (905) 457-3900 C. (647) 325-0761 RTRIMBLE@BLUEGIANT.COM SECONDARY CONTACT: CHRIS WANG P. (905) 457-3900 EXT. 5382 C. (416) 989-6294 CWANG@BLUEGIANT.COM
11160 - LOADING DOCK EQUIPMENT	VERTICAL DOCK LEVELER - HYDRAULIC DOCK BUMPERS WHEEL CHOCK SAFETY KIT (CHOCK & SIGN) DOCK SEALS CONTROL BOX TRACK GUARDS PIT MOUNTED SCISSOR LIFT (AS APPLICABLE ONLY) SURFACE MOUNTED SCISSOR LIFT (AS APPLICABLE ONLY)	BLUE GIANT - V7006H BLUE GIANT - DB512 BLUE GIANT - 038-21E/720-5000/090-486-1 BLUE GIANT - BG100V-22 BLUE GIANT - SP1 BLUE GIANT BLUE GIANT - DL12-72X96-14 SERCO - MODEL #SDL68-8	
12000 - FURNISHINGS			
	PARKING LOT SHOPPING CART CONTAINMENT	GALVANIZED PIPE CART CORRAL(S) #600-10	NATIONAL CART CO. INC. (CART CORRALS IN PARKING AREAS) 3125 BOSCHERTOWN RD. ST. CHARLES, MO 63301 PRIMARY CONTACT: DENISE MOORE P. (636) 947-3800 EXT. 134 DENISE.MOORE@NATIONALCART.COM

General Conditions (CCDC2-2020)

00 72 00 - General Conditions (CCDC2-2008)

1 Contract Documents

- .1 Standard Construction Document for Stipulated Contract CCDC2-2020 (pages 1 thru 28) consisting of Agreement Between Owner and Contractor, Definitions, and The General Conditions of the Stipulated Price Contract, Articles GC-1.1 to GC-13.2 inclusive, governing same, including the Supplementary Conditions, is hereby made a part of these Contract Documents.
- .2 CCDC2-2020 is a common document in the Canadian construction industry, and Contractor is required to have a copy. For copyright reasons, a copy of CCDC2-2020 is not bound into the Project Manual.

END OF SECTION

CCDC 2 Supplementals (RioCan Standard)

**SUPPLEMENTARY CONDITIONS TO THE
 STIPULATED PRICE CONTRACT (CCDC 2-2008)**

These Supplementary Conditions of the Stipulated Price Contract (CCDC 2-2008) (the “**Supplementary Conditions**”) constitute a Contract Document and shall apply to all the Work.

Where any article, paragraph or subparagraph in the Agreement Between Owner and Contractor is supplemented by one of the following paragraphs, the provisions of such article, paragraph or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto.

Where any article, paragraph or subparagraph in the Agreement Between Owner and Contractor is amended, voided or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided or superseded shall remain in effect.

The Contract shall constitute the entire and only agreement between the parties hereto relating to the subject matter hereof, superseding any previous agreements or understandings. There are no agreements, understandings or covenants between the parties of any kind, expressed or implied, oral or otherwise, pertaining to the Work which have not been set forth or specified herein. The Contract cannot be modified except by an instrument in writing signed by an authorized representative or representatives, as the case may be, of each party.

If any paragraph or provision of the Contract is held illegal or unenforceable or is otherwise stricken, then any and all remaining paragraphs of the Contract shall remain valid and binding upon the parties. If any covenant set forth herein is found to be illegal or unenforceable, it is the intention of the parties that such covenant shall not thereby be terminated, but shall be deemed amended to the extent necessary to render it valid and enforceable.

The Contractor represents and warrants that: (a) it is competent to perform the Work; (b) it has the necessary qualifications, including knowledge, skill and experience to perform the Work, together with the ability to use those qualifications effectively for that purpose; and (c) it has, or will arrange for those Subcontractors used by it to have, the necessary licenses and insurances as so required.

The Contractor shall: (a) carry out the Work in a diligent and efficient manner to the highest industry standard; (b) select and employ on the Work a sufficient number of properly qualified personnel, provide efficient and effective inspection and quality control procedures and provide administration and other support to its employees to the extent necessary to properly carry out the Work; (c) perform the Work in accordance with standards of quality acceptable to the Owner acting reasonably and in full conformity with all the requirements of the Contract; (d) provide effective and efficient supervision to ensure that the quality of workmanship is as stated in the Contract; and (e) comply with rules, regulations and policies established by the Owner from time to time, including, without limitation, the Owner’s Code of Business Conduct and Ethics Policy, which policy is available for access by the Contractor on the Owner’s website, <https://riocan.com/about/corporate-governance/>.

SC#	GC#	Supplementary Conditions
A-3 CONTRACT DOCUMENTS		
SC#1	3.1:	Add the following new paragraphs 3.2 and 3.3 to Article A-3 of the Agreement – CONTRACT DOCUMENTS:
	“3.2	If either the Specifications or Procurement Documents provide for more than one

CCDC 2 Supplementals (RioCan Standard)

SC#	GC#	Supplementary Conditions
	3.3	<p>improvement to be made under the Contract, and such improvements are to be made to lands that are not contiguous, then, if specified in the Specification or Procurement Documents and if permitted under the applicable Construction Act, each such improvement is deemed to be made and performed under a separate contract for the purposes determining Substantial Performance of the Work and completion of the Contract, and for any other purpose under the applicable Construction Act, and the relevant provisions of this Contract will be deemed amended accordingly.</p> <p>Paragraph 3.2 will apply to all of the Contractor's contracts with its Subcontractors and Suppliers working on each such improvement on a pass through basis. The Contractor shall include in all of its contracts with Subcontractors and Suppliers (and ensure the same is included in all subcontracts of every tier), as applicable, notice of such deeming of separate contracts for such purposes, and shall ensure that it separates the Work and the supply of Products for each such improvement."</p>
A-5 PAYMENT		
SC#2	5.3: "5.3	<p>Delete paragraph 5.3 of Article A-5 of the Agreement – PAYMENT in its entirety and replace with the following:</p> <p>Interest</p> <p>.1 Should either party fail to make payments as they become due under the terms of the Contract or in an award by arbitration or court, interest at the greater of one per cent per annum above the bank rate and the minimum rate required under the <i>Construction Act</i> on such unpaid amounts shall also become due and payable until payment. Such interest shall be compounded on a monthly basis. The bank rate shall be the rate established by the Bank of Canada as the minimum rate at which the Bank of Canada makes short term advances to the chartered banks.</p> <p>.2 Interest shall apply at the rate and in the manner prescribed by Section 5.3.1 of this Agreement on the amount of any claim advanced and for which the Contractor is thereafter entitled to payment, either pursuant to Part 8 – Dispute Resolution of the General Conditions, or otherwise, from the date the amount would have been due and payable under the Contract, had it not been in dispute, until the date it is paid."</p>
A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING		
SC#3	6.1: "6.2	<p>Add the following new paragraph 6.2 to Article A-6 of the Agreement – NOTICES:</p> <p>In addition to the addresses, requirements and timelines set out in paragraph 6.1, the following applies:</p> <p>.1 for the purposes of the prompt payment provisions under the applicable Construction Act, if any, and for the purposes of Part 5 – PAYMENT,</p> <p>(i) applications for payment and Proper Invoices will be considered given or delivered by the Contractor to the Owner when they are received by the Owner through the Owner's online procurement systems/portal/software, or as otherwise provided for by the Owner in a Notice in Writing delivered to the Contractor; and</p>

CCDC 2 Supplementals (RioCan Standard)

SC#	GC#	<u>Supplementary Conditions</u>
		<p>(ii) notices of non-payment will be considered to have been given or delivered by the Owner to the Contractor when they have been sent by the Owner and such sending can be verified; and</p> <p>.2 for the purposes of adjudication or any notices of a dispute under the applicable Construction Act, any notices, communications or delivery of documents to be given under the applicable Construction Act will:</p> <p>(i) in the case of the Owner, be given by the Contractor to the individuals and locations indicated in the Owner’s Notice in Writing delivered to the Contractor prior to the commencement of the Work, with a copy to: Vice-President, Tenant Construction, RioCan Management, 2300 Yonge Street, Suite 500, Toronto, Ontario, M4P 1E4, together with an e-mail copy to: constructionnotices@riocan.com; and</p> <p>(ii) in the case of the Contractor, be given by the Owner to individuals and locations indicated in the Contractor’s bid submission.”</p>
DEFINITIONS		
SC#4	Definitions:	<p>Add the following new definitions:</p> <p>“Applicable Law. Applicable Law means all public laws, statutes, ordinances, codes, acts, orders, by-laws, rules, regulations, Governmental Consents, binding policies and guidelines, and requirements of all Governmental Authorities, which now or hereafter, may be applicable to and enforceable against the Work or any part thereof, including those relating to employment, zoning, building, life/safety, environment and health.</p> <p>Construction Act Construction Act means the construction or lien legislation applicable to the Work or the Place of the Work.</p> <p>Governmental Authority. Governmental Authority means any government, parliament, legislature, regulatory authority, utility, agency, commission, board, court or instrumentality of Canada, the province or the city or any subdivision thereof having jurisdiction over the Owner or the Project.</p> <p>Governmental Consent. Governmental Consent means any license, right, permit, franchise, privilege, registration, direction, decree, consent, order, permission, approval, or authority to be issued or provided by, or written contract between the Owner and a Governmental Authority.</p>

CCDC 2 Supplementals (RioCan Standard)

SC#	GC#	Supplementary Conditions
		<p>Owner's Representative. Owner's Representative means any firm or individual engaged by the Owner to monitor the Project on its behalf or to represent it in any other capacity during the construction of the Project. Unless the Owner notifies the Contractor of a change in the Owner's Representative, the Owner's Representative for the Project is: _____</p> <p>Person. Person includes any individual, company, corporation, partnership, firm, trust, sole proprietorship, government or government agency, authority or entity howsoever designated or constituted.</p> <p>Procurement Documents. The Procurement Documents are the procurement, tender or bid documents issued by or on behalf of the Owner for this Contract, and include any related request for qualifications, instructions to bidders, request for proposal or bids, or similar tender documents, and any related addenda.</p> <p>Project Materials. Project Materials has the meaning assigned to that term in paragraph 1.1.9.</p>

CCDC 2 Supplementals (RioCan Standard)

SC#	GC#	<u>Supplementary Conditions</u>
		<p>Proper Invoice Proper Invoice means an application for payment containing the information that is required for the application for payment to constitute a “proper invoice” under the Construction Act and this Contract, including the following:</p> <ol style="list-style-type: none"> 1. all of the information specified to be included in a proper invoice as set out in the Construction Act, and including: <ol style="list-style-type: none"> (i) the Contractor’s name and address; (ii) the date of the application for payment and the period during which the Work was performed; (iii) information identifying the authority, whether in the Contract or otherwise, under which the Work was performed; (iv) a description, including quantity where appropriate, of the Work performed and Products supplied; (v) the amount payable for the Work performed, and the payment terms; and (vi) the name, title, telephone number and mailing address of the person to whom payment is to be sent; 2. an original Statutory Declaration; 3. the total amount of expenditures to date and the total estimated expenditures to be made for the remaining balance of the Work; 4. satisfactory evidence of good standing under worker’s compensation legislation applicable to the Place of the Work, as evidenced by a Certificate of Clearance issued by the applicable worker’s compensation authority prior to the release of any monthly progress payment; 5. any certificates, inspection reports, or data resulting from commissioning and testing required under the Contract Documents confirming the satisfactory completion of such commissioning and testing for completed portions of the Work; and 6. any additional information that the Owner or the Consultant may reasonably require. <p>Statutory Declaration. The form of the Statutory Declaration to be delivered by the Contractor upon applications for progress payment, release of holdback and final payment is attached to this Contract as Exhibit “2”.</p> <p>Time Schedule. Time Schedule has the meaning assigned to that term in paragraph 3.5.1.”</p>
SC#5	Definitions:	<p>Delete the definition of “Change Directive” and replace with the following new definition:</p> <p>Change Directive. Change Directive means an instruction or an authorization (including a field instruction) for a change, which is signed by the Consultant and is issued at the Project site in order to prevent a delay, and is subsequently documented as a Change Order.</p>

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SC#	GC#	Supplementary Conditions
GENERAL CONDITIONS		
SC#6	GC-1.1.3:	Add the following sentence at the end of paragraph 1.1.3: "The Contract, including the Contract Documents, constitutes the entire agreement between the Owner and the Contractor with respect to the Work."
SC#7	GC-1.1.7:	<p>Delete the introduction line to paragraph 1.1.7 and substitute with the following: "In the event of conflicts between the Contract Documents, the following shall apply:</p> <ul style="list-style-type: none"> .1 pre-existing constructed works take precedence over drawing dimensions and details. Prior to fabrication of any item dependent upon accurate dimensions or details of any pre-existing constructed works, the Contractor shall take field measurements of such pre-existing constructed works, .2 figured dimensions shown on a drawing shall govern even though they may differ from dimensions scaled on the same drawing, .3 drawings of a later date shall govern over those of an earlier date, .4 detailed drawings shall govern over general drawings, and .5 specifications, finish schedules, legends, and general notes shall govern over drawings and the order of priority of the foregoing, from highest to lowest, shall be: <ul style="list-style-type: none"> (a) specifications; (b) finish schedules; (c) legends; and, (d) general notes. .6 The order of priority of documents, from highest to lowest, shall be: <ul style="list-style-type: none"> (a) the Agreement between the Owner and the Contractor; (b) the Definitions; (c) the Supplementary General Conditions; (d) the General Conditions; and (e) the Procurement Documents. <p>Where certain work is shown on the Drawings but is not described in the Specifications, the Contractor shall include such work in the Contract Price in accordance with a reasonable standard of acceptance based on projects of a similar nature or type. Prior to executing the Work, the Contractor shall draw the matter to the attention of the Consultant."</p>

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SC#	GC#	Supplementary Conditions
SC#8	GC-1.1: 1.1.9 1.1.10	<p>Delete all of paragraphs 1.1.9 to 1.1.10 and replace them with the following as new paragraphs 1.1.9 and 1.1.10:</p> <p>1.1.9 All Drawings and Specifications, computations, sketches, test data, survey results, models, photographs, renderings and other materials prepared by the Contractor in connection with the performance of its obligations under this Agreement (the “Project Materials”) shall be the property of the Owner. The Contractor hereby undertakes not to design any other project containing designs which are similar in any material respects with the Project. The Contractor hereby releases the copyright in the Drawings and Specifications and any copyright it might have in any models, plans, designs and copies thereof relating to the Project (to the extent that the same may be used in the Project in favour of the Owner).</p> <p>1.1.10 If this Agreement is terminated, the Contractor shall promptly deliver to the Owner a complete set of all Project Materials in the Contractor’s possession, including all design documents prepared or obtained by the Contractor together with any predesign, conceptual design or other studies prepared by the Contractor. If the Contractor fails to comply with its obligations under this paragraph, the owner shall be entitled, in addition to any other remedies to which it may be entitled, to appropriate equitable relief, including the remedy of specific performance as money damages will be an inadequate remedy with respect to the receipt of such Project Materials by the Owner.”</p>
SC#9	GC-1.1.11: 1.1.11	<p>Add the following as new paragraph 1.1.11:</p> <p>1.1.11 The Consultant shall furnish to the Contractor without charge, one reproducible set of Drawings and two copies of the Specifications, exclusive of those required by jurisdictional authorities and the executed Contract Documents.”</p>
SC#10	GC-1.4.1:	<p>Delete paragraph 1.4.1 and replace it with the following:</p> <p>“The Contractor shall not assign the Contract or a portion thereof without the written consent of the Owner, which consent may be arbitrarily withheld for any reason which the Owner, in its uncontrolled discretion, considers sufficient. For greater certainty, the consent of the Contractor will not be required for an assignment by the Owner to an affiliated or related entity. No assignment of the Contract or a portion thereof will relieve the Owner or the Contractor from any obligation under the Contract.”</p>
SC#11	GC-1.5 and GC-1.6: “GC-1.5 1.5.1 1.5.2	<p>Add the following new General Conditions GC 1.5 – CONFIDENTIALITY and GC 1.6 – OWNER’S REPRESENTATIVE after GC 1.4 – ASSIGNMENT:</p> <p>CONFIDENTIALITY</p> <p>1.5.1 The Owner and the Contractor shall keep confidential all matters respecting technical, commercial and legal issues relating to or arising out of the Work or the performance of the Contract and shall not, without the prior written consent of the other party, disclose such matters, except in strict confidence, to its professional advisors.</p> <p>1.5.2 The matters that are subject to the confidentiality requirements of this GC 1.5 –</p>

CCDC 2 Supplementals (RioCan Standard)

SC#	GC#	<u>Supplementary Conditions</u>
		CONFIDENTIALITY shall not include information that: (i) has become generally available to the public other than as a result of a disclosure by the other party or any of its representatives; (ii) was available to the other party or its representatives on a non-confidential basis before the date of this Agreement; or (iii) becomes available to the other party or its representatives on a non-confidential basis from a Person other than the first-mentioned party or any of its representatives who is not, to the knowledge of such other party or its representatives, otherwise bound by confidentiality obligations to such first-mentioned party in respect of such information or otherwise prohibited from transmitting the information to the other party or its representatives.
	<p>GC-1.6</p> <p>1.6.1</p> <p>1.6.2</p> <p>1.6.3</p>	<p>OWNER'S REPRESENTATIVE</p> <p>The Owner shall designate an Owner's Representative authorized to act on the Owner's behalf and shall specify in written notice to the Contractor any limits on the representative's authority.</p> <p>Subject to any notified limitations in authority, the Contractor may rely upon any written instructions or directions provided by the Owner's Representative.</p> <p>The Owner's Representative shall take all reasonable steps to be accessible to the Contractor during performance of the Contract and shall render any necessary decisions or instructions promptly to avoid delay in the performance of the Contract."</p>
SC#12	GC-2.2.7:	Delete the words "Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER," from paragraph 2.2.7 and add the following sentence at the end of the paragraph: "and shall make findings as to the performance thereunder by both parties to the Contract."
SC#13	GC-2.2.19: "2.2.19	<p>Add the following new paragraph 2.2.19 after paragraph 2.2.18:</p> <p>In any written or printed notice to the Contractor in respect of general, special, or other repairs, or of any work of any nature required to be done under any of the provisions of the Contract, or of any other matter, it shall not be obligatory upon the Consultant to specify minutely or in detail everything required, nor to specify by measurement the exact extent thereof, or the precise spot or spots where the work or material may be defective or faulty or where any of the requirements of the Specifications have not been observed; but a reference in such notice to the clause or clauses bearing upon the matter, and a description of the locality in general terms, and sufficiently clear, in the opinion of the Consultant, to indicate where the defect or trouble exists, shall be deemed to be, and shall be, ample notice."</p>
SC#14	GC 2.4.8	<p>Add new paragraph 2.3.8 as follows:</p> <p>"2.3.8 On a bi-weekly basis, or as otherwise requested by the Owner, acting reasonably, the Contractor, the Consultant, and the Owner shall meet to discuss progress of the Work and verify certificates for payment as described in paragraph 2.2.5."</p>
SC#15	GC-3.1:	Add the following new paragraphs 3.1.3 to 3.1.7 after paragraph 3.1.2:

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	3.1.3	Time is of the essence of this Contract. The Contractor shall commence the Work on the date first set out in paragraph 1.3 of Article A-1 of the Agreement – THE WORK and proceed with the Work in an orderly fashion so as to ensure that the Work is complete by the second date set out in paragraph 1.3 of Article A-1 of the Agreement – THE WORK.
	3.1.4	The Contractor shall keep the Owner and the Consultant informed of the progress of the Work, on a regular basis (at least weekly) and at any reasonable time the Owner may request. The Contractor shall at all times perform the Work in accordance with the Contract Time.
	3.1.5	The Contractor is solely responsible for the quality of the work and shall undertake any quality control activities specified in the Contract Documents or, if none are specified, as may be reasonably required to ensure such quality.
	3.1.6	The Contractor shall at all times perform the Work required hereunder as diligently and expeditiously as is consistent with the highest professional standards and the orderly progress of the Work, and in accordance with the Contract Time and any revisions thereto, in order to maintain the desired development and construction schedule for the Project, and in order not to delay the Work or any Project. The Contractor shall at all times provide sufficient personnel to accomplish its Work within the time limits required by the Owner.
	3.1.7	The Contractor agrees that, notwithstanding anything to the contrary contained in the Contract, it shall fully comply with any policies or procedures of the Owner which are relevant to any activity of the Contractor to be performed under the Contract, provided that they have been made available to the Contractor. The Contractor further agrees that it will use reasonable efforts to inquire from the Owner if such policies or procedures exist for any activity of the Contractor to be performed under the Contract. The Owner agrees that it will use reasonable efforts to communicate to the Contractor policies or procedures it may have, relevant to any such activity.”
SC#16	GC-3.2.2:	Delete all of paragraph 3.2.2.2.
SC#17	GC-3.2.3:	Insert the following wording at the end of paragraph 3.2.3.3: “Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of the deficiencies in the work of other contractors or Owner’s own forces.
SC#18	GC-3.2.7:	Add the following as new paragraph 3.2.7 after paragraph 3.2.6:
	“3.2.7	The Owner shall have the right to enter upon and take possession of the Work in whole or in part for the purpose of placing fittings and equipment or for other use before completion of the Contract if such entry and taking of possession does not prevent or interfere with the Contractor’s efforts to complete the Work in the time specified. Such entry and taking of possession shall not be considered as acceptance of the Work nor shall it in any way relieve the Contractor from his responsibilities under the Contract.”
SC#19	GC-3.4.1:	Delete the second and third sentences from paragraph 3.4.1.

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SC#20	GC-3.5.1:	Delete the word “monthly” in the second line of paragraph 3.5.1.2 and replace it with “weekly”.
SC#21	GC-3.6.1:	<p>Replace the last sentence with the following: “The appointed representative shall not be removed or replaced without the approval of the Owner, such approval not to be unreasonably withheld, provided that the appointed representative is replaced with an appointed representative of similar qualifications.”</p> <p>Insert at the end of the paragraph the sentence “The Contractor shall give the Owner and the Consultant ten (10) days written notice prior to changing the appointed representative.”</p>
SC#22	GC-3.6.2:	Delete the words “, except with respect to Article A-6 of the Agreement - RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING” from the end of paragraph 3.6.2.
SC#23	GC-3.7.2:	Delete the words “Should the Owner not object” in the third line of paragraph 3.7.2 and replace them with “Upon obtaining the written approval of the Owner”.
SC#24	GC-3.8.4: “3.8.4	<p>Add the following new paragraph 3.8.4 after paragraph 3.8.3:</p> <p>If the Owner specifically requests the Contractor to have work performed at overtime rates in order to complete the Work (or any change in the Work) or any part thereof earlier than the Contractor would otherwise be obliged to finish such Work (or change in the Work) or any part thereof under the Contract Documents, the additional net cost of such overtime (less any savings realized by the Contractor through the earlier completion of the Work) shall be chargeable to the Owner.”</p>
SC#25	GC-3.10.1:	<p>Add the following to the end of the paragraph 3.10.1:</p> <p>“or as the Consultant may reasonably request. The Contractor shall submit all Drawings in triplicate and in reproducible form. The Contractor shall also provide “as built” Drawings upon completion of the Work.”</p>
SC#26	GC 3.10.7	Insert the words “in a timely manner” following the words “, provided to such authority” and the words “to ensure no delays in the Project Schedule” at the end of paragraph 3.10.7.
SC#27	GC-3.10.8:	Delete the word “applicable” before “field measurements” in paragraph 3.10.8.1.
SC#28	GC 3.14	<p>Add new GC 3.14 – APPLICABLE LAWS as follows:</p> <p>“GC 3.14 APPLICABLE LAWS</p> <p>3.14.1 Contractor shall at all times be responsible for obtaining all required approvals for the Work and shall at all times comply with all applicable laws in the performance of its obligations hereunder. Applicable laws shall include any and all applicable domestic, federal, provincial, territorial, regional, municipal or local statutes, laws, by-laws, rules, regulations, codes (including design and building codes), ordinances, permits, decrees, writs, injunctions, orders or the like, of any governmental authority, applicable to the Contractor, or to the performance</p>

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		of the Work.”
SC#29	GC 3.15	<p>Add new GC 3.15 – OPERATIONAL RISKS as follows:</p> <p>“GC 3.15 OPERATIONAL RISKS</p> <p>“3.15.1 Before starting Work, the Contractor shall inform itself of the exact locations of all utilities and structures, and once the utilities are located, by the applicable utility company, or once the Contractor discovers, or once a reasonably prudent contractor ought to have discovered, the actual location of the utilities, the Contractor shall be liable for damages to them as a result of any act or omission, whether or not the result of negligence, by those for whom it is responsible, except to the extent that such damages are caused by the Owner’s negligence or wilful misconduct. Unless otherwise specified, the Contractor shall temporarily support or relocate such utilities and structures, or temporarily remove them, and restore them, to the satisfaction of the owners of the utilities and structures at the cost of the Owner.”</p>
SC#30	GC-4.1.4:	Replace the words “but not” with the word “and” in the fourth line of paragraph 4.1.4.
SC#31	GC-4.1.8: “4.1.8	<p>Add the following new paragraph 4.1.8 after paragraph 4.1.7:</p> <p>The Consultant may direct the Contractor to bid work for which payment is made from a cash allowance.”</p>
SC#32	GC-5.1: “GC 5.1 5.1.1 5.1.2 5.1.3	<p>Replace the heading of “GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER” with “GC 5.1 ESTIMATES”, and delete GC 5.1 in its entirety and replace it with the following:</p> <p>ESTIMATES</p> <p>5.1.1 On the 25th day of each month during the Contract Time, the Contractor will deliver to the Consultant a draft of the Contractor’s proposed application for payment for all of the Work performed by the Contractor in that month, in order to facilitate and expedite payments under GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT, GC 5.3 – PROGRESS PAYMENT and GC 5.7 – FINAL PAYMENT, including an estimate of the Work to be performed and Products to be delivered at the date of such application for payment but before the end of that month, and including any reports or certificates confirming the satisfactory completion of any commissioning and testing required by the Contract Documents for any completed part of the Work that the Contractor will include in its application for payment.</p> <p>5.1.2 The Contractor shall review with the Consultant and the Owner, at a scheduled time, the draft application for payment and the percentage of the Work completed for each item indicated in the schedule of values. This procedure shall be complied with for each draft application for payment.</p> <p>5.1.3 Nothing in paragraph 5.1.2 is intended to condition, pre-condition, prevent or delay the Contractor’s right to submit its applications for payment in accordance with this Contract and the Construction Act.”</p>

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SC#33	GC-5.2: "5.2.1 5.2.2	<p>Delete paragraphs 5.2.1 and 5.2.2 and replace them with the following new paragraphs:</p> <p>5.2.1 Provided that the Contractor has submitted the proposed application in accordance with paragraph 5.1.1, the Contractor shall submit its applications for payment to the Consultant and the Owner monthly as the Work progresses no earlier than the 7th calendar day, and no later than the 12th calendar day, after the end of the month to which the application for payment relates. An application for payment delivered after that time period may be treated by the Owner as an application for payment delivered in respect of the next monthly payment period.</p> <p>5.2.2 The Contractor shall ensure that each application for payment for Work complies with the requirements set out in this Contract, and will include as part of it application for payment of all the documents and information required in this Part 5 – PAYMENT and required for a Proper Invoice, including any reports or certificates confirming the satisfactory completion of any commissioning and testing required under the Contract Documents for any completed part of the Work. The Contractor’s application for payment will indicate any and all changes, updates or revisions made to the draft application for payment submitted under paragraph 5.1.1. The Owner may, in its discretion, reject any application for payment that does not comply with GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT or GC 5.3 – PROGRESS PAYMENT, or the Owner may withhold up to the full amounts otherwise payable in relation to that application for payment until such application for payment includes all of the documents and information required under this Part 5 – PAYMENT and for a Proper Invoice.”</p>
SC#34	GC-5.2: "5.2.4 5.2.5 5.2.6	<p>Delete paragraphs 5.2.4 to 5.2.7 and replace them with the following new paragraphs:</p> <p>5.2.4 Before the Contractor submits each application for payment, the Contractor will check the progress of the Work on site to establish the value of the Work performed. If requested by the Consultant or the Owner, the Contractor shall carry out such check with the Consultant or the Owner. It is understood and agreed that no payment shall be claimed for Products stored at the Place of the Work, or elsewhere, unless the Owner shall agree that they have been delivered no earlier than is reasonably required to meet the construction schedule.</p> <p>5.2.5 Each Contractor’s application for payment shall be in a form prescribed by the Owner and shall contain all of the documents and information required for a Proper Invoice.</p> <p>5.2.6 Each Contractor’s application for payment shall be supported by invoices, payrolls, equipment rental schedules and such other evidence as the Owner or Consultant shall require to support the application for payment and copies thereof shall be supplied to the Owner by the Contractor upon request. Except for the Contractor’s first application for payment, each application shall also be accompanied by such evidence as Owner may require establishing payment and satisfaction by the Contractor of all items with respect to the Work for which the Contractor has been previously paid, such as receipts, Statutory Declarations and releases from Subcontractors and Products Suppliers arising out of or in connection with the Work, and statutory declarations from the Contractor, in such form as may be required by Owner. Upon receipt of a written request from the Owner, the Contractor shall also make available to the Owner the</p>

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SC#	GC#	<u>Supplementary Conditions</u>
	5.2.7 5.2.8 5.2.9	<p>Contractor's files setting forth the addresses of all Subcontractors, labourers and Products Suppliers and the names of all labourers involved in the Work, and Owner shall have the right to make and retain copies of the same.</p> <p>The Contractor shall submit to the Owner and Consultant at least fourteen (14) days before the first application for payment, a schedule of values of the various parts of the Work, divided so as to facilitate evaluation of applications for payment.</p> <p>This schedule shall be made out in such form and supported by such evidence as to its correctness as the Owner or Consultant may direct and when approved by the Owner and Consultant shall be used as the basis for applications for payment, unless it is found to be in error.</p> <p>When making application for payment, the Contractor shall submit a statement based upon this schedule which statement shall be made out in such form and supported by such evidence as to its correctness as the Owner or Consultant may direct."</p>
SC#35	GC-5.3.1.3: ".3	<p>Delete paragraph 5.3.1.3 and replace with the following:</p> <p>subject to the certifications set out in the Consultant's certificate for payment and applicable provisions of the Construction Act, including the delivery of a notice of non-payment under the Construction Act (if applicable in the jurisdiction of the Place of the Work), the Owner shall make payment to the Contractor on account as provided in Article A-5 of the Agreement – PAYMENT on or before 28 days after the date that the Consultant or the Owner receives the Contractor's application for payment and Proper Invoice in accordance with this Contract."</p>
SC#36	GC-5.3: "5.3.2 5.3.3	<p>Add the following new paragraphs 5.3.2 to 5.3.5 to the end of GC-5.3:</p> <p>The application by the Contractor for a certificate of payment will constitute a representation by the Contractor to the Owner that: (1) the Work has progressed to the point indicated; (2) the quality of the Work is in accordance with the Contract Documents; and (3) the Contractor is entitled to payment under the Contract Documents in the amount certified.</p> <p>The Consultant or the Owner may decline to approve an application for payment and may withhold a certificate for payment in whole or in part, to the extent necessary to protect the Owner, if in the Consultant's opinion the Contractor is unable to make representations to the Owner as provided in paragraph 5.3.2 of this GC 5.3 – PROGRESS PAYMENT. The Consultant or the Owner may also decline to approve any application for payment or, because of subsequently discovered evidence, testing or subsequent inspections, the Consultant or the Owner may provide for a withholding of funds to offset a previous payment made pursuant to any certificate for payment previously issued or the Owner may refuse to make payment, to such extent as may be necessary in his opinion to protect the Owner from loss because of:</p> <ol style="list-style-type: none"> .1 defective work not remedied; .2 third party claims filed or reasonable evidence indicating possible filing of such claims;

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	5.3.4 5.3.5	<p>.3 failure of the Contractor to make payments promptly to Subcontractors, Suppliers or for labour, Products or equipment;</p> <p>.4 damage to work of other contractors; or</p> <p>.5 unsatisfactory prosecution of the Work by the Contractor or any Subcontractor.</p> <p>No payment made by the Owner under this Contract nor any partial or entire use or occupancy of the Work by the Owner shall constitute an acceptance of any portion of the Work or any Products which are not in accordance with the requirements of the Contract Documents.</p> <p>If the Owner has reasonable grounds for believing that any amount included in previous applications for payment of the Contractor or paid to the Contractor by the Owner has not been paid to Subcontractors, Suppliers or other third parties to whom such amounts are due, then the Owner may withhold payment in respect of such amount from the current application until satisfactory evidence of payment is provided to the Owner by the Contractor.”</p>
SC#37	GC-5.4: “5.4.1	<p>Add the following at the beginning of paragraph 5.4.1:</p> <p>Subject to paragraph 3.2 and 3.3 of Article A-3 – CONTRACT DOCUMENTS,”</p>
SC#38	GC-5.4: “5.4.4 5.4.5	<p>Add the following new paragraphs 5.4.4 to 5.4.5 at the end of GC-5.4:</p> <p>The Contractor shall submit, with the written application for a certificate of Substantial Performance of the Work, all guarantees, warranties, and certificates, distribution system diagrams, (any spare parts or materials left over to the Contractor and required by Owner), and any other materials or documentation required to be submitted under the Contract, together with written proof, acceptable to Owner and Consultant, that the Work has been substantially performed in conformity with the requirements of the municipal or governmental authorities and utilities having jurisdiction.</p> <p>The acceptance by the Contractor of the certificate of Substantial Performance of the Work, or the acceptance of a certificate by a Subcontractor or for any payment due thereunder shall constitute a waiver by either the Contractor, or the Subcontractor, as the case may be, of all claims whatsoever against the Owner under this Contract or any trade contract whether for a change in the Contract Price, extension of Contract Time, or otherwise, except those made in writing prior to the Contractor’s application for payment upon Substantial Performance of the Work and still unsettled.”</p>
SC#39	GC-5.5.1: “5.5.1	<p>Delete paragraph 5.5.1.1 and replace with the following:</p> <p>.1 submit an application for payment of the holdback amount containing all of the information and documents required of a Proper Invoice, a complete list of deficiencies and including all final reports and certificates confirming satisfactory completion of all commissioning and testing required by the Contract Documents, to the extent applicable, and all manuals, as-built drawings and other turnover documents required under the Contract Documents.”</p>

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SC#40	GC-5.5.2:	Replace the words “statement as provided in paragraph 5.5.1” in paragraph 5.5.2 with “Statutory Declaration”.
SC#41	GC-5.5.3: “5.5.3	Delete paragraph 5.5.3 and replace with the following: Notwithstanding the foregoing, if the Contractor has not provided the documents required by the General Conditions by the 30th day after the publication of the certificate of Substantial Performance of the Work (or the completion of the Work, whichever is earlier), the Owner, at its discretion, shall be entitled to withhold an amount equal to up to the full amount of statutory holdback as security for the Contractor’s delivery of the outstanding document(s) and information. In the event of a withholding under this paragraph 5.5.3, the Owner shall pay the withheld amount to the Contractor upon the Contractor’s delivery of such documents and information.”
SC#42	GC-5.5.4:	Delete “the holdback amount authorized by the certificate for payment of the holdback amount” and replace with “the statutory holdback amount and any other holdback amount authorized by the certificate for payment of the holdback, subject to the delivery by the Owner of a notice of non-payment under the Construction Act”.
SC#43	GC-5.5.6: “5.5.6	Add the following as new paragraph 5.5.6: If the Work includes more than one improvement to be made under the Contract, and such improvements are deemed to be made and performed under separate contracts pursuant to the Specification or the Procurement Documents and paragraphs 3.2 and 3.3 of Article A-3 – CONTRACT DOCUMENTS, then, pursuant to the Construction Act, the Owner shall release holdback in accordance with this GC 5.5 upon the issuance of a certificate of Substantial Performance of the Work for each such improvement.”
SC#44	GC-5.7: “5.7.1	Delete paragraph 5.7.1 and replace it with the following: When the Contractor considers that the Work is completed (as defined in the applicable Construction Act), the Contractor shall submit an application for final payment containing all of the documents and information required under the Contract or for a Proper Invoice and including all final reports and certificates confirming satisfactory completion of all required commissioning and testing, to the extent applicable.”
SC#45	GC-5.7.4: “5.7.4 5.7.5	Delete paragraph 5.7.4 and replace it with the following new paragraphs 5.7.4 and 5.7.5: Subject to the provisions of paragraph 10.4.1 of the GC 10.4 – WORKERS COMPENSATION, the delivery of a notice of non-payment by the Owner (if required under the applicable Construction Act), and any lien legislation applicable to the Place of the Work, the Owner shall, no later than 28 calendar days after the issuance of a final certificate for payment, pay the Contractor as provided in Article A-5 of the Agreement – PAYMENT. The Contractor shall submit, with the application for final payment upon total completion, a Statutory Declaration and a written statement that the Work has been

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		performed to the requirements of the Contract Documents, and itemizing approved changes in the Work and Consultant's written instructions and modifications indicated by the authorities having jurisdiction and such other materials or documentation as may be required to be submitted under the Contract Documents."
SC#46	GC-5.10	<p>Add new GC 5.10 - LIENS as follows:</p> <p>"GG 5.10 LIENS</p> <p>5.10.1 Notwithstanding anything else in this GC 5, the Owner shall not be obligated to issue a certificate for payment in accordance with the Contract, and the Owner shall not be obligated to make payment to the Contractor, if at the time such certificate or payment was otherwise due:</p> <ul style="list-style-type: none"> (i) a claim for lien has been registered against the Project site; (ii) the Owner has received a written notice of lien, or (iii) the Owner reasonably believes that any party may retain or has retained any right, title or interest to Products or materials in respect of which an application for payment has been made including, without limitation, a claim under the Personal Property Security Act (Ontario) or similar legislation applicable to the Place of the Work, a lien, attachment or secured claim. <p>For clarity, the Owner's entitlement to withhold payment to the Contractor pursuant to this paragraph 5.10 shall be limited to claims for liens registered by the Subcontractors, Suppliers and those for whom the Contractor is otherwise responsible."</p>
SC#47	<p>GC-6.1.2:</p> <p>"6.1.2</p> <p>6.1.3</p>	<p>Delete all of paragraph 6.1.2 and replace it with the following new paragraphs 6.1.2 and 6.1.3:</p> <p>No Changes in the Work shall proceed without a written Change Order or Change Directive signed by the Owner and no claim for any change in the Contract Price or for any extension or alteration of the Contract Time shall be valid except as shown on the Change Order or Change Directive, as the case may be. This requirement is of the essence and it is the express intention of the parties hereto that any claims for a change in the Contract Price shall be based, and that the Contract Time shall be altered, only upon strict compliance with the requirements of GC 6 - CHANGES IN THE WORK. Accordingly, no course of conduct or dealing between the parties, no express or implied acceptance of alterations or additions to the Work and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for payment under this Contract or any extension of the Contract Time without a Change Order or Change Directive.</p> <p>If any change or deviation in, or omission from the Work is made by which the amount of work to be done is decreased, or if the whole or a portion of the work is dispensed with, no compensation is claimable by the Contractor or any Subcontractor for any loss of anticipated profit in respect thereof."</p>

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SC#48	GC-6.3:	Delete all of paragraphs 6.3.2 and 6.3.3.
SC#49	GC-6.3.6: "6.3.6.4	Change the wording "without" in paragraph 6.3.6.2 to "with." Add the following new paragraph 6.3.6.4 after paragraph 6.3.6.3: Upon receipt of a Change Directive, the Contractor shall provide the Owner a non-binding written estimate of the costs associated with the related change in the Work within two (2) days of receiving any such Change Directive."
SC#50	GC-6.3.14: "6.3.14	Add the following as new paragraph 6.3.14 after paragraph 6.3.13: Notwithstanding anything in this Contract to the contrary, the Owner, without invalidating the Contract, may make minor adjustments in the Work consistent with the intent of the Contract Documents by delivering a Change Directive. Such adjustments in the Work shall not involve adjustment to the Contract Price or the Contract Time if they are within the general scope of the Work, if the Change Directive indicates that no adjustment shall be made to the Contract Price or the Contract Time as a result thereof and if such minor adjustments are reasonably inferable in the Contract Documents even though not expressly included."
SC#51	GC-6.4.5: "6.4.5	Add the following new paragraph 6.4.5 after paragraph 6.4.4: Notwithstanding anything in the Contract to the contrary, the Contractor has investigated for itself the character of the Work and of all local conditions which might affect its obligations and has satisfied itself as to the nature and extent of the Work to be done under the Contract Documents and as to the facilities and difficulties attending the execution of the Work, including subsurface conditions. Notwithstanding anything in the Contract to the contrary, to the extent the Contractor has not so investigated, it is willing to assume and does hereby assume responsibility for all loss and damage from any cause whatsoever which such an investigation might have avoided and agrees to indemnify the Owner from all risk thereof and of conditions arising and developing in the course of the Work which might make it more onerous and more expensive to fulfil or perform than was contemplated or known when this Contract was signed. Notwithstanding anything in the Contract to the contrary, the Contractor acknowledges and declares that in entering into this Contract it did not and does not rely upon the information furnished by the Owner, its officers and employees and the Contractor confirms its understanding and awareness that any information from such source or sources was approximate and speculative only and was and is not in any manner guaranteed by the Owner."
SC#52	GC-6.5.1:	Add after the words "provisions of the Contract Documents" the following: "and provided the Contractor has given the Owner Notice in Writing in a timely fashion of the action or omission that has given rise to such delay".
SC#53	GC-6.5.3:	Immediately after the words "labour disputes" in paragraph 6.5.3.1, delete the words " , strikes, lock-outs (including lock-outs decreed or recommended for its members by a recognized contractor's association, of which the Contractor is a member or to which the Contractor is otherwise bound)" and replace them with the words "that do not involve the Contractor or that are decreed for its members by a recognized contractor's

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		<p>association of which the Contractor is a member or to which the Contractor is otherwise bound (subject to paragraphs 6.5.4 and 6.5.5).”</p> <p>Delete paragraph 6.5.3.3 in its entirety.</p> <p>Delete end of the last sentence in 6.5.3 after the word “Owner”, namely: “Consultant, or anyone employed or engaged by them directly or indirectly”.</p>
SC#54	GC-6.5.4:	Insert the words “and the Owner” following the words “given to the Consultant” and replace “10 Working Days” with “3 Working Days”.
SC#55	GC 6.5.5	Delete this paragraph in its entirety.
SC#56	GC-6.5.6: “6.5.6	<p>Add the following new paragraphs 6.5.6 to 6.5.8 after paragraph 6.5.5:</p> <p>No extension shall be made for delay arising from a labour dispute that is decreed for its members by a recognized contractor’s association of which the Contractor is a member or to which the Contractor is otherwise bound if the Contractor, before entering into this Contract or commencing the Work, had or should have had knowledge that or a reasonable grounds for believing that the Work would be delayed by such a labour dispute and did not so inform the Owner.</p>
	6.5.7	If there is a delay in the performance of any portion of the Work, the Contractor shall use its reasonable best efforts to re-arrange and re-schedule the Work so as to minimize the ultimate delay in the completion of the Work. The Contractor shall be responsible for the care, maintenance and protection of the Work in the event of any shutdown. The Contractor will co-operate with the Owner and the Consultant to avoid labour complications.
	6.5.8	Any adjustment to the Contract Time and the Contract Price required as a result of GC 6.5 - DELAYS shall be made as provided in GC 6.1 - OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.”
SC#57	GC-7.1.4:	<p>Add the following words after the words “subsequently agreed in writing by the parties,”:</p> <p>“or if the Contractor is delayed for 180 days or longer in the performance of the Work and notwithstanding anything else herein provided,”.</p>
SC#58	GC-7.1.7: “7.1.7	<p>Add the following new paragraph 7.1.7 after paragraph 7.1.6:</p> <p>In addition to the rights set out in GC 7.1 – OWNER’S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR’S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT, if the Owner has reasonable grounds for believing and does believe that the Contractor will not fulfill his contractual obligations hereunder, then the Owner shall also be entitled, on the giving of seven (7) days’ Notice in Writing, to terminate the Contractor’s right to continue with the Work in whole or in part or terminate the Contract, and in such event the Contractor shall be entitled to be paid for all work performed to the date of termination and the Contractor shall, at the request of the Owner, assign to the Owner all of its rights under any Subcontracts</p>

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SC#	GC#	Supplementary Conditions
		that the Owner may specify and the Owner shall thereafter assume all obligations under such Subcontracts.”
SC#59	GC-7.2.3:	Delete the following wording from paragraph 7.2.3.4: “, except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER,”.
SC#60	GC 8.2: “8.2.9 8.2.10	Add the following new paragraphs 8.2.9 and 8.2.10 after 8.2.8: Notwithstanding anything else in this Contract, in the event of a dispute relating to payment arising prior to the completion of the Work, the parties may adjudicate such dispute in accordance with the Construction Act. If the Contractor issues a notice of adjudication to the Owner, it will include with such notice a description of the reasons for its dispute that includes a reference to the applicable application for payment and Proper Invoice, all Notices in Writing demanding payment, authority for the claim under the Contract (including copies of any applicable Change Order, Change Directive, requests for any related change, and written approval of any related change). The parties acknowledge and agree that the adjudication of a payment dispute in accordance with the Construction Act will not stay, pause, withdraw, terminate, discontinue, or prejudice any mediation, arbitration, or court proceeding that relates to the same matter and that was commenced prior to the delivery of a notice of adjudication under the Construction Act, unless the parties otherwise agree in writing.”
SC#61	GC 8.3.1	Replace paragraphs 8.3.1 with the following: “8.3.1 For any dispute, neither Party may suspend the performance of its obligations under the Contract, including remedying any material breach 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, while the Parties are following for that dispute the dispute resolution procedures contemplated under the Contract. Notwithstanding the preceding sentence, and without prejudice to paragraph 2.4.3 of GC 2.4 – DEFECTIVE WORK, the Owner may, acting reasonably, withhold payment of disputed amounts in invoices while the parties are making efforts to resolve the dispute over those amounts. The Owner will pay these amounts promptly after the dispute is resolved, to the extent it is resolved in the Contractor’s favour. 8.3.2 The Contractor may suspend the Work if a dispute relates to Work that must be performed before additional Work can be performed, as appropriate, to protect public health and safety or the environment, or as otherwise authorized in the Contract Documents.”
SC#62	GC 8.3.2	Renumber paragraph 8.3.2 as paragraph 8.3.3.
SC#63	GC-9.1.5: “9.1.5	Add the following new paragraph 9.1.5 to the end of GC-9.1: If the Contractor has caused damage to the work of another contractor on the Project, the Contractor agrees upon due notice to settle with the other contractor by negotiation or arbitration. If the other contractor makes a claim against the Owner on account of damage alleged to have been so sustained, the Owner shall notify the Contractor and may require the Contractor to defend the action at the Contractor’s expense. The

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SC#	GC#	Supplementary Conditions
		Contractor shall satisfy a final order or judgment against the Owner and pay the costs incurred by the Owner arising from such action.”
SC#64	GC-9.2.7:	Delete paragraph 9.2.7.4.
SC#65	GC-9.2.8:	Add the following language after the word “Owner” in paragraph 9.2.8.4: “ and the Consultant, their agents and employees,”.
SC#66	GC-9.2.10: “9.2.10	Add the following new paragraph 9.2.10 after paragraph 9.2.9: The Contractor shall indemnify and hold harmless the Owner, Consultant, other consultants, Subcontractors, Suppliers and their agents and employees, from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of or resulting from exposure to, or the presence of, toxic or hazardous substances or materials which were brought onto or made at the Place of the Work after the Contractor commenced the Work. This obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity set out in GC 12.1 - INDEMNIFICATION or which otherwise exist respecting a person or party described in this paragraph.”
SC#67	GC-9.4.1:	Delete the following from paragraph 9.4.1: “Subject to paragraph 3.2.2.2 of GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS,”.
SC#68	GC-9.4:	Add the following new paragraph 9.4.2 after paragraph 9.4.1: Add new paragraphs 9.4.2, 9.4.3 and 9.4.4 as follows: “9.4.2 The Contractor agrees, in addition to the obligations set forth elsewhere in the Contract, to comply with all applicable legislation, rules, regulations and practices pertaining to employment standards, human rights, occupational health and safety, labour relations, workers’ compensation, pay equity and employment equity and all other legislation applicable to its employees. The Contractor will ensure that all of its employees and all of the employees of any Subcontractor and any agent of the Contractor are covered by worker’s compensation insurance or other similar legislative compensation scheme in force at the Place of the Work. 9.4.3 Prior to the commencement of the Work, the Contractor shall submit to the Owner: .1 a current Workplace Safety & Insurance Board Clearance Certificate if the Project is in Ontario, or equivalent documentation in other jurisdictions; .2 copies of the Contractor’s insurance policies having application to the Project or certificates of insurance, at the option of the Owner; .3 documentation setting out the Contractor’s in-house safety programs; .4 a copy of the Notice of Project filed with the Ministry of Labour naming

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		<p>itself as “constructor” under the Occupational Health and Safety Act if the Project is in Ontario, or equivalent documentation in other jurisdictions.</p> <p>9.4.4 The Contractor shall indemnify, save harmless, and defend the Owner, its agents, officers, directors, employees, consultants, successors, appointees, and assigns from and against the consequences of any and all safety infractions committed by the Contractor under the relevant occupational health and safety act for the Province where the Project is situated, including the payment of legal fees and disbursements on a solicitor and client basis.”</p>
SC#69	GC-9.5.2:	Add the following language after the word “Owner” in paragraph 9.5.2.4: “and the Consultant, their agents and employees,”.
SC#70	GC-9.5.3:	Delete paragraph 9.5.3.4.
SC#71	GC-10.1.2: “10.1.2	<p>Delete paragraph 10.1.2 and replace it with the following:</p> <p>Any increase or decrease in cost to the Contractor due to changes in government sales taxes, custom duties or excise taxes occurring after the date of the tender shall increase or decrease the Contract Price accordingly. For greater certainty, the parties agree that the Contractor is not entitled to any mark-up for profit, overhead or otherwise in connection with any increase in taxes or duties and that the Contract Price will be increased only by the actual amount of increased taxes or duties actually paid to the government. If any such taxes or duties be retroactively reduced, the Owner shall be entitled to withhold payment to the Contractor of a sum equal to the amount of such tax or duty reduction but only after the Contractor has received the benefit of such tax or duty reduction.”</p>
SC#72	GC-10.1.3: “10.1.3	<p>Add the following new paragraph 10.1.3 at the end of GC 10.1 – TAXES AND DUTIES:</p> <p>When an exemption from or recovery of, government sales taxes, customs duties or excise taxes is applicable to the Contract, the Contractor shall, at the request of the Owner (or his agent) assist, join in, or make application for any exemption, recovery or refund of all such taxes and duties and all amounts recovered or exemptions obtained shall be for the sole benefit of the Owner. The Contractor agrees to endorse over to the Owner any cheques received from governmental authorities as may be required to implement the foregoing.”</p>
SC#73	GC-10.2.2:	Add an “and” before “rights of servitude” in paragraph 10.2.2 and delete remainder of the paragraph, namely: “, and all other necessary approvals and permits, except for the permits and fees referred to in paragraph 10.2.3 or for which the Contract Documents specify as the responsibility of the Contractor.”
SC#74	GC-10.2.3:	Delete the wording “and customarily obtained by contractors in the jurisdiction of the Place of the Work after the issuance of the building permit” and replace with the following sentence: “and all necessary permits, licenses and certificates, and fees shall include the approval of Drawings and Specifications required by applicable provincial labour legislation.”

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SC#	GC#	<u>Supplementary Conditions</u>
SC#75	GC-10.2.5:	Delete the word “not” in the first line of paragraph 10.2.5 and replace it with “, to the extent only of the Contractor’s expertise, experience and knowledge,”.
SC#76	GC-10.2.6:	Delete the words “knowing it to be” in the second line of paragraph 10.2.6 and replace them with “that is”.
SC#77	GC-10.2.7:	Delete paragraph 10.2.7 in its entirety.
SC#78	GC-11.1:	<p>[NTD: The following insurance provisions are intended to apply to Tenant Construction and CapEx works having a contract value < \$10M and where a standalone building is <u>not</u> being constructed. Please consult with RioCan Insurance if the contract value is > \$10M or the GC is being engaged to construct a standalone building as these coverages will need to be revised.]</p> <p>Delete paragraph 11.1.1 in its entirety and replace with the following:</p> <p>11.1 Insurance</p> <p>11.1.1 The Owner and Contractor shall provide, maintain and pay for the insurance coverages listed in this GC 11.1 - INSURANCE (provided that the cost of any insurance required to be provided and maintained by the Contractor under this Schedule shall be included in the Contract Price under this Agreement):</p> <p>(a) Commercial General Liability Insurance</p> <p>The Contractor shall provide, maintain and pay for, or cause to be provided, maintained and paid for, Commercial General Liability Insurance on a wrap-up form to include the Owner, the Contractor, the Owner’s designated Representative, Subcontractors of every tier as named insureds, with a limit of not less than ten million dollars (\$10,000,000) for any one accident or occurrence, or such other limit as the Owner may in its sole discretion determine, inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof, with a bodily injury and property damage deductible no greater than fifty thousand dollars (\$50,000). Such insurance shall include any other entity the Owner may reasonably require from time to time as named or additional insureds including, without limitation, the construction lender, if any, and Consultants. The policy shall include non-owned vehicles, tenants, legal liability, medical payments, damage to existing structures, damage to hired vehicles and limited pollution, blasting and demolition, where applicable, and shall contain a standard form of cross-liability and severability of interest clause. This insurance shall be maintained continuously from commencement of the Work until the date of Substantial Performance of the Work, as set out in the Certificate of Substantial Performance of the Work, and with respect to completed operations, coverage for a period of not less than thirty-six (36) months (or such other period as the Owner may in its discretion require) from the date of Substantial Performance of the Work. The policy shall be non-cancellable except as provided in the policy.</p>

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SC#	GC#	<u>Supplementary Conditions</u>
		<p>(b) Automobile Liability Insurance:</p> <p>The Contractor shall provide, maintain and pay for and shall require each of its Subcontractors to provide, maintain and pay for, automobile liability insurance in respect to licensed vehicles with limits of not less than five million dollars (\$5,000,000) inclusive per occurrence and which shall be in the Standard Owner's Form Automobile Policy providing third party liability and accident benefits insurance and covering all vehicles of every description and kind owned, leased or operated by or on behalf of the Contractor, or any person or persons for whom the Contractor is in law responsible.</p> <p>(c) Contractor's Equipment Insurance:</p> <p>The Contractor shall provide, maintain and pay for and shall require each of its Subcontractors to provide, maintain and pay for, "all-risk contractors' equipment insurance" covering construction machinery and equipment used by the Contractor or any of its trades or suppliers for the performance of the Work. Such insurance shall be in a form acceptable to the Owner and shall not allow subrogation claims by the Insurer against the Owner. Subject to satisfactory proof of financial capability by the Contractor for self-insurance of his equipment, the Owner agrees to waive the equipment insurance requirement, but the Contractor shall be deemed for the purposes of this Agreement to have satisfactorily taken out such insurance and indemnify the Owner to the same extent.</p> <p>(d) Additional Insurance</p> <p>The Contractor shall provide, maintain and pay for such other insurance not identified in this Schedule as is customary for a contractor to purchase and maintain in the Province in which the Project is located, which is to be clearly identified by the Contractor as to the risk insured, the rate applicable, the insured interest for the Owner, and such other information as the Owner may reasonably require. It is acknowledged and agreed that the Owner has the right to negotiate any or all of this Contractor Additional Insurance.</p> <p>11.1.2 Unless specified otherwise the duration of each insurance policy shall be from the date of commencement of the Work until the date of Substantial Performance of the Work as set out in the certificate of Substantial Performance of the Work. The Contractor shall be responsible for deductible amounts under all policies and for determining the deductible amount in respect of automobile liability and Contractor's equipment insurance. It shall be the responsibility of the Contractor not to violate, nor knowingly permit to be violated, any conditions of the policies maintained according to the provisions of this Section 11.1 and it shall be the Contractor's duty and responsibility to impose upon each Subcontractor the same responsibilities and obligations imposed upon the Contractor under such provisions.</p> <p>11.1.3 The Contractor (for itself and its insurers) hereby releases each of the Indemnified Parties and waives any rights, including rights of subrogation it may have against them for compensation for any loss or damage incurred by</p>

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SC#	GC#	<u>Supplementary Conditions</u>
		<p>the Contractor or its Subcontractors or loss of use of property of the Contractor or its Subcontractors. The foregoing release and waiver will operate so long as available in the Province where the Project is located.</p> <p>11.1.4 All insurance policies required to be taken out by the Contractor, or any of its Subcontractors, as required under this Section 11.1, shall be in a form acceptable to the Owner and shall contain a waiver of any subrogation rights which the Contractor's, or Subcontractors' as the case may be, insurers may have against the Owner and each of the other Indemnified Parties. All project specific insurance policies will be primary in nature.</p> <p>11.1.5 Each insurance policy provided by the Contractor or any Subcontractor shall be endorsed to provide the Owner with not less than thirty (30) days written notice of cancellation of the policy, except for non-payment of premium, in which case the statutory condition shall apply. The Contractor shall promptly provide the Owner with copies of any notices received by the Contractor from the insurer advising of any material change to any insurance policy arranged by the Contractor or any amendment to any such policy restricting coverage.</p> <p>11.1.6 The Contractor shall provide certificates of insurance evidencing the coverage as required above to the Owner prior to the commencement of the Work under this Agreement and shall promptly provide the Owner with a certified true copy of each insurance policy. A new certificate shall be provided promptly upon renewal of said insurance policies. The certificates shall confirm the obligation on the part of the insurer to provide at least thirty (30) days written notice of cancellation to the certificate holders. The renewed insurance policy shall be forwarded to the Owner at the address indicated in this Agreement.</p> <p>11.1.7 If the Contractor fails to provide or maintain insurance or indemnify the Indemnified Parties against claims, actions, expenses or loss as required in this Agreement, than the Owner shall have the right to provide and maintain such insurance or respond to such claims and give evidence thereof to the Contractor. The cost thereof plus a fifteen percent (15%) administrative fee shall be payable by the Contractor to the Owner on demand or the Owner may deduct the costs thereof from monies which are due or may become due to the Contractor.</p> <p>11.1.8 The Contractor or the Owner, as the case may be, hereby declares that "specimen" policy wordings are available upon request for examination by any party insured under any insurance policy provided and maintained by the Owner or the Contractor, as the case may be (an "Insured"), and it shall be the responsibility of each Insured to examine said policies and arrange, at its sole cost, for any additional protection any Insured may deem necessary.</p> <p>11.1.9 If so requested by any Insured the Contractor or the Owner, as the case may be, shall deliver to any Insured, at any time after the commencement of coverage under policies placed and maintained by the Owner, certificates of insurance evidencing that the applicable policy is in force.</p> <p>11.1.10 The policies described in this Section 11.1 to be obtained by the Contractor or</p>

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SC#	GC#	<u>Supplementary Conditions</u>
		<p>the Owner, as the case may be, will be placed and maintained with insurers and will contain terms and conditions determined by the Owner in its sole discretion. The Owner is not liable to the Contractor or any Subcontractor or any "Insured" for any deficiency or alleged deficiency in coverage, provided that the policies comply with the description set out in this Section 11.1 The Contractor shall place and maintain, and shall require all Subcontractors to place and maintain such other insurance as they may consider necessary or desirable for their own protection, including "Difference in Conditions", "Difference in Deductible", "Difference in Perils" and/or "Difference in Limits" for Commercial General Liability coverage, in each case at the sole expense of the Contractor and/or each Subcontractor.</p> <p>11.1.11 The Contractor hereby represents, warrants and covenants that its Contract Price does not include any allowance for insurance premiums, whether payable by the Contractor or a Subcontractor, for policies to be taken out by the Owner, of the type and to the extent of coverage described in this Section 11.1, including any "Difference in Conditions", "Difference in Deductible", "Difference in Perils" and/or "Difference in Limits" for Commercial General Liability coverage.</p> <p>11.1.12 Subject to GC 9.1 – PROTECTION OF WORK AND PROPERTY, in the event of damage or destruction to the Project, the Contractor shall immediately proceed to restore the Work and shall be entitled to receive from the Owner (in addition to any sum due under the Agreement) the amount of insurance proceeds received by the Owner relating to such property damage, pursuant to the insurance maintained by the Owner in accordance with Section 11.1.1(h) with respect to the cost of restoration of the Work, such amount not to be paid before the Owner has received the insurance proceeds under the insurance with respect to the restoration of the Work. Damage shall not affect the rights and obligations of either party under the Agreement except that the Contractor shall be entitled to such reasonable extension of time for Substantial Performance and Final Completion of the Work as the Consultant may decide.</p> <p>11.1.13 The Contractor and its Contractors and Sub-Contractors of every tier shall cooperate with the Owner's insurers and comply with all of their reasonable requirements.</p> <p>11.1.14 Claims Procedures:</p> <p>The Contractor will promptly submit a written report on all incidents involving bodily injury or property damage to the Contractor and to the Owner.</p>

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SC#	GC#	Supplementary Conditions
SC#79	GC-12.1:	<p>Delete all of paragraph 12.1.1 and replace it with the following:</p> <p>“12.1.1 The Contractor shall indemnify, hold harmless, and defend the Owner, its directors, officers, agents and employees from and against all claims, demands, losses, costs, including legal costs, damages, actions, suits or proceedings by whomever made, brought or prosecuted and in any manner based upon, arising out of, related to, occasioned by or attributable to the activities of the Contractor, its servants, agents or Subcontractors, in performing the Work or to any negligent acts or omissions of the Contractor, its servants, agents or subcontractors. This indemnification shall specifically include, but not be limited to, compliance or non-compliance with the occupational health & safety act governing the Place of the Work and under legislation or ordinances applying to such Work</p>
SC#80	GC-12.2:	<p>Add new paragraph 12.2.11 as follows:</p> <p>“12.2.11 Notwithstanding any provision to the contrary in this Contract, the Contractor expressly waives and releases the Owner and any of the Owner’s consultants, servants, employees or agents, from all claims, in any way related to the Contract for:</p> <p>(i) indirect losses; and</p> <p>(ii) consequential damages;</p> <p>including, without limiting the generality of the foregoing, claims for loss of profit, extra, extended or unallocable overheads or any indirect increased cost or expense.”</p>
SC#81	GC-12.3.1: “12.3.1	<p>Delete paragraph 12.3.1 and replace with the following:</p> <p>The Contractor warrants that the Work is free from any defect in workmanship and materials and complies in all respects with the provisions of the Contract Documents and the Contractor agrees to correct promptly, at his own expense, defects or deficiencies in the Work which appear (i) in the case of Work covered by the extended warranties set out in the Specifications, prior to the end of the extended warranty period and (ii) in the case of all other Work, prior to and during the period of one year from the date of Substantial Performance of the Work. The Contractor shall also pay at his own expense for any damage to other work or property or to Persons resulting from any defects or deficiencies in the Work which appear during the warranty period. The carrying out of the replacement work and the making good of all defects shall be executed at such time as is convenient to the Owner and this may entail overtime work on the part of the Contractor. Additional charges for overtime work in this regard shall be borne by the Contractor at his expense. These warranties shall enure to the benefit of any subsequent owner of the Project or any part thereof.”</p>
SC#82	GC-12.3.3:	Delete the words “, through the Consultant,” and “one year” from paragraph 12.3.3.
SC#83	GC-12.3.4:	Add “Except for the provisions of paragraph 12.3.6 and” to the beginning of paragraph 12.3.4.

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SC#	GC#	<u>Supplementary Conditions</u>
		Delete “one year warranty period” at the end of paragraph 12.3.4 and replace it with “warranty periods specified in the Contract Documents.”
SC#84	GC-12.3.6: “12.3.6	Delete paragraph 12.3.6 in its entirety and replace it with the following: The Contractor shall be responsible for obtaining Product warranties in excess of one year on behalf of the Owner from the manufacturer. The Product warranties shall be issued by the manufacturer in favour of the Owner or if not issued to the Owner extended warranties beyond the standard one year warranty after the date of acceptance of the Work will be assigned to the Owner. The Contractor shall ensure that such warranties commence on the date of completion of the Work as approved of by the Consultant and the Owner. The Contractor shall remain jointly liable with the manufacturer to the Owner with respect to such Products Warranties to the extent required in the Contract Documents, notwithstanding any limitation in the manufacturer’s warranty.”
SC#85	GC-12.3.7:	Insert the following new paragraph 12.3.7 after paragraph 12.3.6: “12.3.7 If any defect is corrected under the conditions of GC 12.3 – WARRANTY, the time period for the warranty in that particular item in the Work shall begin again from the date when the defect is corrected and if such defect be corrected more than once the time period for warranty applicable shall begin again from the latest date when such defect is corrected.” 12.3.9 The foregoing warranty in paragraph 12.3.1 shall not limit the extended warranty on any items of equipment or material called for elsewhere in the specifications. 12.3.10 The Contractor shall, to the extent permitted by manufacturers and suppliers, assign to the Owner, the benefit of any guarantee or warranty by any manufacturer or supplier in addition to the warranty as provided in Subsection 12.3.6 above. 12.3.11 The Contractor shall commence to correct any deficiency within 5 Working Days after receiving a notice from the Owner, and complete the Work as expeditiously as possible, except that in case the deficiency would prevent maintaining security or keep basic systems essential to the ongoing business of the Owner operational as designed, in which case all necessary corrections and/or installation of temporary replacements shall be carried out immediately as an emergency service. Should the Contractor fail to provide this emergency service within 8 hours of a request made during normal business hours of the Contractor, the Owner is authorized, regardless of paragraph GC 3.1.1 of the General Conditions to carry out all necessary repairs or replacements at the Contractor’s expense. 12.3.12 The carrying out of replacement work and the making good of defects that are the responsibility of the Contractor shall be at the sole cost of the Contractor and shall be executed at times convenient to the Owner.”

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SC#	GC#	<u>Supplementary Conditions</u>
SC#86	GC 13.1	<p>Add Part 13 – MISCELLANEOUS as follows:</p> <p>“GC 13.1 – SET OFF</p> <p>13.1.1 The Owner shall be entitled to deduct from or set off against any payment of the Contract Price and any other amounts payable by the Owner to the Contractor under this Agreement:</p> <ul style="list-style-type: none">.1 Any amount expended by the Owner in exercising the Owner’s rights under this Agreement to perform any of the Contractor’s obligations that the Contractor has failed to perform;.2 Any amount paid by the Owner directly to Subcontractors in respect of Work for which the Owner previously paid the Contractor;.3 Any damages, costs or expenses (including, without limitation, reasonable legal fees and expenses) incurred by the Owner as a result of the failure of the Contractor to perform any of its obligations under this Agreement;.4 A reasonable amount on account of any outstanding Work or any outstanding deficiencies; and,.5 Any other amount owing from the Contractor to the Owner under this Agreement.”

END OF SUPPLEMENTARY
CONDITIONS

Exhibit "2"

Statutory Declaration

**TO BE MADE BY THE CONTRACTOR WHEN APPLYING FOR PROGRESS PAYMENT
OR FOR RELEASE OF HOLDBACK, SECURITY DEPOSIT OR BOTH UPON
SUBSTANTIAL OR TOTAL PERFORMANCE**

CANADA)	IN THE MATTER OF THE CONTRACT
)	BETWEEN •,
PROVINCE OF ONTARIO)	OWNER AND •
)	COMPANY, CONTRACTOR FOR THE
)	•WORK ON PREMISES
TO WIT:)	LOCATED AT •,
)	IN THE PROVINCE OF ONTARIO
)	

I, _____ of the _____ of _____ in the Province of ONTARIO,
do hereby DECLARE THAT:

1. I am _____ of _____, the Contractor named in the Contract abovementioned, and as such have personal knowledge of the facts hereunder declared.
2. All accounts for labour, subcontracts, products, construction machinery and equipment and other indebtedness which may have been incurred by the Contractor in the performance of the Work (as defined in the Contract) and for which the Owner might in any way be held responsible have been paid in full except holdback monies properly retained.
3. There are no claims for lien registered against the Owner or the Place of the Work (as defined in the Contract) and I am not aware of any grounds supporting any claim for lien against the Owner. The Contractor has not received any notice of adjudication or other claims from any Subcontractor or Supplier relating to the Work that it has not previously disclosed to the Owner.
4. I MAKE THIS SOLEMN DECLARATION conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath.

DECLARED before me at the **[City/Town/etc.]**)
of **[name]**)
in the Province of Ontario)
day of **[month]** 20__) _____

A Commissioner, etc.

General Requirements (CCDC2-2020)

01 10 00 – General Requirements

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GR13	Fire and Life Safety
GR14	Testing and Balancing of Systems
GR15	Systems Demonstrations
GR16	Contract Closeout

General Requirements (CCDC2-2020)

- 1 Summary of Work
 - 1.1 GENERAL**
 - 1.1.1 Unless specified otherwise, instructions and requirements specified in this section shall apply to all sections of the Work.
 - 1.1.2 The Contractor is responsible for directing and implementing all the Work shown and specified, including construction facilities and requirements specified herein.
 - 1.1.3 The Contractor takes sole responsibility for and division of Work among Subcontractors and Suppliers. The Consultant assumes no liability to act as an arbiter to establish subcontract limits between sections or divisions of Work.
 - 1.1.4 Do not scale Drawings. Use dimensions indicated.
 - 1.2 COVID-19 PROTOCOLS**
 - 1.2.1 Follow standards and practices for protection of all site personnel and the surrounding communities as identified in the latest version of the COVID-19 Standardized Protocols for All Canadian Construction Sites prepared by the Canadian Construction Association.
 - 1.2.1.1 Retain copies of the latest COVID-19 Standardized Protocols for All Canadian Construction Sites on site. Make master copy readily available in Site Office for review and update.
 - 1.3 DEFINITIONS**
 - 1.3.1 Provide - This term means to Furnish, install, connect and connect, complete and in place, including accessories, finishes, tests, and services required to render item so specified complete ready for use.
 - 1.3.2 Furnish - This term means fabrication or procurement of materials, equipment, or components, or performance of services to the extent specified and shown. Where used with respect to materials, equipment, or components, the term includes crating and delivery to Project site but is not intended to include installation of item, either temporary or final.
 - 1.3.3 Install - This term means placement of materials, equipment, or components, including receiving, unloading, transporting, storage, uncrating and installing, and performance of such testing and finish Work as is compatible with degree of installation specified.
 - 1.3.4 Overhead - 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 Place of the Work; all requirements of Division 1, including but not limited to submittals, warranty, quality control, insurance and bonding; calculations, testing and inspections; meals and accommodations; and, tools, expendables and clean-up costs.
 - 1.3.5 Request for Information (RFI).: A formal process used during the bid and construction phase to facilitate communication between the Contractor and the Consultant with regard to requests for Additional Information and clarification of the intent of the Contract Documents (Drawings and Specifications).

General Requirements (CCDC2-2020)

1.4 EXAMINATION OF BID DOCUMENTS

- 1.4.1 Read all the Bid Documents in conjunction with one another. It is the Contractor's responsibility to examine all Bid Documents as soon as possible upon receipt thereof and if he discovers any discrepancies, omissions, errors, ambiguities or conflicts in or among the Bid Documents, or be in doubt as to their meaning or intent, shall have bring such matters to the attention of the Consultant at least five (5) Business Days prior to the date set for receiving Bids.
- 1.4.2 The Contractor understands and agrees that where a discrepancy in Products or systems between Consultant Drawings and that which is written in the Specifications exists, Contractor shall have allowed in its Bid for the most expensive Product or system indicated, and a Request for Information (RFI) issued to the Consultant to clarify the issue at no increase in Contract Price.
- 1.4.3 Contractor shall avoid submitting RFI's on information readily available within the Contract Documents.
- 1.4.4 Refer to Article GR3 for Submittal Procedures.

1.5 WORK OF THE CONTRACT

- 1.5.1 Work of this Contract is comprised of the supply of all material, equipment and labour necessary for the complete construction of new works, alterations and additions and all other related Work as shown on the Contract Drawings, specified herein or both, all in accordance with the terms of the Contract.

1.6 REFERENCE STANDARDS

- 1.6.1 Reference Standard Edition dates are not specified. It is to be considered that references to manufacturer's and published codes, standards and specifications are made to the latest edition (revision) approved by the issuing organization, current at the date of this Specification.
- 1.6.2 Reference standards and specifications are quoted in this Specification to establish minimum standards. Work of quality or of performance characteristics that exceeds these minimum standards will be considered to conform.
- 1.6.3 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information or storing, handling, preparing, mixing, installing, erecting, applying or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.
- 1.6.4 Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in the Specifications, always available at construction site.

1.7 DRAWINGS AND INSTALLATION

- 1.7.1 The Drawings are intended to show the general character and scope of the Work and not necessarily the detail design, or exact details of the installation. The Contractor shall provide all items, articles, materials, services and incidentals, including detail design with Drawings, whether or not expressly specified or shown on Drawings, to make finished Work complete and fully operational, consistent with the intent of the Contract Documents.
- 1.7.2 Provide all Work, goods and services that are listed or shown, or that may reasonably be inferred from the Contract Documents, as being required to produce the intended result.

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- 1.7.3 The location, arrangement and connection of equipment and materials shown on the Drawings represent a close approximation to the intent and requirements of the Contract. The right is reserved by the Consultant to make reasonable changes required to accommodate conditions arising during the progress of the Work, at no extra cost to the Owner.
- 1.7.4 The location and size of existing services shown on the Drawings are based on the best available information. The actual location of existing services shall be verified in the field before Work is commenced.
- 1.7.5 Changes and modifications necessary to ensure coordination and avoidance of interference and conflicts with other trades or to accommodate existing conditions, shall be made at no extra cost to the Owner.
- 1.7.6 Where RFIs are received requesting clarification of information which, in the opinion of the Consultant, is clearly contained within the Contract Documents, the completed RFI will be returned to the Contractor with the appropriate reference to the Contract Documents. At the Consultant's and Owner's discretion, a \$200.00 Consultant's fee for this service will be levied on the Contractor, and deducted from the Contract Price via a Change Order.
- 1.8 EXISTING CONDITIONS**
- 1.8.1 Where Work of this Contract occurs in an existing space, certain new installations may be dependent upon existing conditions for support as indicated on Drawings. By way of a Site visit during Bidding period, the Contractor shall, carefully examine such existing conditions and satisfy itself as to the structural adequacy of such existing substrates. By commencing Work in the field, Contractor implies acceptance of existing conditions.
- 1.9 CULTURAL HERITAGE RESOURCES**
- 1.9.1 If cultural heritage resources are encountered during performance of Work, contact Consultant immediately and suspend Work in immediate area until assessment has been completed by Ministry of Culture, Tourism and Recreation. Perform required measures to mitigate negative impacts on found resources to acceptance of Consultant. Cultural Heritage Resources include but are not limited to: archaeological sites, artifacts, building and structural remains, and/or human burials.
- 1.10 REGULATORY REQUIREMENTS DOCUMENTS**
- 1.10.1 The Drawings and Specifications shall not be so construed as to be in conflict with any law, by-law or regulation of the municipal, provincial or other authorities having jurisdiction. Work shall be performed in conformity with all such laws, by-laws and regulations.
- 1.10.2 Contract forms, codes, Specifications, standards, manuals and installation, application and maintenance instructions referred to in the Specifications are to be of the latest published editions at the date of signing the Contract.
- 1.10.3 In addition to codes and standards specified in individual sections of the Specifications, comply with the latest edition of the following:
- 1.10.3.1 American Society for Testing and Materials
 - 1.10.3.2 Canadian Construction Association
 - 1.10.3.3 Canadian General Standards Board
 - 1.10.3.4 Canadian Standards Association
 - 1.10.3.5 National Building Code of Canada
 - 1.10.3.6 National Fire Prevention Association
 - 1.10.3.7 National Standards of Canada

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- 1.10.3.8 Alberta Building Code
- 1.10.3.9 Ontario Ministry of the Environment
- 1.10.3.10 Ontario Ministry of Labour
- 1.10.3.11 Ontario Occupational Health and Safety Association
- 1.10.3.12 Underwriters' Laboratories of Canada
- 1.10.3.13 The Aluminum Association

1.11 PERMITS

- 1.11.1 The Owner will apply and pay for the building permit. Contractor shall expedite and pick up the building permit.
- 1.11.2 The Contractor shall apply and pay for all other permits from all authorities having jurisdiction, including, where required, inspection fees and permits. Additionally, the Contractor shall:
 - 1.11.2.1 Ensure that no Work whatsoever is undertaken which is conditional on permits, approvals, guarantees, until certain that all conditions necessary to obtain these are met. No time extensions will be allowed by the Owner for obtaining necessary permits.
 - 1.11.2.2 Report to the Consultant in writing, any condition which would prohibit granting of any permit or approval before any Work affecting such items is commenced.

1.12 CONSTRUCTOR

- 1.12.1 The Contractor shall be the "Constructor" as defined in the Occupational Health and Safety Act. As such, the Contractor shall be responsible for ensuring that the provisions of the statutes, regulations and by-laws pertaining to the duties, obligations, and safe performance of the Work in accordance with the obligations of the Constructor as set out in the Occupational Health and Safety Act are observed.

- 2 Allowances

NOT USED

- 3 Submittals

3.1 GENERAL

- 3.1.1 Refer to Section 01 33 00.

3.2 EARNED VALUE

- 3.2.1 Within 10 working days of the award of Contract, provide an earned value schedule that indicates the planned value of monthly Work for the duration of the Project.

3.3 MONTHLY EARNED VALUE PROGRESS

- 3.3.1 With each monthly progress claim provide an "S" curve indicating the actual earned progress compared against the planned earned progress.

- 4 Project Coordination

4.1 GENERAL

- 4.1.1 Ensure that the Contract Documents are fully coordinated with all trades involved in the Project.
- 4.1.2 Coordinate progress of the Work, progress schedules, submittals, use of Site, temporary utilities, construction facilities and construction Work, in conjunction with the progress of work of other Contractors.

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- 4.1.3 Ensure all trades cooperate with and work together so that the Work will fit together and make a complete and satisfactory job in every detail. Ensure each Subcontractor maintains its own quality assurance program.
- 4.1.4 Comply with Owner's instructions for access to Owner occupied areas.
- 4.2 CONSTRUCTION ORGANIZATION AND START-UP**
- 4.2.1 Comply with Contract requirements for staging areas of the Site; field offices and storage areas; access and parking facilities, and temporary utilities and construction facilities.
- 4.3 WORK SEQUENCE**
- 4.3.1 Coordinate the stages of Work to accommodate Project requirements during construction; and the sequence and direction of execution to meet Project schedule.
- 4.3.2 Coordinate the progress schedule with the Owner's requirements during construction.
- 4.3.3 Construct Work in stages or manner to provide for continuous operation of the entire facility. Do not close off public or Owner usage of any area of the Site which are not defined as part of the Contractor's work areas.
- 4.4 COORDINATION AND INTERFERENCE DRAWINGS**
- 4.4.1 The purpose of the interference Drawings coordination is to enable efficient use of available space, proper sequencing of the Work, and to resolve conflicts or interferences at no extra cost to the Owner. Sequence the production and review of interference Drawings in advance of the actual Work being performed to allow construction to proceed as scheduled.
- 4.4.2 Coordinate placement of materials and equipment to ensure that all components will be properly accommodated within the spaces provided prior to commencement of Work.
- 4.4.3 Take complete responsibility for any remedial Work that results from failure to coordinate any aspect of the Work prior to its fabrication/installation.
- 4.4.4 Ensure that all accesses and clearances required by jurisdictional authorities and/or for easy maintenance of equipment are provided in the layout of equipment and services.
- 4.4.5 Prepare interference Drawings indicating the co-relation of the architectural, mechanical, electrical, and security/communications and the building structure, and review with trades at Contractor's coordination meetings. Agree with trades on proposed installation and routing of systems prior to installation. Interference Drawings shall contain information based on reviewed Shop Drawings.
- 4.4.6 Prepare and distribute minutes of interference coordination meetings to all parties.
- 4.5 CONTRACTOR'S USE OF PREMISES**
- 4.5.1 Carry out Work in such manner as to cause a minimum of noise or interference to adjacent properties. Secure the approval of authorities having jurisdiction before proceeding with any Work which may cause interference. Provide all necessary precautions to protect existing property and people.
- 4.5.2 Coordinate use of premises with Owner to avoid interference with the Owner's normal operations of the facility.
- 4.5.3 Assume full responsibility for protection and security of Products and Work under this Contract.
- 4.5.4 Limit operations to the prescribed areas including installation operations, storage areas and movement of vehicles and equipment.

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- 4.5.5 Access and egress to and from the Site of Work areas shall be by the prescribed routes only.
- 4.5.6 Allow free and unrestrictive access to the Site by Owner, Consultant or his Representatives, or by any authorized person representing the Owner, and allow them to enter upon and inspect any or all parts of the Work under this Contract.
- 4.6 HOURS OF WORK**
- 4.6.1 Schedule and perform the Work to meet completion date.
- 4.7 PARTIAL OWNER OCCUPANCY**
- 4.7.1 Schedule and substantially complete designated portions of Work for Owner's occupancy prior to Substantial Performance of entire Work.
- 4.8 PRE-ORDERED PRODUCTS / PRE-TENDERED WORK**
- 4.8.1 Owner has placed orders (pre-tendered work with Suppliers for specific work (Products)) to expedite the Work of this Contract and for other purposes in the Owner's interest.
- 4.8.2 On execution of Owner-Contractor agreement, execute an agreement with the designated Supplier in accordance with terms stated in the Reference Documents.
- 4.8.3 Contractor's responsibility for purchase, handling and installation for pre-ordered Products shall be regarded in the same manner as other Contractor-furnished Products.
- 4.8.4 Determine the extent and scope of the general requirements to be provided by pre-tendered Subcontractors as defined in the reference documents and provide additional requirements and services necessary to all such Subcontractors to carry out their Work.
- 4.8.5 Be responsible for the proper determination and scheduling of the Work and the necessary coordination of services provided by all assigned and/or pre-tendered Subcontractors, in order to minimize on-site disruptions in the flow of the Work and to maintain continuity of progress of the Work.
- 4.8.6 Pre-Ordered Items: Contractor's Responsibilities
- 4.8.6.1 Designate submittal and delivery dates for each Product pre-ordered by Owner, in the construction progress schedule.
- 4.8.6.2 Review Shop Drawings, Product data, and other submittals. Submit to Consultant notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
- 4.8.6.3 Arrange and pay for delivery of material/equipment to Site in accordance with progress schedule.
- 4.8.6.4 Receive and unload Products at Site.
- 4.8.6.5 Inspect deliveries jointly with Construction Manager.
- 4.8.6.6 Submit claims for transportation damage.
- 4.8.6.7 Arrange for replacement of damaged, defective or missing items.
- 4.8.6.8 Inspect deliveries jointly with Construction Manager, record shortages and/or damaged or defective items.
- 4.8.6.9 Handle Products at Site, including uncrating and storage.
- 4.8.6.10 Protect Products from damage and from exposure to elements.
- 4.8.6.11 Assemble, install, connect, adjust and commission Products as required.
- 4.8.6.12 Provide installation and inspections as required by public authorities.
- 4.8.6.13 Arrange for manufacturer's field services and submit all manufacturers' Warranties to Subcontractor.
- 4.8.6.14 Repair or replace items damaged by Sub-subcontractor on Site under Subcontractor control.

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4.9 OWNER-FURNISHED ITEMS

4.9.1 Owner's Responsibilities:

- 4.9.2 Arrange for delivery of Shop Drawings, Product data, samples, manufacturer's instructions and certificates.
- 4.9.3 Submit Supplier's bill of material to Contractor.
- 4.9.4 Arrange and pay for delivery of material/equipment to Site in accordance with progress schedule.
- 4.9.5 Inspect deliveries jointly with Contractor.
- 4.9.6 Submit claims for transportation damage.
- 4.9.7 Arrange for replacement of damaged, defective or missing items.
- 4.9.8 Arrange for manufacturers' field services and submit all manufacturers' warranties to Contractor.

4.9.9 Contractor's Responsibilities:

- 4.9.9.1 Designate submittal and delivery dates for each Product supplied by Owner, in the construction progress schedule.
- 4.9.9.2 Review Shop Drawings, Product data, samples, and other submittals. Submit to Consultant notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
- 4.9.9.3 Receive and unload Products at Site.
- 4.9.9.4 Inspect deliveries jointly with Owner, record shortages and/or damaged or defective items.
- 4.9.9.5 Handle Products at Site, including uncrating and storage.
- 4.9.9.6 Protect Products from damage and from exposure to elements.
- 4.9.9.7 Assemble, install, connect, adjust and finish Products as required.
- 4.9.9.8 Provide for installation and inspections as required by public authorities.
- 4.9.9.9 Repair or replace items damaged by Contractor or Subcontractor on Site under Contractor control.

4.9.10 Contractor-Furnished Products:

- 4.9.10.1 Inspect equipment during manufacture.
- 4.9.10.2 Arrange for Consultant to visit equipment manufacturer's plant when requested.
- 4.9.10.3 Inform Consultant of manufacturer's progress.
- 4.9.10.4 Action taken as a result of factory inspection shall not be construed as final acceptance.
- 4.9.10.5 Where inspection and testing of Products is carried out at the premises of Contractors, submit test reports to Consultant. Refer to test reports.
- 4.9.10.6 Repair or replace items with defects revealed as a result of inspection or tests.

4.10 SUPERINTENDENTS

- 4.10.1 Provide the following full time staff with responsibilities as stated below. All staff shall have relevant formal training and experience with similar Project size and complexity.

- 4.10.1.1 **Project Manager, Construction Manager, or Site Superintendent:** responsible for managing all administrative aspects of the Project including administration of Contracts and changes with the Owner, the Subcontractors and Suppliers. This role will also include for administration of all Contract administration documents required by the Contract Documents including schedules, logs, reports, meeting minutes, RFI's, Site instruction, change orders, change directives, and monthly progress payment invoice. This person shall be on Site full time for the complete duration of the Project and must chair the site kick-off meeting, and the regular progress and coordination meetings.

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- 4.10.1.2 **Site Engineer** or **Site Coordinator**: responsible for planning and coordination of the Work, review of submittals and Shop Drawings, maintaining as-built records, and assisting the Site Superintendent and Construction Manager. This person shall be on Site full time for the complete duration of the Project.
- 4.10.2 Provide **Foremen** as necessary to direct and control the Work on Site, such personnel to be well experienced, competent in their specialized fields and having full knowledge and experience in directing the Work under their charge.
- 4.10.3 In addition to the full time superintendent that the Contractor shall place in full charge of the Work on Site, ensure that each major Subcontractor maintains a full time superintendent to be in charge and responsible for their respective Work and who shall report to the Contractor's site superintendent.
- 5 Project Meetings
- 5.1 ADMINISTRATIVE**
- 5.1.1 Schedule and administer Project meetings throughout the progress of the Work.
- 5.1.2 Notify in writing, Owner and Consultant to attend meeting a minimum of one week in advance of meeting.
- 5.1.3 Prepare agenda for the meeting.
- 5.1.4 Provide physical space and make arrangements for meetings.
- 5.1.5 Record the minutes. Include significant proceedings and decisions. Identify "action by" parties.
- 5.1.6 Reproduce and distribute copies of minutes no later than three Working Days after each meeting and transmit to meeting participants, including affected parties not in attendance.
- 5.1.7 Representatives of Contractor, Subcontractor and Suppliers attending meetings shall be qualified and authorized to act on behalf of the party each represents.
- 5.2 KICK-OFF MEETING**
- 5.2.1 Arrange a kick-off meeting immediately upon award of Contract. Ensure attendance by authorized Representatives of Owner, Consultant and Subcontractors. The purpose of this meeting is to commence the Work under this Contract, to acquaint the Contractor's and Owner's designated personnel with each other, and to discuss methods and means by which full cooperation and coordination of all participants can be achieved during the execution of the Work.
- 5.3 PRECONSTRUCTION MEETING**
- 5.3.1 A preconstruction meeting will be held one (1) week after award of Contract. The Contractor will be responsible for the following:
- 5.3.1.1 Meeting room of appropriate size to suit number of people at local hotel.
- 5.3.1.2 Prepare invitation list following the kick-off meeting, for review by Consultant. Invitation list shall consist of Consultant's, Owner's and tenant's Construction Managers, all sub-trades, local officials and local inspectors.
- 5.3.1.3 Prepare minutes of meeting and distribute to all parties concerned within seventy-two (72) hours.
- 5.3.1.4 All costs incurred for the preconstruction meeting will be the Contractors.
- 5.3.2 Discuss at the meeting the means by which full co-operation and co-ordination of the participants during construction can be achieved.

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5.3.3 Document the responsibilities and necessary activities of the participants during construction as discussed, and distribute documentation to each participant.

5.3.4 At the preconstruction meetings, the Contractor shall also present and prepare updated scheduling, participate in construction methods and recommendations, prepare budgets and Provide material selection advice.

5.4 PROGRESS AND COORDINATION MEETINGS

5.4.1 Conduct and record bi-weekly progress and coordination meetings as required by the Owner. Ensure responsible persons attend who have the required authority to commit Contractor to carry out agreements reached at the meeting. Subcontractors, material Suppliers and others shall be in attendance as requested.

5.4.2 Agenda may include, but is not limited to, the following:

5.4.2.1 Review, approval of minutes of previous meeting;

5.4.2.2 Review of Work progress since previous meeting;

5.4.2.3 Field observations, problems, conflicts and interferences

5.4.2.4 Problems which impede construction schedule;

5.4.2.5 Review of off-site fabrication delivery schedules;

5.4.2.6 Corrective measures and procedures to regain Project schedule;

5.4.2.7 Revisions to construction schedule;

5.4.2.8 Progress, schedule, during forthcoming work period;

5.4.2.9 Review submittal schedules; expedite as required;

5.4.2.10 Maintenance of quality standards;

5.4.2.11 Pending changes and substitutions;

5.4.2.12 Review proposed changes for effect on construction schedule and on completion date;

5.4.2.13 Other business.

5.4.3 Record, prepare and distribute minutes of each meeting to the Owner's and tenant's Construction Managers and Consultant, and to each other participant and general distribution as required by the Owner, tenant and Consultant. Minutes of each meeting shall be distributed within seventy-two (72) hours of the subject meeting. Minutes of meeting to contain 'Action By' and 'Date required' columns.

6 Schedules

6.1 SCHEDULES REQUIRED

6.1.1 Engineering and fabrication schedules and sub-order schedule.

6.1.2 Construction schedules.

6.1.3 Work schedule with manpower loading.

6.1.4 Submittal Schedule for System Design and Engineering, Shop Drawings, Product Data, As-Built Drawings, Operating and Maintenance Manuals, Samples.

6.1.5 Cash Flow Schedule.

6.2 SUBMISSION

6.2.1 Submit initial schedules within seven days after award of Contract.

6.2.2 Owner will review schedule and return reviewed copy within two days after receipt.

6.2.3 Resubmit finalized schedule within three days after return of reviewed copy.

6.2.4 Submit updated progress schedule with each application for payment and as otherwise instructed by Owner.

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6.2.5 Distribute copies of the reviewed schedule to job Site, Subcontractors and other concerned parties.

6.3 WEATHER

6.3.1 Incorporate into the Contract schedule, allowances for the number of Working Days lost due to inclement weather, which can be anticipated on the basis of analysis of information from Environment Canada.

6.3.2 The Contractor may be entitled to a schedule extension for those activities on the critical path that are delayed on account of inclement weather. This is assessed based on average seasonal public records on file with the Ministry of Environment, Conservation and Parks and 10-year weather patterns.

6.3.3 No additional payment will be made on account of any such schedule extension. For the purpose of this clause the quarters are defined as January 1st to March 31st, April 1st to June 30th, July 1st to September 30th and October 1st to December 31st.

6.4 RESPONSIBILITY

6.4.1 Perform overall planning and control of the Project.

6.4.2 Plan and schedule the Work to provide a continuous and efficient flow of the Work to achieve the Contract completion date.

6.4.3 Develop a detailed schedule as previously described, based on sequencing, phasing, and direction of installation required by the Project.

6.4.4 At the regular scheduling meetings, report on the actual progress of each element of Work, including work of Subcontractors.

6.4.5 Report on firm established delivery and/or start dates for all critical material and equipment, of own trades and of Subcontractors. Immediate notice shall be given to the Owner of all problems or anticipated problems in respect of deliveries of critical materials or trade operations.

6.5 ENGINEERING AND FABRICATION SCHEDULE

6.5.1 Develop and implement an engineering and fabrication schedule as follows:

6.5.1.1 Immediately following award of the Contract, submit a preliminary schedule showing major Work elements of the Contract, for discussion and review with the Consultant.

6.5.1.2 Revise as required and fix dates of major elements of the Work. Prepare the schedule of Work for the Contract in sufficient detail to allow proper control and coordination of Work, including design Work, material and equipment procurement, and work of Subcontractors. Fix firm dates for completion on Work on which related work is dependent.

6.5.1.3 Review revised and detailed schedule with the Consultant, the finalized schedule commitment of Contractor, and provide the basis of schedule control of the Work.

6.5.2 Provide weekly fabrication progress schedule or when requested by the Owner, report on the actual progress of each element of work, including work of Subcontractors and design subowner.

6.5.2.1 In the event of any change from the scheduled progress, notify the Owner immediately and take such measures as are necessary to ensure the scheduled rate of progress. Reschedule as necessary throughout the course of the Work so that the schedule at all times reflects the actual progress of the Work.

6.5.3 Provide sub-order schedule of major equipment or components and update as required by Owner.

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6.5.4 Report on firm established delivery and/or start dates for critical materials and equipment. Immediate notice shall be given to the Owner of problems or anticipated problems in respect of deliveries of critical materials

6.6 CONSTRUCTION SCHEDULES

6.6.1 Develop a detailed schedule in the following format, as previously described, based on sequencing, phasing, and direction of installation required by the Project.

6.6.1.1 Prepare schedule in the form of a horizontal bar chart and with manpower loading figures based on average weekly loading.

6.6.1.2 Provide a separate bar line for each trade or operation. Identify all tie-ins to Owner's existing facilities.

6.6.1.3 Provide horizontal time scale identifying the first work day of each week.

6.6.1.4 Format in chronological order of the start of each item of Work.

6.6.1.5 Format schedules to allow plotting of actual progress against scheduled progress.

6.6.2 Update for progress and submit weekly or as requested by Owner.

6.7 SHOP DRAWINGS AND PRODUCT DATA

6.7.1 Contractor's detailed schedule of Work or a separate schedule shall identify the development and submission of Shop Drawings and submission of Product data.

6.7.2 Agree with Owner on a Shop Drawing numbering system to be used for this Project.

6.7.3 At the start of the Project, review the Contract Documents and compile a submittal schedule which shall include all submittals required by the Contract Documents. Coordinate the submittal schedule with the construction schedule, show all scheduled dates the submittals are to be submitted, and the latest review return date from the Consultant.

6.8 CASH FLOW SCHEDULE

6.8.1 Submit one month prior to the first application for payment, a cash flow schedule by month for the duration of the Contract, based on net payments. Identify holdback releases.

6.8.2 Update as required to reflect Contract changes or as requested by Owner.

6.9 SCHEDULE UPDATES

6.9.1 For the purpose of administering this Contract, 'Schedule Update' shall be defined as the process of applying actual and projected progress information, gathered on a single point in time, to the Contract Construction Schedule. Progress information to be included in schedule updates includes actual start and finish dates for all activities in progress during the reporting period. Schedule updates may also include minor changes in activity descriptions, for the purpose of clarity. Updating the schedule does not include revision of any numeric data, such as activity durations, logic or constrained dates.

6.9.2 Once a week, the Contractor's representative shall gather current progress information as of a given date, (Data, Date) and process the updated data and produce a "Full Progress Schedule", in a format similar to the Contract Construction Schedule, which displays all the schedule activities and current progress compared to the original Target Schedule.

6.9.3 If the current schedule update indicates that the current critical path(s) of the schedule are in jeopardy, the Owner may direct the Contractor to take such corrective action as may be necessary to recover from the delay(s).

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6.10 SCHEDULE REVISIONS

- 6.10.1 If the Contractor wishes to make changes in his method of operating and/or sequencing of the Work, he shall notify the Owner in writing stating the reasons for the changes, and provide a written description of the proposed schedule revisions. Upon review and approval of the changes the Owner will direct its schedule consultant to provide a reproducible copy of the revised Construction Contract Schedule, which will be jointly signed by the Owner and the Contractor, signifying acceptance by both parties. At a minimum, proposed schedule revisions may not delay contractual milestone dates, alter interfacing with other contractors, modify the overall flow of the Work, or result in an increase in the Contact Price.
- 6.10.2 From time-to-time, the Owner or the Contractor may identify minor revisions to the approved Contract Construction Schedule which better represent the intent of the construction plan. Such minor revisions will be incorporated into the approved Construction Schedule upon agreement by the Owner and the Contractor and will be documented in writing

6.11 RECOVERY PLAN

- 6.11.1 Should the updated Construction Schedule show the Contractor to be one (1) week or more behind schedule on the critical path activities, the Contractor shall advise the Owner and Consultant in writing of any variation from the baseline or slippage in the Construction Contract Schedule. The Contractor shall immediately devise a plan for recovery of the lost time within the subsequent reporting period. The Contractor's recovery plan will be reviewed at the job site Progress Meeting, or as soon as possible thereafter. Once approved by the Owner in writing, the Contractor shall immediately put the recovery plan into action.

7 Quality Control

7.1 INSPECTION AND TESTING BY CONTRACTOR

- 7.1.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.
- 7.1.2 Retain the services of Inspectors for the purpose of maintaining quality assurance and compliance with the Contract Documents. Reports by Inspectors shall in no way relieve the Contractor of his obligation to perform the work in accordance with the Contract Documents, or to maintain his own quality control.
- 7.1.3 Cost of inspection and testing shall be paid by the Contractor, where so specified. Additional inspection and testing required for Owner's quality control will be paid by the Owner, except as otherwise stipulated in the Contract Documents.
- 7.1.4 Inspectors shall be authorized to operate in the Province of of the Work.
- 7.1.4.1 Inspectors required to provide laboratory services shall meet "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories.
- 7.1.5 The cost of supplying materials, products, and labour for testing purposes, and erection of entire mock-ups, prototypes, and sample installations where specified, shall be borne by the Contractor and constitutes a part of the Work.

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7.2 INSPECTION AND TESTING BY INDEPENDENT AGENCIES

- 7.2.1 Independent inspection/testing firms may be engaged by Owner for the purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner.
- 7.2.2 Employment of inspection/testing firms does not relieve the Contractor's responsibility to perform Work in accordance with Contract Documents. Defective materials and/or workmanship may be rejected, regardless of previous inspection, whenever found.
- 7.2.3 Provide assistance required for executing inspection and testing by the appointed firms. Allow access and facilities for inspection and testing.
- 7.2.4 If defects are revealed during inspection and/or testing, the Owner will request additional inspection and/or testing to ascertain the full degree of the defect. Correct defects and irregularities as advised by Owner at no cost to Owner. Pay costs for retesting and re-inspection.

7.3 CONTRACTOR'S QUALITY CONTROL

- 7.3.1 Contractor shall maintain his own quality control to ensure that the requirements of the Contract Documents are attained.
- 7.3.2 Co-operate with Inspector's personnel. Provide access to work, and to manufacturer's operations to facilitate execution of required services.
- 7.3.3 Secure and deliver to Inspector adequate quantities of representative samples of materials proposed to be used which require testing.
- 7.3.4 Furnish mix designs proposed to be used for concrete, mortar, grout, and other material mixes with certification by an independent inspection and testing company that such mix designs meet the requirements of the Contract Documents.
- 7.3.5 Furnish copies of product tests, or mill test reports of steel products, as required.
- 7.3.6 Furnish labour and facilities to:
 - 7.3.6.1 Provide access to work to be inspected
 - 7.3.6.2 Facilitate inspections and tests, including obtaining and handling samples at Project site or at source of product to be tested
 - 7.3.6.3 Make good any work disturbed by inspection and test
- 7.3.7 Provide storage on site for Inspector's exclusive use to store equipment and cure test samples.
- 7.3.8 Notify Inspector and Consultant sufficiently in advance of operations to allow assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse Owner for Inspector's personnel and travel expenses incurred due to Contractor's negligence.
- 7.3.9 Pay costs for uncovering and make good work that has been covered before the required inspection or testing is completed and approved by the Consultant.

7.4 PROCEDURES

- 7.4.1 Allow inspection/testing agencies access to the Work on the Site, at off-site manufacturing and fabrication plants.
- 7.4.2 Notify the appropriate agency and Owner and Consultant in advance of the requirement for tests, in order that attendance arrangements can be made.
- 7.4.3 Submit samples and/or materials required for testing. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.

General Requirements (CCDC2-2020)

7.5 REPORTS

7.5.1 Copies of inspection and test reports will be issued to prime Contractor, Owner and Consultant.

7.5.2 Provide copies to Subcontractor of work being inspected/tested.

7.6 TESTS AND MIX DESIGN

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

7.6.2 The cost of tests and mix designs beyond those called for in the Contract Documents or beyond those required by the law of the Place of Work shall be appraised by the Consultant and may be authorized as recoverable.

7.7 MILL TESTS

7.7.1 Submit mill test certificates as required by the Specification sections.

7.8 EQUIPMENT/SYSTEMS

7.8.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

8 Field Engineering

8.1 QUALIFICATIONS OF SURVEYOR

8.1.1 All setting out of the Work and survey Work shall be performed by a qualified registered Land Surveyor (registered in the Place of the Work) or Engineer.

8.2 SURVEY REFERENCE POINTS

8.2.1 Existing base horizontal and vertical control points are designated on Drawings and were taken from survey information established by persons engaged directly by Owner. The accuracy of survey information is not the Consultant's responsibility.

8.2.2 Locate, confirm and protect control points prior to starting Site Work. Preserve permanent reference points during construction.

8.2.3 Make no changes or relocations without prior written notice to Owner.

8.3 SURVEY REQUIREMENTS

8.3.1 Establish temporary bench marks on Site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

8.3.2 Establish lines and levels, locate and lay out, by instrumentation.

8.3.3 Work Adjacent to Public Property:

8.3.3.1 Verify before commencing Work at adjacent public property, that no plans for altering clearances, set-backs, easements, grades or otherwise have been made by local authorities, subsequent to their approval of Contract Documents, and which would affect the original intent.

8.4 RECORDS

8.4.1 Maintain a complete, accurate log of control and survey Work as it progresses.

8.4.2 Record all authorized field changes of dimension and detail.

General Requirements (CCDC2-2020)

8.5 SUBSURFACE CONDITIONS

- 8.5.1 Promptly notify Consultant in writing if subsurface conditions at the Place of the Work differ materially from those indicated in the Contract Documents.
- 8.5.2 After investigation, should the Consultant determine that the subsurface conditions do differ materially from those indicated in the Documents instructions will be issued for changes in the Work as provided in the Contract.

8.6 UTILITY SURVEYS

- 8.6.1 Locate and mark the routing of embedded or subsurface utilities located within the construction Site. This includes, but is not limited to, electrical conduits, telephone lines, storm sewers, sanitary sewers, water mains, communication cabling, gas lines, duct banks, and hidden or obtrusive plants.
- 8.6.2 Examine pre-existing concrete floors before cutting or penetration where the structural integrity may be compromised.
- 8.6.3 Use ground penetrating radar (GPR) devices and other similar equipment and software to provide the most accurate depiction of surveyed areas and to best determine the horizontal locations and relative depths of both metallic and non-metallic utilities. Survey Work to include the following:
 - 8.6.3.1 Clearly mark inferred positions of each utility or subsurface object by means of visible paint or flags.
 - 8.6.3.2 Show located utilities and subsurface objects on Drawing prints, scalable with dimensions, for use in final reports upon completion of surveys.
 - 8.6.3.3 Submit final reports. Include in the report, details of field procedures and identification of potential impediments to construction.
 - 8.6.3.4 Describe the limitations of technologies used during surveys and identify variations between the inferred utility positions during surveys and the actual positions of underground plant, when uncovered.
- 8.6.4 Provide well-trained and well-equipped technicians in the use of detection systems and locating devices for utility surveys. Technical staff shall be deemed to be proficient with the latest technological advances in subsurface detection.
- 8.6.5 Employ a professional firm to conduct the above operations.

8.7 DRAINAGE

- 8.7.1 Ensure that positive drainage is provided to roof, floor and site drains and catch basins, as set in their final positions. Provide constant slopes for drained surfaces to drains and drainage courses.
- 8.7.2 Ensure that allowable construction tolerances and structural tolerances do not permit ponding of water.
- 8.7.3 Verify the extent of each area served by a drain, or drainage course, to eliminate possible undrained surfaces. Co-ordinate the Work of involved Sections before each proceeds.

9 Cutting and Patching

9.1 APPROVALS

- 9.1.1 Submit written request in advance of cutting or alteration which affects:
 - 9.1.1.1 Structural integrity of any element of the Project.
 - 9.1.1.2 Integrity of weather-exposed or moisture-resistant elements.
 - 9.1.1.3 Efficiency, maintenance, or safety of any operational element.
 - 9.1.1.4 Visual qualities of sight-exposed elements.

General Requirements (CCDC2-2020)

9.1.1.5 Work of Owner or separate Contractor.

9.2 INSPECTION

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

9.2.2 After uncovering, inspect conditions affecting performance of Work.

9.2.3 Beginning of cutting or patching means acceptance of existing conditions.

9.3 PERFORMANCE REQUIREMENTS

9.3.1 Cutting and patching includes cutting into existing construction to Provide for installation or performance of other Work and subsequent fitting and patching required to restore surfaces to their original condition.

9.3.2 Operational Limitations:

9.3.2.1 Do not cut and patch operational elements and safety components in manner resulting in decreased performance, shortened useful life or increased maintenance.

9.3.3 Quality Limitations:

9.3.3.1 Do not cut and patch Work exposed to view (exterior and interior) in manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by the Consultant.

9.3.4 Limitation on Acceptance: the Consultant's acceptance to proceed with cutting and patching does not waive right to later require removal or replacement of Work found to be cut and patched in unsatisfactory manner as judged by the Consultant.

9.4 EXECUTION

9.4.1 Execute cutting, fitting, and patching to complete the Work.

9.4.2 Do not cut and patch structural Work in manner resulting in reduction of load-carrying capacity or load and deflection ratio. Provide supports to assure structural integrity of surroundings; including devices and methods to protect other portions of the Project from damage.

9.4.3 Employ appropriate trades with skilled labour to perform cutting Work.

9.4.4 Cut materials using proper equipment and methods.

9.4.5 Remove and replace defective and non-conforming Work.

9.4.6 Execute Work to avoid damage to other Work.

9.4.7 Prepare proper surfaces to receive patching and finishing.

9.4.8 Fit all Work segments together to integrate with penetrations through surfaces and with other Work.

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

9.4.10 At penetration of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated or fire-resistant material, specified to the full thickness of the construction element.

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

General Requirements (CCDC2-2020)

9.4.12 Where Drawings indicate or Specifications call for items to be relocated, perform Work to the same quality of workmanship specified for new Work. Replace damaged or missing items at no extra cost to the Owner. Provide new fasteners; for exterior, use stainless steel.

10 Environmental Protection

10.1 GENERAL

10.1.1 Protection of the environment in all aspects of the Project is of prime importance.

10.1.2 The Contractor is responsible for monitoring, reporting and ensuring the Work is completed in compliance with the requirements of all environmental legislation and regulations governing the Place of the Project.

10.1.3 The Contractor's failure to comply with any environmental requirements when instructed will result in the Owner undertaking corrective action. The costs for such corrective action shall be borne by the Contractor.

10.1.4 Directions given by the Owner or Consultant with respect to action to be taken to correct environmental deficiencies must be acted upon immediately.

10.2 EROSION & SEDIMENTATION CONTROL

10.2.1 Prepare and submit final Erosion & Sedimentation Control Plan as per site condition and construction operation schedule. Plan to meet the guidelines and methods described in EPA Document No. EPA 832/R-92-005 (Latest Edition) or requirements of authorities having jurisdiction, whichever is more stringent. A preliminary plan may be provided with the specification, and is for reference only.

11 Material and Equipment

11.1 PRODUCTS - GENERAL

11.1.1 The Specifications may contain Product brands that form the basis of some design, and the Specifications will explicitly state so. Such "basis of design" Products are indicated as first listed item in the Product Specifications.

11.1.1.1 Other listed manufacturers' Products are acceptable only on the condition that they comply with, or are modified as necessary, to comply with specified and indicated requirements and conform to quality levels and functional requirements of "basis of design" Product.

11.1.1.2 Inclusion of a manufacturer's model number does not void any specified or indicated requirements.

11.1.2 When manufacturers' catalogued trade name and model number is specified for a Product, any specified Product will be acceptable.

11.1.3 When a Product is specified by reference to a standard only, any Product that meets the specified standard may be selected. Products meeting minimum reference standards will be accepted subject to the Consultant's review for compliance with the Specifications.

11.1.4 When a Product is specified by performance Specification without manufacturers specified, any Product meeting the requirements of the Specification may be accepted subject to Consultant's review.

11.1.5 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the Work.

11.2 PRODUCT AND MATERIAL QUALITY

11.2.1 Refer to GC3.7 of CCDC2 2020.

General Requirements (CCDC2-2020)

11.2.2 Products, materials, equipment and articles (referred to as Products throughout the Specifications) incorporated in the Work shall be new, not damaged or defective, and of the best quality (compatible with Specifications) for the purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.

11.2.3 Defective Products will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. Remove and replace defective Products at own expense and be responsible for delays and expenses caused by rejection.

11.2.4 Unless otherwise indicated in the Specifications, maintain uniformity of manufacturers for any particular or like item.

11.3 WARRANTIES

11.3.1 Warranties commence at date of Substantial Performance of the Work unless otherwise provided from Trade Contractors or the manufacturers.

11.3.2 Submit warranties for applicable items, signed by the company responsible for provision of each warranty.

11.3.3 Submit warranties on form approved by Owner

11.3.4 Owner shall be named in manufacturer's product warranties. Submit on relevant Product manufacturer's standard warranty or guarantee form.

11.3.5 The following list of warranties is the minimum required from Trade Contractors responsible for the work relevant to listed warranty. Extended industry standard warranties provided by the various Trade Contractors will be accepted. Refer also to Tarion requirements pertaining to the following list:

11.3.5.1 Free from defects in work and materials: 2-year

11.3.5.2 Constructed in accordance with the Alberta Building Code: 1-year

11.3.5.3 Water penetration through basement or foundation walls, including parking garage: 2-years

11.3.5.4 Defects in materials and work including caulking, windows and doors, such that the building envelope prevents water penetration: 2-years

11.3.5.5 Defects in materials and work in the electrical, plumbing and heating delivery and distribution systems: 2-years

11.3.5.6 Defects in materials and work which result in the detachment, displacement or physical deterioration of exterior cladding: 2-years

11.3.5.7 Violations of the Alberta Building Code's health and safety provisions: 2-years

11.3.5.8 Glazing systems as designed, constructed and installed to be warranted respecting air leakage and water ingress by the window wall manufacturer for a period of not less than 5 years following date of Substantial Performance of the Work. The warranty provided shall cover all of the labour and materials required to repair or replace the window wall system should air leakage or water ingress occur during the warranty period

11.4 STORAGE AND HANDLING

11.4.1 Ensure no delay in the progress of the Work and provide delivery access and unloading areas.

11.4.2 Make available areas for storage of Products and Construction Equipment to meet specified requirements and to ensure a minimum of interference with progress of the Work and relocation.

11.4.3 Make access available for transference of stored Products and Construction Equipment to Work areas.

General Requirements (CCDC2-2020)

11.4.4 Review schedule of Product deliveries at each site meeting.

11.5 SUBSTITUTIONS

11.5.1 Refer to Sections 01 62 00 and 01 62 01.

11.6 EXPEDITING

11.6.1 Immediately after award of Contract, review Product delivery requirements and anticipate foreseeable supply delays for any item. If delays in supply of Products are foreseeable, notify the Owner of such, in order that substitutions or other remedial action may be authorized in sufficient time to prevent delay in performance of Work.

11.6.2 In the event of failure to notify the Owner at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Owner reserves the right to substitute more readily available Products of similar character at no increase in Contract Price.

11.6.3 Utilize Canadian materials and Products if available and equivalent in price and quality.

11.6.4 Submit, when requested by Owner, an updated material procurement/expediting record indicating clearly the status of material delivery and fabrication. Particulars to be covered by this record shall include the item identification, sub-vendor, order date, order number, Shop Drawing submission date(s) and review date(s), required delivery date, promised delivery date, date received, date checked and general remarks.

11.6.5 Accumulate and submit similar records from (assigned) Subcontractors and ensure that Subcontractors are properly and frequently expediting all equipment and material to meet delivery deadlines to suit installation schedule.

11.6.6 Allow the Owner or their Representative free access to the Contractor's plant and to Subcontractor's plants for visual inspection of allotted material and/or progress of the Work.

11.7 TRANSPORTATION

11.7.1 Pay transportation costs to Site of Products required in the performance of Work.

11.8 WORKMANSHIP

11.8.1 Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed.

11.8.2 Immediately notify the Owner if required Work is such as to make it impractical to produce required results.

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

11.9 FASTENINGS

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

11.9.2 Prevent electrolytic action between dissimilar metals and materials.

11.9.3 Use non-corrosive hot dipped galvanized steel fasteners and anchors for securing exterior Work, unless stainless steel or other material is specifically requested in the affected Specification section.

General Requirements (CCDC2-2020)

- 11.9.4 Space anchors within their load limit or shear capacity and ensure that they provide positive permanent anchorage. Wood or any other organic material plugs are not acceptable.
- 11.9.5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- 11.9.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- 11.10 PROTECTION OF WORK**
- 11.10.1 Adequately protect Work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Owner, at no increase in Contract Price.
- 11.10.2 Prevent overloading of any part of the Work or building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of the Owner.
- 11.10.3 Maintain and monitor protection of roofing membrane when Work is done on or above finished roofing system.
- 11.11 EXISTING UTILITIES**
- 11.11.1 Connect to existing services or utilities at times directed by Owner or local governing authorities, with a minimum of disturbance to Work, building occupants, pedestrian and vehicular traffic.
- 11.11.2 Protect and maintain existing active services. When inactive services are encountered cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service.
- 11.12 CONCEALMENT**
- 11.12.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- 11.12.2 Before installation, inform Consultant if there is a contradictory situation. Install as directed by Consultant.
- 12 Temporary Construction Facilities and Controls
- 12.1 INSTALLATION/REMOVAL**
- 12.1.1 Provide construction facilities and temporary controls in order to execute the Work expeditiously.
- 12.1.2 Remove from Site all such Work after use.
- 12.2 GUARD RAILS, BARRICADES AND TRAFFIC CONTROL**
- 12.2.1 Provide secure, rigid guard railings and barricades where required for protection of Work, workers and public.
- 12.2.2 Provide flag-persons, traffic signals, flares, lights or lanterns as required to perform the Work and protect the public.
- 12.2.3 Provide as required by governing authorities.
- 12.3 HOARDING**
- 12.3.1 Provide hoarding where required to protect the public, workers and private property from injury or damage.

General Requirements (CCDC2-2020)

12.3.2 Provide around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

12.4 WEATHER ENCLOSURES

12.4.1 Provide weathertight closures to unfinished door, wall and window openings, tops of shafts or other openings in floors, walls and roofs.

12.4.2 Provide weathertight enclosures to floor slabs to keep them dry in preparation for application of finishes. Any remedial Work as required to bring floor slabs to a dry state following penetration of water from the atmosphere shall be at the Contractor's expense.

12.4.3 Close off floor areas where walls are not finished; seal off other openings; enclose building interior Work area for temporary heat.

12.5 DUST TIGHT SCREENS

12.5.1 Provide dust tight screens or partitions to localize dust generating activities and for the protection of workers, finished areas of the Work and the public.

12.5.2 Maintain and relocate protection until such Work is complete.

12.6 DEWATERING

12.6.1 Provide temporary drainage and pumping facilities to keep excavations and Site free from standing water.

12.7 SCAFFOLDING

12.7.1 Provide and maintain scaffolding, ramps and ladders.

12.7.2 Construct and maintain scaffolding in a rigid, secure and safe manner, independent of walls.

12.8 HOISTING

12.8.1 Provide, operate and maintain lifting equipment required for construction.

12.8.2 All equipment to have valid inspection certificate.

12.8.3 All hydraulic equipment to be fitted with "diaper" to contain any oil leaks from the equipment to prevent damage to the walls and floors.

12.8.4 Hoists shall be operated by qualified operators.

12.8.5 Locations and means for securing chain blocks, hoists or similar hoisting equipment to building structure shall be approved by Owner. Repair any damage for such activity at own expense.

12.9 ACCESS AND CONSTRUCTION PARKING

12.9.1 Use entrance, exits and on-Site routes as directed by Owner.

12.9.2 Parking is permitted on Site at locations designated by Owner. Comply with the Owner's requirements for daily access through the gate and related security.

12.9.3 Before Contractor enters the Site with his vehicles or equipment, he shall coordinate with the Owner and appropriately barricade, stake off or snow fence the access routes and storage areas and around the construction area in order to prevent damage to buildings, grounds, plantings, turf and surrounding facilities at the Site, and to restrict unauthorized persons from entering the construction area. The Contractor shall be responsible for making good any and all damages caused by his operations on Site. Restoration of such damages shall be to the original condition or better, and to the satisfaction of, and at no extra cost to, the Owner.

General Requirements (CCDC2-2020)

12.9.4 Work in areas of the property which are external to those areas defined as "Construction Areas" shall not be commenced without first obtaining written approval from Owner.

12.10 USE OF THE WORK

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

12.10.2 Storage of material shall be outside of the building with exception of material for each day's work requirements.

12.10.3 Fabrication shops shall not be set up within the building except as directed by the Owner.

12.10.4 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work.

12.10.5 Use of Owner water and power supply is prohibited.

12.11 PROJECT IDENTIFICATION

12.11.1 Erect, within three weeks prior to commencing Work on Site, one Architect Identification Sign, in a location clearly visible at a minimum distance of 30 m.

12.11.2 Sign will be provided by Consultant, in one of four colours, as selected by the Consultant or Owner. Sign is sized 915 mm wide x 1220 mm high, constructed of corrugated plastic sheet.

12.11.3 Maintain sign in good condition for the duration of the Work. Clean as required.

12.11.4 Other than warning signs, no other signs or advertisements will be allowed on Site, unless approval is received in writing from the Consultant or Owner.

12.12 SANITARY FACILITIES

12.12.1 Provide weatherproof sanitary facilities as required (portable, trailer type washrooms which consist of flush toilets and wash basins) in accordance with local health and other authorities.

12.12.2 Maintain in clean condition.

12.13 WATER SUPPLY

12.13.1 Provide and pay for a supply of potable water for construction use until permanent system is available.

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

12.14 TEMPORARY POWER AND LIGHTING

12.14.1 Provide and pay for temporary power required during construction for temporary lighting and the operating of hand power tools until permanent system is available.

12.14.2 Provide all necessary hook-ups and extensions from locations of Work to temporary source, designated by Owner. Provide all temporary lighting using fluorescent Products.

12.14.3 Arrange for connection with Owner and pay all costs for installation, maintenance and removal.

12.14.4 Temporary power distribution wiring shall comply with the Hydro Electrical Safety Code. Obtain inspection certificates for temporary electrical Work.

General Requirements (CCDC2-2020)

12.15 TEMPORARY HEATING

- 12.15.1 Provide temporary heating when required during construction period, including attendance, maintenance and fuel to maintain minimum 10°C (50°F) in areas where construction is in progress, unless indicated otherwise in Specifications.
- 12.15.2 Construction heaters used inside the building must be vented to the outside or be a flameless type. Solid fuel salamanders are not permitted.
- 12.15.3 Ventilate heated areas and keep building free from exhaust combustion gases.
- 12.15.4 Take care that heating units are placed in such a way that no material is damaged by excessive heat.
- 12.15.5 The permanent heating system of the building or portions thereof may be used when available and when installed in conformance with the Contract Documents.

12.16 TEMPORARY TELEPHONE

- 12.16.1 Provide and pay for temporary telephones necessary for own use.
- 12.16.2 Do not use Owner's telephones.

12.17 OFFICES/FIRST AID

- 12.17.1 Provide and maintain in a clean condition during progress of Work adequately lighted, heated and ventilated office with space for filing and layout of Contract Documents.
- 12.17.2 Provide adequate first aid facilities.
- 12.17.3 Owner Construction Office:
 - 12.17.3.1 Provide a temporary Owner construction office with an area of a minimum of 8 feet by 10 feet, lockable, with heat, air conditioning, fluorescent lighting and power, telephone and high speed intranet connection. The Owner will provide furniture.
 - 12.17.3.2 Maintain and store Contract Administration Documents in an orderly manner and accessible by the Owner and Consultant on Site.
- 12.17.4 Contract Administration Documents:
 - 12.17.4.1 Keep the following documents, stored securely and in good order and available to Owner and Consultant in hard copy or electronic form:
 - 12.17.4.1.1 Current Contract Documents, including Drawings, Specifications and addenda.
 - 12.17.4.1.2 Change Orders, Change Directives, and Supplementary Instructions.
 - 12.17.4.1.3 Reviewed Shop Drawings, Product data and samples.
 - 12.17.4.1.4 Field test reports and records.
 - 12.17.4.1.5 Construction progress schedule.
 - 12.17.4.1.6 Meeting minutes.
 - 12.17.4.1.7 Manufacturer's certifications.
 - 12.17.4.1.8 Permits, inspection certificates, and other documents required by authorities having jurisdiction.
 - 12.17.4.1.9 Current as-built drawings.
 - 12.17.4.1.10 Material Safety Data Sheets (MSDS) for all controlled Products.

12.18 EQUIPMENT/TOOL/MATERIALS STORAGE

- 12.18.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials. Locate as directed by Owner.
- 12.18.2 Locate materials not required to be stored in weatherproof sheds on Site in a manner to cause the least interference with Work activities, as directed by Owner.

General Requirements (CCDC2-2020)

12.19 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

12.19.1 Protect surrounding private and public property from damage during performance of Work.

12.19.2 Be responsible for damage incurred and pay all costs for correction.

12.20 SECURITY

12.20.1 Be responsible for the security of Work and material supplied, stored and installed until all Work is complete and accepted by Owner.

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

12.21 PROJECT CLEANLINESS

12.21.1 Refer to CCDC2, 2008 article 3.13 of General Conditions.

12.21.2 The Owner reserves the right to perform clean-up Work not expeditiously completed by the Contractor and deduct such costs from the Contract Price.

12.22 ROAD CLEAN-UP

12.22.1 Take all precautions to avoid depositing materials, debris and mud on the Owner's roadways and parking areas and on roads and streets adjoining the Owner's property from vehicles and equipment operating to and from the construction Site, and be responsible for removal of such deposits by brooming and washing.

12.23 SNOW REMOVAL

12.23.1 Maintain all access routes, Site roads, trailer area and storage areas as well as Work areas of this Contract and assigned Subcontracts free of ice and snow to maintain safe operating conditions and to maintain progress of the Work. Cleared snow shall be placed in areas on the Site as directed by the Owner.

13 Fire and Life Safety

13.1 SAFETY PLAN

13.1.1 As may be requested by the Owner, submit the following within 3 business days or the request:

13.1.1.1 Evidence of Safety Supervisor's training qualifications (supervisor to have successfully complete IHSA (Infrastructure Health and Safety Association) Supervisory Basics training or equivalent).

13.1.1.2 The Contractor's occupational health and safety policy and procedures.

13.1.1.3 The Contractor's site-specific safety plan and associated procedures.

13.1.1.4 The site-specific emergency response plan listed below:

13.1.1.4.1 Site-specific emergency response plan guideline.

13.1.1.4.2 Emergency Response Planning for Construction Projects by the Provincial Labour-Management Health and Safety Committee.

13.1.1.5 The site-specific traffic control plan.

13.1.1.6 The Contractor's site orientation package.

13.1.1.7 The site-specific Fire Safety Plan.

General Requirements (CCDC2-2020)

13.2 FIRE PROTECTION

- 13.2.1 Provide and maintain temporary fire protection equipment e.g. portable fire extinguishers, during performance of Work required by authorities having jurisdiction, governing codes, regulations and by-laws, to the satisfaction of the Owner and all local and insurance authorities in order to protect the property of the Owner and the Contractor against fire hazards during construction.
- 13.2.2 Bulk storage of flammable liquids and other hazardous materials is not allowed on the Site.
- 13.2.3 Flammable liquids must be handled in approved containers.
- 13.2.4 The bringing in, use, and disposal of gasoline, benzene or other flammable materials shall be handled with good and safe practice as required by authorities having jurisdiction.
- 13.2.5 Provide fire extinguishers of the non-freezing chemical type in each temporary building, enclosure and trailer.
- 13.2.6 Use fire-proofed tarpaulins.
- 13.2.7 A fire watch shall be required for each of the following activities regardless of the number, duration or size of the activity in operation on a single floor:
 - 13.2.7.1 Any open flame activities (e.g. soldering and welding);
 - 13.2.7.2 Shutdown of fire detection system;
 - 13.2.7.3 Shutdown of sprinkler system;
 - 13.2.7.4 Connection to drain line

13.3 TESTING AND INSPECTION

- 13.3.1 Where fire protection and life safety systems, and systems with fire protection and life safety functions, are integrated with each other, the systems shall be tested as a whole in accordance with CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems".
- 13.3.2 Provide testing and inspection of the integrated system, performed by a Third-Party testing and Inspection company as approved by the Owner.
- 13.3.3 Submit testing and inspection report detailing results, for record, no later than 5 working days after the test completion(s).

13.4 TRAINING, AWARENESS AND ORIENTATION

- 13.4.1 Provide the Owner, Consultant and visitors to the Site, training, awareness, orientation or familiarization in advance of Site visit.

13.5 OCCUPATIONAL HEALTH AND SAFETY

- 13.5.1 Safety is of prime importance on this Project.
- 13.5.2 Conform to safe Work practices in accordance with regulations and authorities having jurisdiction.
- 13.5.3 Promptly report to Owner all accidents or if any claim is made by anyone against the Contractor or Subcontractor on account of any accident.
- 13.5.4 Provide at the Site, equipment to supply first aid service.
- 13.5.5 Enforce proper Work methods and act immediately on directions regarding safety and Work practices given by authorities having jurisdiction or the Owner at no additional cost to Owner.

General Requirements (CCDC2-2020)

- 13.5.6 Failure of Contractor to comply with verbal or written instructions or orders from the Ministry of Labour inspector or other authorities as well as instructions from the Owner or Consultant regarding safe Work practices or provision of specified requirements under the act shall be considered non-compliance of the Contract.
- 13.5.7 Fully indemnify the Owner and Consultant for any charges or convictions flowing as a result of Work performed under this Contract.
- 13.5.8 Maintain on Site a copy of the latest edition of the "Occupational Health and Safety Act, Construction Projects, issued January 2017", and "Occupational Health and Safety Act, Industrial Establishments, issued July 2016".
- 13.5.9 Ensure that all personnel are adequately equipped to comply with safety regulations and that sufficient safety equipment is available.
- 13.5.10 Lack of equipment will not be reason for non-compliance.

13.6 SAFETY SUPERVISOR

- 13.6.1 Designate a senior employee as Contractor's safety supervisor.
- 13.6.2 Duties will include involvement in training, instruction, planning, safety patrols, and enforcement of rules.
- 13.6.3 Give name and telephone number (site, office and residential) to Owner.
- 13.6.4 Ensure that a designated person is certified by IHSA (Infrastructure Health and Safety Association).
- 13.6.5 Workplace Hazardous Materials Information System (WHMIS).
- 13.6.6 Be familiar with WHMIS regulations and be responsible for compliance.
- 13.6.7 Controlled Products shall be properly labeled.
- 13.6.8 Provide proper warning labels and training at the workplace.
- 13.6.9 Provide copies of safety data sheets for any controlled Product in the workplace.
- 13.6.10 Be responsible for all other requirements of the regulations as applicable to employers.
- 13.6.11 Before commencing any Work on the Site, attend Owner's safety orientation meeting and provide Owner with a proposal as to how hazardous materials will be stored and dispensed on the Site area, in addition, specifically outline the measures which Contractor will undertake to prevent damage or injury in the event of an accidental spill.
- 13.6.12 The Contractor's "Handling Procedure" will be provided no later than ten (10) days following the health and safety orientation meeting.

14 Testing and Balancing of Systems

14.1 GENERAL

- 14.1.1 Refer to Division 23.

15 Systems Demonstrations

15.1 DESCRIPTION

- 15.1.1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel prior to date of Substantial Performance.
- 15.1.2 The Owner will provide list of personnel to receive instruction and will coordinate their attendance on mutually agreed to dates.

General Requirements (CCDC2-2020)

15.2 QUALITY CONTROL

15.2.1 Provide for manufacturers authorized Representatives to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

15.3 SUBMITTALS

15.3.1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates for Owner's approval.

15.3.2 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

15.3.3 Give time and date of each demonstration with a list of all personnel present.

15.4 CONDITIONS FOR DEMONSTRATIONS

15.4.1 Equipment has been previously inspected and put into operation in accordance with individual Specification sections prior to demonstrations.

15.4.2 Testing, adjusting and balancing have been performed and equipment and systems are fully operational.

15.4.3 Provide copies of completed Operation and Maintenance Manuals for use in demonstrations and instructions.

15.5 DEMONSTRATION AND INSTRUCTIONS

15.5.1 Demonstrate start-up, operation, control, adjustment, trouble shooting, servicing and maintenance of each item of equipment or systems.

15.5.2 Instruct personnel in all phases of operation and maintenance using Operation and Maintenance Manuals as the basis of instructions. Videotape the training sessions in full and submit two DVD discs to the Consultant for turning over to the Owner.

15.5.3 Review content of manual in detail to explain all aspects of operation and maintenance.

15.5.4 Prepare and insert additional data in Operations and Maintenance Manuals when the requirement for additional data becomes apparent during instructions.

16 Contract Closeout

16.1 PREREQUISITES TO FINAL PAYMENT

16.1.1 After Ready-for-Takeover of the Work and before submitting an application for final payment in accordance with the General Conditions of Contract.

16.1.1.1 Correct or complete all remaining defective, deficient, and incomplete work.

16.1.1.2 Remove from the Place of the Work all remaining surplus Products, Construction Equipment, and Temporary Work.

16.1.1.3 Perform final cleaning and waste removal necessitated by the Contractor's work performed after Ready-for-Takeover, as specified.

16.2 PROGRESSIVE CLEANING

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

16.3 FINAL CLEANING

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

General Requirements (CCDC2-2020)

- 16.3.2 Remove waste materials and debris from the Site at regularly scheduled times or dispose of as directed by the Owner. Do not burn waste materials on Site, unless approved by the Owner.
- 16.3.3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation system is not permitted for this purpose.
- 16.3.4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on previously cleaned surfaces
- 16.3.5 Remove dirt and broom clean, wash and sweep exterior walks, steps and paved surfaces. Leave exterior Work broom clean before the inspection process commences.
- 16.3.6 Remove dust, dirt and other foreign disfigurements from exposed surfaces.
- 16.3.7 Vacuum clean and dust building interiors, behind grilles, louvres and screens. Leave Work vacuum-clean before the inspection process commences.
- 16.3.8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures and equipment. Replace broken, scratched or disfigured items at no extra cost to the Owner.
- 16.3.9 Remove grease, stains, spots, marks, dust and dirt from decorative Work, electrical and mechanical fixtures, furniture, fittings, and walls and floors.
- 16.3.10 Replace all filters with new, as per Specifications, in all mechanical units.
- 16.3.11 Clean roof.
- 16.3.12 Remove from building and site, snow and ice that would prevent operation and activities of the facility.
- 16.4 DOCUMENTS**
- 16.4.1 Collect reviewed submittals and assemble documents executed by Subcontractors, Suppliers, and manufacturers.
- 16.4.2 Submit material in a neatly indexed package, prior to final application for payment.
- 16.4.3 All Warranties shall commence from date of Certificate of Substantial Performance unless indicated otherwise.
- 16.4.4 Contractor shall be responsible for obtaining and enforcing all required warranties.
- 16.4.5 Examine all sections of the Specification to ensure inclusion of all warranties specified.
- 16.4.6 Fire Safety Plan
- 16.4.6.1 Prepare and obtain approvals from Authorities having Jurisdiction a Fire Safety Plan in accordance with local Authorities FIRE CODE, latest edition.
- 16.4.6.2 For Work in Occupied Buildings, prepare revisions to the building's existing Fire Safety Plan as required and obtain approvals as specified above.
- 16.5 PROJECT RECORD DOCUMENTS**
- 16.5.1 Submittals shall include but not limited to that listed below.
- 16.5.1.1 Warranties and bonds.
- 16.5.1.2 Article GR8 - Field Engineering: site survey after construction.
- 16.5.1.3 Section 01 33 00 - Submittals: Shop Drawings, As-Built Drawings, Building Manuals, Operation and Maintenance Manuals, Samples.
- 16.5.1.4 Inspection certificates required by municipal, provincial and other authorities having jurisdiction.
- 16.5.1.5 Final adjustment in cash allowances.

General Requirements (CCDC2-2020)

- 16.5.1.6 Product data, materials and finishes and related information.
- 16.5.1.7 Equipment and systems.
- 16.5.1.8 Testing and balancing reports
- 16.5.1.9 Commissioning reports.
- 16.5.1.10 Individual Specifications sections: Specific requirements for operation and maintenance data.

16.5.2 Should the required operations and maintenance manuals, as-built drawings and the like not be submitted in a timely fashion as herein specified, payments will be withheld in the amount of 5% **each** of the mechanical and electrical contract amounts, and 2% of the Contract Sum amount, until such time as this documentation is properly submitted.

16.6 INSPECTION/TAKEOVER PROCEDURES

16.6.1 Prior to application for certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete, defects are corrected and the building is clean and in condition for occupancy. Notify the Owner in writing of satisfactory completion of the Work and request an inspection.

16.6.2 Conform to OAA/OGCA document No.100 for takeover procedures.

16.6.3 Consultant will allow a maximum of two final inspections for each discipline for rectifying all defects. Beyond this all additional visits will be charged to the General Contractor at a rate of \$1000.00 per visit/report.

16.6.4 During inspection by the Owner and Consultant, a list of deficiencies and defects will be tabulated. Correct within agreed time schedules.

END OF SECTION

Request for Information (RFI)

- 1 General
- 1.1 DEFINITION**
- 1.1.1 As defined in Section 01 10 00 General Requirements.
- 1.2 PROCEDURE**
- 1.2.1 Allocation of various aspects of the Work to specific subtrades is the responsibility of the Contractor. R.F.I.s will be received directly and only from the Contractor to the Consultant.
- 1.2.2 Conditions Requiring Clarification of the Contract Documents:
 - 1.2.2.1 Submit Request for Information from Contractor's office or field office only. Request for Information submitted directly from Subcontractors or Suppliers will not be accepted, or reviewed by the Consultant.
 - 1.2.2.2 Generate Request for Information by one (1) source per Project and number accordingly.
 - 1.2.2.3 Submit one (1) Request for Information form containing all relevant information, backup documents, and related subtopics only.
- 1.2.3 Consultant will review formal requests from the Contractor with reasonable promptness and the Contractor will be notified in writing of decisions made, to the source of R.F.I. It is the Contractor's responsibility to distribute reply to appropriate parties.
 - 1.2.3.1 Consultant's response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Sum or Contract Time.
- 1.2.4 Maintain log of Request for Information sent to, and responses from Consultant.
- 1.2.5 The Contractor may use his own Request for Information form shall include the following information, but not limited to:
 - 1.2.5.1 Contractor's Letterhead, including full address and telephone number
 - 1.2.5.2 The Consultant's name, and contact information.
 - 1.2.5.3 Official Project Name, Consultant project number, Owner's project number (if applicable), Contractor's project reference number.
 - 1.2.5.4 R.F.I. numbering identification system, either numerical or alphanumeric as required in order to quickly and efficiently identify the R.F.I. This numbering system must also include the Date the Contractor is submitting the R.F.I. to the Consultant.
 - 1.2.5.5 Subject line, briefly describing the R.F.I. contents.
 - 1.2.5.6 Information requested, including all backup documents, and related subtopics.
 - 1.2.5.7 Contractor's signature, dated, stating he has reviewed the Request for Information for completeness and correctness, and against the provided Contract Documents.

END OF SECTION

Abbreviations

01 17 00 – Abbreviations

1 General

1.1 ABBREVIATIONS OF SPECIFYING AUTHORITIES

1.1.1 The following abbreviations used in the Contract Documents, shall have the meanings listed and the applicable standards shall apply.

AA	Aluminum Association (USA)
AAMA	American Architectural Manufacturers Association
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APEG BC	Guidelines for Structural Engineering Services for Building Projects
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.
ASTM	American Society for Testing and Materials
AWMAC	Architectural Woodwork Manufacturer's Association of Canada
BCLMA	British Columbia Lumber Manufacturer's Association
BHMA	Builders Hardware Manufacturers Association
CAN	Canadian Standards Association
CCA	Canadian Construction Association
CCDC	Canadian Construction Documents Committee
CEC	Canadian Electrical Code (published by CSA)
CEMA	Canadian Electrical Manufacturers' Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CLA	Canadian Lumberman's Association
COFI	Council of Forest Industries of British Columbia
CPCA	Canadian Painting Contractors' Association
CPMA	Canadian Paint Manufacturers Association
CRCA	Canadian Roofing Contractor's Association
CSA	Canadian Standards Association
CSC	Construction Specifications Canada
CSDFMA	Canadian Steel Door and Frame Manufacturers' Association
CSSBI	Canadian Sheet Steel Building Institute
FM	Factory Mutual
ISO	International Organization for Standardization
MCCR	Ministry of Consumer and Commercial Relations
MSDS	Material Safety Data Sheet
MTC	Ministry of Transportation and Communications (Ontario)
NAAMM	National Association of Architectural Metal Manufacturers
NBC	National Building Code of Canada
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Prevention Bureau
NHLA	National Hardwood Lumber Association (USA)
NLGA	National Lumber Grades Authority
NRC	National Research Council

Abbreviations

NSC	National Standards of Canada
OAA	Ontario Association of Architects
OBC	Ontario Building Code
OGCA	Ontario General Contractors Association
OHSA	Occupational Health and Safety Act
OIRCA	Ontario Industrial Roofing Contractor's Association
OFM	Ontario Fire Marshal
OPSS	Ontario Provincial Standard Specifications
RAIC	Royal Architectural Institute of Canada
SSPC	Steel Structures Painting Council
TTMAC	Terrazzo, Tile and Marble Association of Canada
ULC	Underwriters Laboratories of Canada
UL or ULI	Underwriters Laboratories Incorporated
USSL	United States Sports Surfacing Laboratories (USA)
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

END OF SECTION

Submittal Procedures

- 1 General
- 1.1 SUMMARY**
 - 1.1.1 Items to be submitted for review:
 - 1.1.1.1 Shop Drawings
 - 1.1.1.2 Samples
 - 1.1.1.3 Operating and Maintenance Manuals
 - 1.1.1.4 "As-Built" Drawings
 - 1.1.1.5 Certificates and transcripts
 - 1.1.1.6 Progress photographs
 - 1.1.2 Submittals **MUST** be accompanied by "Standard Submittal Form" with all blank spaces filled in. A copy of the form is appended to this section.
 - 1.1.3 Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work. Failure to submit in adequate time is not considered sufficient reason for an extension of Contract Time and no claim for an extension by reason of such default will be allowed.
 - 1.1.4 Work affected by the submittal shall not proceed until review is complete.
 - 1.1.5 Retain a copy of reviewed and stamped submission on Site. Only the stamped copies shall be used on the Work
- 2 Shop Drawings
- 2.1 GENERAL**
 - 2.1.1 The term "Shop Drawing" includes Drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.
 - 2.1.2 Arrange for the preparation of clearly identified Shop Drawings as specified or as the Consultant may reasonably request.
 - 2.1.3 Review and stamp all Shop Drawings prior to submission to the Consultant. By this review the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data and that he has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each Shop Drawing shall be indicated by stamp, date, and signature of a responsible person.
 - 2.1.4 Submittals not stamped, signed, dated and identified as to the specific Contract requirements will be returned without being examined and shall be considered rejected.
 - 2.1.5 Submit Shop Drawings for review with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the work of other Contractors. If either the Contractor or the Consultant so requests they shall jointly prepare a schedule fixing the dates for submission and return of Shop Drawings. At the time of submission the Contractor shall notify the Consultant in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents.

Submittal Procedures

- 2.1.6 The Consultant will review and return Shop Drawings in accordance with schedule agreed upon, or otherwise with reasonable promptness so as to cause no delay. The Consultant's review will be for conformity to the design concept and for general arrangement only. Such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract Documents, unless a deviation on the Shop Drawings has been approved in writing by the Consultant or Owner.
- 2.1.7 Make any changes in Shop Drawings which the Consultant may require consistent with the Contract Documents and resubmit as directed by the Consultant. When resubmitting, the notify the Consultant in writing of any revisions other than those requested by the Consultant.
- 2.1.8 Secure from all his Subcontractors and material Suppliers, uniform size Shop Drawings showing the construction materials, etc., or as required and upon which the respective Bids have been based.
- 2.1.8.1 Submittals shall be sized, not less than 8-½ by 11 inches nor larger than 30 by 42 inches
- 2.1.9 Shop Drawings shall define the division of responsibility between the trades, and all items shown on the Shop Drawings shall be supplied as part of the Contract unless it is specifically noted that certain items are not part of the Contract.
- 2.1.10 Any work done before receiving the Consultant's final review of the Shop Drawings shall be at the Contractor's risk.

2.2 SUBMITTAL SYSTEM - GENERAL

- 2.2.1 Submit Portable Data Files (PDF's) of fully detailed and dimensioned Shop Drawings of the Work.
- 2.2.2 Shop Drawings will be returned to the Contractor stamped and marked "REVIEWED", "NOT REVIEWED", "REVISE AS MODIFIED", or "REVISE AND RESUBMIT" or These stamps are defined as follows:

Stamp	Meaning
REVIEWED	Drawings reviewed without comments. Proceed with construction
NOT REVIEWED	Drawing has not been reviewed and is returned as submitted
REVIEWED AS MODIFIED	Incorporate corrections or comments and proceed with construction. No other alterations are to be made to the Drawings by the Contractor subsequent to receipt of Drawings stamped and marked as above. If further changes are made in addition to the Consultant's notations, then the Drawings must be resubmitted for further review
REVISE AND RESUBMIT	Revise Drawing in accordance with corrections or comments and re-submit for further review

- 2.2.3 Coordinate Shop Drawing file sizes with Consultant in advance of submittal. Generally, submit up to 10 megabytes file size only.
- 2.2.4 Drawings shall be blackline as much as possible to obtain good resolution when printed.
- 2.2.5 Consultant may print the Shop Drawings and mark manually, or provide review digitally.

Submittal Procedures

2.2.6 A copy of Shop Drawings with Consultant's comments will be returned via emailed to the Contractor or posted on a Turner Fleischer's Information Exchange server "Newforma Project Center". The Consultant will retain on its electronic folder, a PDF copy of Shop Drawings returned to the Contractor. Original marked up hardcopy will also be retained by the Consultant.

2.3 INFORMATION REQUIRED

2.3.1 All Shop Drawing submittals shall indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information requested in the individual Specification sections or as necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross references to design Drawings and Specifications.

2.3.2 Where a submittal relates to door schedule(s), submittal MUST be cross referenced to the door schedule(s) indicating door number and type. Non-compliance will result in the rejection of Shop Drawing.

2.3.3 All submittals shall be clearly drawn with CAD or typewritten to be legible. Illegible submittals will be returned to the Contractor stamped "REVISE AND RESUBMIT" without Consultant review.

2.4 ENGINEER'S STAMP AND SIGNATURE

2.4.1 Shop Drawings of components, apparatus and equipment which are designed by the Contractor shall bear the stamp and signature of a Professional Engineer licensed to practice in the Province of Ontario in accordance with the Ontario Building Code and the Professional Engineer's Act.

2.5 CHANGES

2.5.1 Adjustments made on Shop Drawings by the Consultant are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Consultant prior to proceeding with the Work.

2.5.2 Make changes in Shop Drawings as the Consultant may require and which are consistent with Contract Documents. When resubmitting, notify the Consultant in writing of any revisions other than those requested by the latter.

2.6 UNITS OF MEASUREMENT

2.6.1 Shop Drawings shall show weights and dimensions in either metric S.I. units or Imperial units, consistent with the Consultant's Drawings and Specifications.

2.7 PRODUCT DATA AND BROCHURES

2.7.1 Submit Product Data and Brochures in the same manner as Shop Drawings specified above.

2.7.2 As a part of Record Documents, submit PDF copies of Product data sheets and brochures, on a CDROM(s). Scanned file copies in Adobe Acrobat or Original Digital files are acceptable. Data sheets or brochures are for requirements requested in Specification sections and as the Consultant may reasonably request where customized Shop Drawings will not be prepared due to standardized manufacture of Product.

Submittal Procedures

- 3 Samples
- 3.1 GENERAL**
- 3.1.1 Submit for review all samples as requested in the respective Specification sections. Label samples as to origin and intended use in the Work.
- 3.1.2 Deliver samples prepaid to Consultant's business address.
- 3.1.3 Notify the Consultant in writing at the time of submission, of deviations in samples from requirements of Contract Documents.
- 3.1.4 Adjustments made on samples by the Consultant are not intended to change the Contract Price. If such adjustments affect the value of Work, state such in writing to the Consultant prior to proceeding with the Work.
- 3.1.5 Make changes in samples which the Consultant may require consistent with the Contract Documents.
- 4 Building, Operating And Maintenance Manuals
- 4.1 BINDERS**
- 4.1.1 Binders: premium quality hard covered, jacketed, "D" ring style with 3 rings in size to suit binder thickness.
- 4.1.2 Covers: Identify each binder with typed title "Building, Operating and Maintenance Manuals"; list title of Project, Owner, and date of manual submission.
- 4.1.3 Organize contents into applicable categories of Work, parallel to Specification sections. Where only one volume is required, include a complete index. Where more than one volume is required, include a complete index of all volumes and each succeeding volume shall contain an index of its own contents.
- 4.1.3.1 Provide tabbed fly leaf for each category of Work, with typed description of Product and major component parts of equipment.
- 4.1.3.2 Include names, addresses, telephone number and general email address of Contractor with names of responsible parties; schedule of Products and systems, indexed to content of the volume.
- 4.1.3.3 For each Product or system, list names, addresses, telephone numbers and general email address of Subcontractors and Suppliers who can effect repair or maintenance on equipment, including local source of supplies and replacement parts.
- 4.1.3.4 Product data: organize CDROM(s) to parallel Specifications breakdown. Clearly identify specific Products and component parts and data applicable to installation; delete inapplicable information. Supplement Product data to illustrate relationships of component parts of equipment and systems to show control and flow diagrams.
- 4.2 BUILDING MANUALS**
- 4.2.1 For building Products, applied materials and finishes include:
 - 4.2.1.1 Product data with catalogue number, size, composition and colour and texture designations.
 - 4.2.1.2 Maintenance instructions for finished surfaces and materials.
 - 4.2.1.3 Copy of finish hardware and paint schedules.
 - 4.2.1.4 Spare materials for maintenance purposes as listed in various technical sections.
 - 4.2.1.5 Provide information for reordering custom manufactured Products.

Submittal Procedures

- 4.2.2 Include instructions for cleaning agents methods and recommended schedule for cleaning and maintenance, include precautionary information against detrimental agents and proper methods.
- 4.2.3 Additional requirements: Include as specified in individual Specification sections.
- 4.3 OPERATING AND MAINTENANCE MANUALS**
- 4.3.1 Manuals are to contain operational information on equipment, cleaning and lubrication schedules e.g. filters, overhaul and adjustment schedules and similar maintenance information. Give equipment function, normal operation characteristics and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- 4.3.2 Instructions shall be in such form and language so as to facilitate the Owner in the proper operation and maintenance of building systems.
- 4.3.3 In addition to information specified, include the following:
- 4.3.3.1 Final Shop Drawings and Product data of equipment.
- 4.3.3.2 Record Drawings of mechanical and electrical installations.
- 4.3.3.3 Full description of building systems and operations.
- 4.3.3.4 Operating procedure: include start up, break-in, and routing normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter and any special operating instructions.
- 4.3.3.5 Controls and operating sequences; wiring diagram of control panels.
- 4.3.3.6 Schematic diagram of pneumatic, electrical, oil and/or gas systems.
- 4.3.3.7 Non-dimensional layout showing locations of all electrical devices on mechanical equipment.
- 4.3.3.8 Complete parts list of assemblies showing manufacturer's names, addresses, nearest replacement sources and telephone numbers.
- 4.3.3.9 List of recommended spare parts and quantity of each item to be stocked.
- 4.3.3.10 Maintenance requirements: include preventative requirements; routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions and alignment, balancing and checking instructions.
- 4.3.3.11 Manufacturer's warranties.
- 4.3.3.12 Lubricating instructions, list of lubricants and recommended cycle of lubrication.
- 4.3.3.13 Manufacturer's certified reports.
- 4.3.3.14 Field testing and commissioning reports.
- 4.3.3.15 Factory test reports.
- 4.3.3.16 Sequence of controls operation and control diagrams.
- 4.3.3.17 Contractor's coordination Drawings with installed colour coded piping diagrams.
- 4.3.3.18 Original manufacturer's parts list, illustrations, assembly Drawings and diagrams required for maintenance.
- 4.3.3.19 List of original manufacturer's spare parts, current prices and recommended quantities to be maintained in storage.
- 4.3.3.20 Additional requirements: Provide as specified in individual Specifications sections.
- 4.3.4 Requirements specified apply to component parts of equipment whether they are manufactured by Supplier of equipment or are supplied as a component part of an item of equipment.
- 4.4 SUBMITTAL OF MANUALS**
- 4.4.1 Two weeks prior to the anticipated date of Substantial Performance, submit to Consultant complete set of completed manuals in final form.
- 4.4.2 Copy will be returned with Consultant's comments.

Submittal Procedures

- 4.4.3 Revise contents of manuals as required prior to final submittal.
- 4.4.4 Submit two (2) copies of revised manuals in final form within 14 days before Substantial Performance.
- 4.4.5 CD ROM(s) shall contain scanned file copies in Adobe Acrobat Version 6 or later version, of all Building, Operating and Maintenance Manuals. Provide a file for each document, with bookmarking reference for each chapter or section in the document.

5 As-builts

5.1 AS-BUILT DRAWINGS

- 5.1.1 Provide at own cost, additional sets of Drawing prints for use in maintaining "As-Built" information.
- 5.1.2 Be responsible for creating "As-Builts" from field data collected during the course of the Project. Neatly record complete with legible dimensions and notes.
- 5.1.3 "As-Built" Drawings are those prepared by the Contractor as it constructs the Project and upon which it documents the actual locations of the building components and changes to the original Contract Documents.
- 5.1.4 Field data is defined as information that is not available from the Contract Documents, addenda, Change Orders, or Site instructions. It is of importance that the Contractor record on the "As-Builts" all field information relating to concealed conditions.
- 5.1.5 "As-Built" information MUST have a high degree of accuracy in all respects.
- 5.1.6 Recording must be done on the same day that deviation is made to ensure that important information is not missed from the "As-Builts".
- 5.1.7 Hand-mark all recording using red ink. "Clouded" method is unacceptable and "As-Builts" showing such method will be returned to the Contractor.
- 5.1.8 Identify as "Project As-Built Copy". Maintain in good condition; clean, dry and legible, and make available for inspection on Site by Consultant at all times.
- 5.1.9 Upon completion of the Work and prior to final inspection, submit a clean and legible copy of "As-Built" Drawings to Consultant.

5.2 PROGRESS PHOTOGRAPHS

- 5.2.1 On commencement of the Work and at every two-week intervals thereafter, supply the Consultant with minimum 10 digital colour photographs, taken from different views, indicating status and progress of the Work by each section of Work. Progress photographs shall be submitted along with the Bi-Weekly Inspection Report
- 5.2.2 Number prints and keep a log noting date and a brief description of subject, conditions, camera position and direction of view for each print. Photographs shall document relevant events occurring at the Place of the Work. Unless conditions warrant, no more than two (2) photographs of the same subject will be accepted. Contractor may be instructed to take certain photographs as the Work progresses.

END OF SECTION

Alternates and Substitutions

01 62 00 – Alternates and Substitutions

1 Alternates and Substitutions

1.1 PROPOSED ALTERNATE AND SUBSTITUTE PRODUCTS

1.1.1 Whenever a material or article is specified or described by using the name of a proprietary Product or the name of a particular manufacturer or Vendor, the specific item mentioned shall be understood as establishing type, function, dimension, appearance, and quality of Product desired.

1.1.2 The words "or accepted equal", "or accepted equivalent" and "or accepted alternative" as used in the Specifications are to be regarded as synonymous in meaning, and are applicable to all Specifications unless specifically stated otherwise. Any material, Product, or equipment which will fully perform or meet the service or function and/or aesthetics represented by a specified Product will be considered for acceptance as an "**alternate**" or "**substitution**", provided the Contractor submits proof that such material, Product or equipment is of acceptable equivalent substance and function and is accepted by the Owner. The burden of proof of acceptability rests with the Contractor.

1.2 REQUESTS FOR ALTERNATES OR SUBSTITUTES

1.2.1 Voluntary alternates or substitution by the Contractor will not be accepted.

1.2.2 Requests must be submitted in writing using Section 01 62 01 Substitution Request Form.

1.2.3 The net cost of proposed substitution, weighed versus the cost of review, will be a factor in the Owner's final decision.

1.2.4 Contractor is responsible to determine suitability of accepted substitute Products for general construction purposes and scheduling requirements.

1.2.5 Acceptability of proposed substitutions is at the sole discretion of the Owner. The Owner however, is under no obligation to consider any or all proposed substitutions. Acceptance of substitutions shall in no way be interpreted as a waiver from full compliance with other Specification requirements.

1.2.6 Contractor shall declare that such substitution will fit within all constraints of the intended location and operating system in the Work without modification, or clearly described and defined modification, to allied specified systems, materials or assemblies.

1.2.7 Contractor shall save harmless the Owner, Consultant and their Subconsultants from any costs or third party action as a consequence of accepted substitution. Failure to comply with these requirements will result in rejection of the request.

1.3 NOTIFICATION OF ACCEPTANCE

1.3.1 Materials and equipment accepted as substitutions will be formally notified to the Contractor by a Change Order, Supplementary Instruction (SI) or Shop Drawings, as the case may be.

END OF SECTION

Alternates and Substitutions Request Form

01 62 01 – Alternate and Substitutions Request Form

1 General

- .1 This section applies to proposed alternate or substitution submitted after Contract award.
- .2 The Consultant will receive requests for alternate or substitution on the form appended to this Section, from the Contractor for consideration. Submissions received directly from the Contractor's subcontractors will not be reviewed. Alternate or substitution submittals not reviewed will returned to Contractor, marked "Not Reviewed"
- .3 Alternate or substitution requests will not be received or reviewed during the Bid/Tender phase of this Project. The Consultant will receive and review requests during the Construction phase of this Project as submitted on the appended form.
- .4 Copy the Owner on all alternate or substitution requests. The Owner will forward authorized alternate or substitution requests to Consultant for review. Consultant will not proceed with review without Owner's authorization.
- .5 The Consultant will complete its review and submit a response back to Contractor in a timely manner. If accepted, a Change Order or Supplementary Instruction is issued
- .6 The Owner is under no obligation to consider proposed alternate or substitution requests.
- .7 Contractor shall declare that such alternate or substitution will fit within all constraints of the intended location and operating system in the Work without modification, or clearly described and defined modification, to allied specified systems, materials or assemblies. The proposed alternate or substitution is to be equal to or superior to the specified item as determined by Consultant.
- .8 Save harmless the Owner, Consultant and their subconsultants from any costs or third party action as a consequence of accepted alternate or substitution. Failure to comply with these requirements will result in rejection of the request.
- .9 Any system, Product or material utilized without acceptance from the Consultant shall be removed from the Work, and replaced with complete installation of those specified without adjustment of Contract Price or Contract Time.

END OF SECTION

Alternates and Substitutions Request Form

Alternate or Substitution Request Form (ASRF) No.: _____ Date: _____

Contractor: _____ Subcontractor _____

Owner's Authorization:

2 Alternate or Substitution Request Form:

.1 Consultant Specified Product

.1 Section No., Section Title, and Item No.:

.2 Proposed Substitution

.1 Manufacturer:

.2 Model No.:

.3 Manufacturer and Contact information:

.3 Product History

.1 New 2 to 5 yrs old 5 to 10 yrs old more than 10 yrs old

.2 Similar Installations:

.3 Project Name and Address:

.4 Consultant:

.5 Owner:

.6 General Contractor:

Alternates and Substitutions Request Form

.4 Proposed Product Affects Other Parts of Work?

.1 No Yes

.2 If "Yes", explain:

.5 Differences between proposed substitution and specified Product:

.6 Reason for not providing specified Product (substitution requests are considered under any of the following conditions only. Indicate conditions with a check mark):

.1 Product(s) selected from those specified is/are unavailable.

.2 Method(s) specified is/are too intricate.

.3 Delivery date of Product(s), selected from those specified would unduly delay completion of Contract.

.4 Method(s) specified would unduly delay completion of Contract.

.5 Proposed substitute Product(s) or system(s) will result in a meaningful credit to the Contract Price.

.7 Change to Contract Price

.1 Add/Deduct \$ _____ (_____)

.8 Change to Contract Time

.1 Add/Deduct _____ days

.9 Contractor's Declaration:

.1 Proposed substitution has been fully investigated and determined to be equivalent or superior in all respects to specified Product, and complies with requirements of authorities having jurisdiction.

.2 Same warranty will be furnished for proposed substitution as for specified Product.

.3 Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.

.4 Proposed substitution does not affect dimensions and functional clearances.

.5 Proposed substitution is compatible with adjacent materials and assemblies.

Alternates and Substitutions Request Form

- .6 Coordination, installation, and changes in the Work as necessary for accepted substitution will be the responsibility of the Contractor.

Signed By Contractor: _____ Date: _____

Supporting Data Attached:

Drawings Product Data Samples Reports Other

3 Consultant's Review

.1 Substitution Accepted - Provide submittals per Specification requirements.

.2 Substitution Not Accepted

.1 Reason:

Signed By Consultant: _____ Date: _____

END OF FORM

Material Equipment and Workmanship

01 66 15 - Material, Equipment and Workmanship

1 General

1.1 REQUIREMENTS

1.1.1 Product quality, availability, storage, handling, protection, handling on Site.

1.1.2 Manufacturer's instructions.

1.1.3 Workmanship, coordination, cutting, fastenings.

1.1.4 Existing facilities.

1.2 GREEN BUILDING AND CONSTRUCTION

1.2.1 The Owner is committed to the principles of sustainable design, green construction practices, and the reduction of greenhouse gas emissions. This project is not registered under any governing program; however, these Construction Documents may reference or note specific *Green Building and Construction* requirements.

1.2.2 The Contractor shall assist in achieving the *Green Building and Construction* initiatives specified.

1.2.3 Work of this contract may include, but is not limited to, the use of Rapidly renewable materials, Regionally extracted and manufactured materials, and Resource reuse.

1.2.4 Recycled Content Of Materials

1.2.4.1 Provide building materials with recycled content such that post-consumer recycled content plus one-half of post-industrial recycled content constitutes a minimum of 15 percent of the cost of materials used for the Project.

1.2.4.2 The cost of post-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.

1.2.4.3 The cost of post consumer recycled content plus one-half of post-industrial recycled content of an item shall be determined by dividing the weight of post-consumer recycled content plus one-half of post-industrial recycled content in the item by the total weight of the item and multiplying by the cost of the item.

1.2.4.4 Do not include mechanical and electrical components in the calculation.

1.2.4.5 Recycled content of materials shall be defined according to the Federal Trade Commission's Guide for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e).

1.2.5 Regional Materials

1.2.5.1 Provide Regionally Extracted and Manufactured Materials that are processed or manufactured within 800 km of the construction site, or 2400 km if final transportation leg is by rail or water, and for which 80% of the weight of constituent raw materials were extracted within the same limiting distance from the Project site.

2 Products

2.1 QUALITY

2.1.1 Refer to GR7 and GR11 of Section 01 10 00 General Requirements.

2.1.2 Products, material, equipment and articles (referred to as Products throughout the Specifications) incorporated in the Work shall be new, not damaged or defective, and of the best quality, compatible with Specifications for the purpose intended.

2.1.2.1 If requested, furnish evidence as to type, source and quality of Products provided.

Material Equipment and Workmanship

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

2.2 AVAILABILITY

- 2.2.1 Immediately after award of Contract, review Product delivery requirements and anticipate foreseeable supply delays for any item. If delays in supply of Products are foreseeable, notify the Consultant of such, in order that substitutions or other remedial action may be authorized in sufficient time to prevent delay in performance of Work.
- 2.2.2 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to substitute more readily available Products of similar character at no increase in Contract Price.
- 2.2.3 Utilize Canadian materials and Products if available and equivalent in price and quality.

2.3 STORAGE, HANDLING AND PROTECTION

- 2.3.1 Handle and store Products in a manner to prevent damage, deterioration and soiling and in accordance with manufacturer's instructions where applicable.
- 2.3.2 Store packaged or bundled Products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging, crating or bundling until required in the Work.
- 2.3.3 Store Products subject to damage from the elements, in weatherproof enclosures.
- 2.3.4 Store cementitious Products clear of earth or concrete floors, and away from walls.
- 2.3.5 Keep sand, when used for mortar or grout materials, clean and dry. Store sand on platforms and cover with waterproof tarpaulins during inclement weather.
- 2.3.6 Store sheet materials and lumber on flat solid supports and keep clear of ground. Slope to shed moisture.
- 2.3.7 Store and mix paints in a heated and ventilated room. Remove oily rags and other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.
- 2.3.8 Remove and replace damaged Products at own expense and to the satisfaction of Consultant.

2.4 RECEIVING MATERIAL FURNISHED BY OWNER

- 2.4.1 Owner furnished material or equipment are listed in the Specifications.
- 2.4.1.1 Contractor shall be responsible for unloading and handling material or equipment furnished by Owner to the Site.

Material Equipment and Workmanship

2.4.2 Contractor receiving such items shall give receipts for the item delivered and thereafter will be held responsible for the care and storage of such items and shall pay for the cost of replacing or repairing any items damaged, misplaced or found to be missing while in Contractor's care and custody.

2.5 TRANSPORTATION

2.5.1 Pay costs of transportation of Products required in the performance of Work.

2.5.2 Transportation cost of Products supplied by the Owner and delivered to Site will be paid for by the Owner.

2.5.2.1 Contractor shall unload, handle and store such Products.

2.6 MANUFACTURER'S INSTRUCTIONS

2.6.1 Unless otherwise indicated in the Specifications, install or erect Products in accordance with manufacturer's instructions. Do not rely solely on labels or enclosures provided with Products.

2.6.2 Obtain written instructions directly from manufacturers.

2.7 ALTERNATIVE MATERIALS

2.7.1 Purchased items or materials must meet the requirements of the Specifications. Be responsible for all costs for any modifications required for use of such items.

2.7.2 To receive approval of substitution, the proposed substitute shall be equal to or superior to the specified item. Requests for substitution shall be accompanied by documentary proof of equality and difference in price and delivery.

2.7.3 Submit request to the Consultant in writing and provide all technical data, samples and other information requested. No substitution shall be made without the written authority of the Consultant whose decision shall be final.

2.7.4 Products shall be applied, installed, connected, erected, cleaned and conditioned in accordance with the manufacturer's instructions or directions, unless specified to the contrary elsewhere in the Contract Documents.

2.7.5 Assume responsibility for any additional material or installation costs resulting from the approved use of equivalent materials or equipment.

2.8 EXPEDITING

2.8.1 The Contractor shall submit, when requested by Consultant, an updated material procurement/expediting record indicating clearly the status of material delivery and fabrication. Particulars to be covered by this record shall include the item identification, sub-vendor, order date, order number, Shop Drawing submission date(s) and review date(s), required delivery date, promised delivery date, date received, date checked and general remarks.

2.8.2 The Contractor shall accumulate and submit similar records from (assigned) Subcontractors and shall ensure that Subcontractors are properly and frequently expediting all equipment and material to meet delivery deadlines to suit installation schedule.

2.8.3 The Contractor shall allow the Owner, Consultant, or their representative free access to the Contractor's plant and to Subcontractor's plants for visual inspection of allotted material and/or progress of the Work.

Material Equipment and Workmanship

- 3 Workmanship
- 3.1 GENERAL**
- 3.1.1 Workmanship shall be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce required results.
- 3.1.2 Do not employ any unfit person or anyone unskilled in their required duties. The Consultant reserves the right to require the dismissal from the Site of workers deemed incompetent, careless, insubordinate or otherwise objectionable.
- 3.1.3 Decision as to the quality or fitness of workmanship in cases of dispute rests solely with the Consultant whose decision shall be final.
- 3.1.4 Whenever possible, give preference to the use of local labour. Establish rates of wages, and hours of work in accordance with provincial regulations and as generally recognized and accepted in the locality.
- 3.2 TOLERANCES**
- 3.2.1 Building and Construction tolerances are specified for Works of this Contract within each specification section. Monitor fabrication and installation tolerance control of Materials and Products.
- 3.2.2 Do not permit tolerances to accumulate beyond effective or practical limits as specified, or as required by Building and Construction standards.
- 3.2.3 Comply with manufacturers' tolerances. In case of conflict between manufacturers' tolerances and Contract Documents, the most stringent will apply.
- 3.2.4 Adjust Materials and Products to appropriate dimensions; position and confirm tolerance acceptability, before permanently securing Products in place.
- 3.3 CO-ORDINATION**
- 3.3.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- 3.3.2 Be responsible for coordination and placement of openings, sleeves and accessories.
- 3.4 CONCEALMENT**
- 3.4.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- 3.4.2 Before installation, inform Consultant if there is an existing contradictory situation. Install as directed by Consultant.
- 3.5 CUTTING AND REMEDIAL WORK**
- 3.5.1 Refer to GR9 of Section 01 10 00 General Requirements.
- 3.5.2 Perform cutting and remedial Work required to make the parts of the Work come together. Coordinate the Work to ensure this requirement is maintained
- 3.5.3 Should Work performed outside this Contract necessitate cutting and/or remedial Work to be performed, the cost of such Work will be valued by the Consultant.
- 3.5.4 Perform cutting and remedial Work by specialists familiar with the materials affected. Perform in a manner to neither damage nor endanger any portion of Work.

Material Equipment and Workmanship

3.6 FASTENINGS

- 3.6.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent material unless indicated otherwise.
- 3.6.2 Prevent electrolytic action between dissimilar metals and materials.
- 3.6.3 Use non-corrosive hot dipped galvanized steel fasteners and anchors for securing exterior Work, unless stainless steel or other material is specifically requested in the affected Specification section.
- 3.6.4 Space anchors within their load limit or shear capacity and ensure that they provide positive permanent anchorage. Wood or any other organic material plugs are not acceptable.
- 3.6.5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- 3.6.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

3.7 PROTECTION OF WORK IN PROGRESS

- 3.7.1 Adequately protect Work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant, at no increase in Contract Price.
- 3.7.2 Prevent overloading of any part of the Work or building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of the Consultant.

3.8 EXISTING UTILITIES

- 3.8.1 Connect to existing services or utilities at times directed by Owner or local governing authorities, with a minimum of disturbance to Work, building occupants, pedestrian and vehicular traffic.
- 3.8.2 Protect and maintain existing active services. When inactive services are encountered cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service.

END OF SECTION

Construction Waste Management

01 74 19 – Construction Waste Management

1 General

1.1 DESCRIPTION

1.1.1 This section includes administrative and procedural requirements for construction waste management activities including the following:

1.1.1.1 Recycling nonhazardous construction waste.

1.1.1.2 Disposing of nonhazardous construction waste.

1.2 DEFINITIONS

1.2.1 Construction Waste: Building and Site improvement materials and other solid waste resulting from construction operations. Construction waste includes packaging.

1.2.2 Disposal: Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.2.3 Recycling: Sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new Product.

1.2.4 Salvage: Recovery of construction waste for sale or reuse in another facility.

1.2.5 Salvage and Reuse: Recovery of construction waste and incorporation into the Work of this Contract.

1.2.6 Approved Recycling Facility: A facility that can legally accept construction, demolition, and land clearing waste materials, for the purpose of processing the materials into an altered form for the manufacture of a new Product.

1.2.7 Material Recovery Facility: A general term used to describe a waste-sorting facility.

1.3 PERFORMANCE REQUIREMENTS

1.3.1 Salvage/recycle: salvage and recycle as much nonhazardous construction waste as possible.

1.3.2 Develop waste management plan that results in end-of-Project rates for recycling of 75 percent by weight of total waste generated by the Work or a combination reuse, salvaging, and recycling.

1.3.3 Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous construction waste as possible. Owner has established minimum goals for the following Construction Waste materials:

1.3.3.1 Masonry and CMU

1.3.3.2 Lumber

1.3.3.3 Wood sheet materials

1.3.3.4 Wood trim

1.3.3.5 Metals

1.3.3.6 Roofing

1.3.3.7 Insulation

1.3.3.8 Carpet and pad

1.3.3.9 Gypsum board

1.3.3.10 Piping

1.3.3.11 Electrical conduit

1.3.4 Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1.3.4.1 Paper

1.3.4.2 Cardboard

Construction Waste Management

- 1.3.4.3 Boxes
- 1.3.4.4 Plastic sheet and film
- 1.3.4.5 Polystyrene packaging
- 1.3.4.6 Wood crates
- 1.3.4.7 Plastic pails

1.4 SUBMITTALS

- 1.4.1 Waste management plan: Submit the Waste Management Plan within seven days of date established by the notice of award.
- 1.4.2 Waste reduction progress reports: Concurrent with each application for payment, submit a copy of the progress report. Include separate reports for construction waste. Include, as a minimum, the following information:
 - 1.4.2.1 Material category
 - 1.4.2.2 Generation point of waste
 - 1.4.2.3 Total quantity of waste in tonnes
 - 1.4.2.4 Quantity of waste salvaged, both estimated and actual in tonnes
 - 1.4.2.5 Quantity of waste recycled, both estimated and actual in tonnes
 - 1.4.2.6 Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste
- 1.4.3 Waste reduction calculations: Before request for Substantial Performance, calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- 1.4.4 Records of donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- 1.4.5 Records of sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- 1.4.6 Recycling and processing facility records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- 1.4.7 Landfill and incinerator disposal records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

- 1.5.1 Regulatory requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 WASTE MANAGEMENT MEETING

- 1.6.1 Schedule and conduct meeting at Project site prior to construction activities. This meeting may take place in conjunction with the Preconstruction Meeting, refer to Section 01 10 00 - General Requirements.
- 1.6.2 Ensure attendance by authorized Representatives of Owner, Consultant and Subcontractors, and any other parties required.
- 1.6.3 Review methods and procedures related to waste management including but not limited to:
 - 1.6.3.1 Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 1.6.3.2 Review requirements for documenting quantities of each type of waste and its disposal.
 - 1.6.3.3 Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

Construction Waste Management

1.6.3.4 Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

1.6.3.5 Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

1.7.1 Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

1.7.2 Indicate anticipated types and quantities of construction waste generated by the Work, and include estimated quantities and assumptions for estimates.

1.7.3 List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1.7.4 Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan.

1.7.5 Indicate how waste materials will be separately stored for collection in on-site facilities. Include handling and storage procedures, and anticipated quantities of recyclable materials. Locate containers in locations which minimize damage to materials and do not hinder daily operations

1.8 WASTE MANAGEMENT REPORT

1.8.1 Submit accumulative waste management report with each application for payment with the following attachments:

1.8.1.1 A record of the type and quantity, by weight, of each material salvaged, reused, recycled or disposed.

1.8.1.2 Total quantity of waste recycled as a percentage of total waste.

1.8.1.3 Disposal receipts: copy of receipts issued by a disposal facility for construction, demolition and land clearing waste that is disposed in a landfill.

1.8.1.4 Recycling receipts: copy of receipts issued by an approved recycling facility.

1.8.1.5 Salvaged materials documentation: Types and quantities, by weight, for materials salvaged for reuse on site, sold or donated to a third party

2 Products

2.1 NOT USED

3 Execution

3.1 IMPLEMENTATION

3.1.1 Implement waste management plan as approved by the Consultant.

3.1.2 Waste management coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

3.1.3 Training: Train workers, Subcontractors, and Suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

3.1.4 Site access and temporary controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

Construction Waste Management

3.2 RECYCLING AND CONSTRUCTION WASTE

- 3.2.1 Provide containers for construction, demolition and land clearing waste that is to be recycled clearly labeled as such with a list of acceptable and unacceptable materials.
- 3.2.2 Provide containers for construction, demolition and land clearing waste that is disposed in a landfill clearly labeled as such.
- 3.2.3 Conduct regular visual inspections of dumpsters and recycling bins to remove contaminants.
- 3.2.4 Separate recyclable materials by type from construction, demolition and land clearing.
- 3.2.5 Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Stockpile materials away from demolition area.
- 3.2.6 Include in material purchasing agreements, a waste reduction provision requesting that materials and equipment be delivered in packaging made of recyclable material, that they reduce the amount of packaging, the packaging be taken back for reuse or recycling, and to take back all unused product. Ensure that Subcontractors require the same provisions in their purchase agreements.
- 3.2.7 Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

3.3 DISPOSAL OF WASTE

- 3.3.1 Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- 3.3.2 Burning: Do not burn waste materials.
- 3.3.3 Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

Concrete Forming

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.1.3 Read this Section in conjunction with the following Sections:

1.1.3.1 Section 03 20 00 Concrete Reinforcing

1.1.3.2 Section 03 30 00 Cast-In-Place Concrete

1.1.3.3 Section 03 35 00 Concrete Floors and Finishing

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

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

1.2.1.2 CSA-A23.1 - Concrete Materials and Methods of Concrete Construction

1.2.1.3 CSA O121-M - Douglas Fir Plywood

1.2.1.4 CSA S269.1 - Falsework for Construction Purposes

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 Shop Drawings: Submit Shop Drawings showing spacing of form ties for architectural concrete walls in accordance with Section 01 33 00. Show size of tie hole, plastic plug and plug recess.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

1.4.1 Coordinate delivery, receive and store materials on Site in a manner to prevent damage thereto. Protect from the weather. Comply with CSA-A23.1.

1.4.2 Protect Work of this section from damage. Protect other Work from damage resulting from this Work. Replace damaged Work which cannot be satisfactorily repaired.

1.5 TOLERANCES

1.5.1 All forms are to produce plumb and level concrete, true to linear building lines. Conform to CSA-A23.1 for maximum variations (not accumulative).

1.5.2 A permitted variation in one part of the construction or in one section of the Specification shall not be construed as permitting violation of more stringent requirements for any other part of the construction, or in any other Specification section.

2 Products

2.1 GENERAL

2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.

Concrete Forming

2.2 MATERIALS

- 2.2.1 Forms and accessories:
- 2.2.1.1 Plywood: CSA O121-M, G1S; Douglas fir plywood, sheets as large as practical, exterior grade, waterproof glue, edges sealed with oil-based sealer.
- 2.2.1.2 Prefabricated steel forms: CAN/CSA S136-M; free of irregularities, dents, sags, rust, and materials that can discolour concrete finish.
- 2.2.1.3 Used formwork may be used for surfaces which will be concealed.
- 2.2.1.4 The use of premanufactured commercial "system formwork" is not permitted.
- 2.2.2 Falsework materials: To CSA S269.1. Where patented accessories, fabricated forms, shoring or scaffolding units are to be used, follow manufacturer's instructions for load carrying capacity and bracing.
- 2.2.3 Plywood form liner: Medium density overlaid plywood marked "COFI Form Plus"; "Ultraform" by Richmond Plywood Corporation, or "Pourform 107" by Ainsworth Lumber Company Ltd.
- 2.2.4 Form tape: Pressure sensitive plastic film.
- 2.2.5 Form ties: Threaded internal disconnecting, spreader type, adjustable in length, minimum working strength of 13 kN when fully assembled. Ties to have maximum break-back of 38 mm from concrete surface. Ties shall incorporate removable tapered plastic spreader cones, with a setback of 38 mm. (Taper of spreader shall match taper of tie hole plugs).
- 2.2.6 Tie hole plugs: Plastic set back plugs, grey to match concrete, 38 mm setback, to fit tightly into tie holes. Include for tie hole plug quantity on the basis of 750 mm each way plug spacing pattern.
- 2.2.7 Bar type waterstops: Preformed bentonite and butyl rubber-based waterstop, "Waterstop RX 101" by DRE Industries Inc, "Krytonite Swelling Waterstop" by Kryton International Inc., or Consultant approved equivalent. Adhesive for concrete, steel, or PVC: water based "WB-Adhesive" by DRE Industries Inc. or approved equivalent.
- 2.2.8 Bar type waterstops: Preformed water-swelling elastic rubber, "Adeka Ultraseal MC-2010M" as distributed by Form and Build Supply Inc. Securement to substrate shall be either adhesive or concrete nail with packing depending on substrate, as recommended by waterstop manufacturer.
- 2.2.9 Tubular forms: Sonoco Products Ltd. "Sonotube" spirally wound fibre forms free of dents and other irregularities, treated internally with release material.
- 2.2.10 Tubular forms: Newark Paperboard Products "Poli-NewForm" fibre forms with seamless plastic liner.
- 2.2.11 Chamfer strips: 13 x 13 mm triangular fillets milled from clear, straight grain pine, surfaced each side, or extruded vinyl type.
- 2.2.12 Formwork release agent: Imperial Oil "Filmo No 40", Goodco "Noxcrete", W.R. Meadows "Duogard", Euclid "Super Slip", CPD Chemical Form Release Agent or Dayton Superior "Clean-Strip (J-1)".

3 Execution

3.1 FORMWORK

- 3.1.1 All formwork to be in strict accordance with CSA-A23.1, unless shown otherwise on drawings or as directed by the Consultant. Do not leave lumber in concrete.
- 3.1.2 All falsework to be in strict accordance with CSA S269.1.

Concrete Forming

- 3.1.3 Obtain Consultant's approval in writing for use of earth cuts as forms for vertical sides of footings and other Work not exposed to view. If approved, hand trim sides and bottoms and remove loose earth before placing concrete.
- 3.1.4 Assume full responsibility for the complete design and engineering of formwork including shoring and bracing to resist loads due to wet concrete, forms, wind, etc., and other forces arising from use of equipment to place concrete.
- 3.1.5 Do not set shoring and scaffolding on frozen subgrade. Continuously monitor safety of scaffolding.
- 3.1.6 Apply formwork release agent by spray in accordance with manufacturer's recommendations. Ensure surfaces of form receive a uniform coating.
- 3.1.7 Align form joints and make watertight. Keep form joints to a minimum.
- 3.1.8 Form for depressions, recesses, chases, reglets, anchorages and keys required in concrete.
- 3.1.9 Set floor screeds with true and straight top edge to proper elevation.
- 3.1.10 Form **13 mm x 13 mm** minimum chamfered edges on exposed concrete corners unless shown otherwise. Set chamfer strips to achieve a smooth finish and consistent chamfer size throughout length of concrete.
- 3.1.11 Construct forms for exposed finished concrete Work to achieve the following:
- 3.1.11.1 Grout-tight forms at corners, panel joints, recesses, arrises and at construction joints to prevent cement paste from leaking.
- 3.1.11.2 Accurate alignment of concrete surfaces.
- 3.1.11.3 Surfaces without indentations other than those shown.
- 3.1.11.4 Sharp and straight corners.
- 3.1.12 Use full-size contact form sheeting panels wherever possible. Carefully install contact surfaces of formwork to produce neat and symmetrical joint patterns. Joints shall be either vertical or horizontal and, where possible, stagger so as to maintain structural continuity. Back vertical joints solidly and nail edges of abutting sheets to same stud. Likewise solidly back horizontal joints. Take care to ensure adjacent form panels fit accurately, tight and flush. Use straight lumber.
- 3.1.13 Align forms to ensure no visible defects appear on finished Work.
- 3.1.14 Locate wall form ties in accordance with reviewed Shop Drawings; align on a particular member both vertically and horizontally. Arrange reuse of forms so tie holes are also reused. Tighten form ties, particularly at corners.
- 3.1.15 Form slab soffits using full size panels where possible. Keep number of smaller size panels to a minimum.
- 3.1.16 Take particular care in forming corners and openings. Ensure formwork is tight and braced so no movement occurs.
- 3.1.17 Cleaning and tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- 3.2 CONSTRUCTION JOINTS**
- 3.2.1 Construction joints to be in strict conformance with CSA-A23.1. Locate construction joints as required and as shown on drawings.

Concrete Forming

3.2.2 Form 50 mm x 100 mm bevelled shear keys full length on construction joints, unless detailed otherwise.

3.3 INSTALLATION OF BAR TYPE BENTONITE WATERSTOPS

3.3.1 Install continuous waterstops in all pour joints (i.e. wall-to-slab joint) of a concrete structure that is waterproofed by a bentonite clay waterproofing system or as shown.

3.3.2 Brush clean debris, dirt, and rocks from dry concrete surface. Verify surfaces are dry.

3.3.3 Ensure proper waterstop placement for sufficient concrete coverage. Install waterstop along interior side of the outer row of steel reinforcement to allow for minimum concrete cover.

3.3.4 Apply adhesive by roller or brush to 125 microns thick x width of waterstop to prepared concrete surfaces.

3.3.5 Allow adhesive to dry 10 - 15 minutes or until adhesive appears black in colour.

3.3.6 Remove release paper from waterstop and press firmly into dried adhesive. Apply pressure for minimum 15 seconds to ensure adhesion.

3.3.7 Butt coil ends of waterstop together to form continuous installation. Do not overlap ends.

3.4 STRIPPING FORMWORK

3.4.1 Strip formwork in accordance with CSA-A23.1. Forms may be removed any time after three days from date of placing concrete or otherwise as directed by Consultant. Remove plastic spreader cones from architectural form ties in preparation for installation of tie hole plugs or grouting application.

3.4.2 Be responsible for the safety of structure, both before and after removal of forms until concrete has reached its specified 28-day compressive strength.

3.4.3 Take particular care when removing forms to ensure no damage occurs.

3.4.4 To help avoid colour variations in architectural concrete, ensure length of time between concrete placing and form removal is approximately the same for each portion of Work..

3.4.5 Ensure length of time between concrete placing and form removal is approximately the same for each portion of Work.

3.4.6 Loosen forms as soon as practical without damage to the concrete during hot weather construction. Wood forms remaining in place are not adequate for curing purposes, Ensure concrete is kept moist.

3.4.7 In cold weather, defer removal of formwork or replace formwork with insulation blankets, to avoid thermal shock and consequent cracking of concrete surface.

END OF SECTION

Concrete Floors and Finishing

1 General

1.1 SUMMARY

1.1.1 Unless otherwise shown on Structural Drawings or specifications, comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

- 1.2.2.1 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- 1.2.2.2 ASTM A820 - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
- 1.2.2.3 ASTM C156 - Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete
- 1.2.2.4 ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- 1.2.2.5 ASTM C332 - Standard Specification for Lightweight Aggregates for Insulating Concrete
- 1.2.2.6 ASTM C494 - Standard Specification for Chemical Admixtures for Concrete
- 1.2.2.7 ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
- 1.2.2.8 ASTM C920 - Standard Specification for Elastomeric Joint Sealants
- 1.2.2.9 ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete
- 1.2.2.10 ASTM C1399 - Standard Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete
- 1.2.2.11 ASTM C1609 - Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete
- 1.2.2.12 ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
- 1.2.2.13 ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics
- 1.2.2.14 ASTM D1667 - Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
- 1.2.2.15 ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- 1.2.2.16 ASTM D3575 - Standard Test Methods for Flexible Cellular Materials Made from Olefin Polymers

1.2.3 Canadian Standards Association (CSA):

- 1.2.3.1 CSA G40.21 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
- 1.2.3.2 CAN/CSA-A3001 - Cementitious Materials for Use in Concrete
- 1.2.3.3 CSA-A23.1 - Concrete Materials and Methods of Concrete Construction

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1.2.3.4 CSA-A23.2 - Methods of Test for Concrete

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 **Shop Drawings:** submit as shop drawings:

1.3.2.1 Proposed method for bulkheads and formwork, proposed placement equipment, schedule of events and casting plan regarding placement operations, and records of concrete casts, letter from steel fibre manufacturer certifying that steel fibres meet the requirements as specified, and certification of current membership in good standing, with the Concrete Floor Contractors Association (CFCA).

1.3.3 **Product Data:** submit performance criteria and other documentation for each material specified in this section that is proposed for use, including:

1.3.3.1 Admixtures, liquid curing/sealing, curing/hardener and curing/antispalling compound, premoulded joint filler, joint sealant and primer, and bonding agent.

1.3.4 **Concrete mix design:** submit concrete Supplier's latest statistical analysis of all concrete mixes to be used on this Project.

1.3.5 **Other Documents:** submit other documents as defined in the referenced CSA standards which are applicable to Work of this section.

1.4 RECORDS

1.4.1 Keep a written record of concrete placements, showing location, date, cubic metres of concrete including signed trip ticket for each truck, ambient air temperature, and unusual occurrences during each placement. Permit inspection of records by Consultant at any time. At completion of Work, submit a summary of such data in triplicate to Consultant.

1.5 QUALITY ASSURANCE

1.5.1 Concrete Floor Finishing

1.5.1.1 Work of this section shall be performed by a Floor Finishing Subcontractor that is a current member in good standing of the Concrete Floor Contractors Association (CFCA).

1.5.1.2 Slab placing and finishing shall be done by an established Subcontractor with at least five years of proven, accredited and satisfactory experience in this trade, employing skilled personnel. Submit proof of this requirement to Consultant.

1.5.2 Steel Fibre

1.5.2.1 The steel fibre Supplier shall have a minimum five years of experience in Canada and provide a list of job histories that demonstrates their Product has been used successfully in a minimum of five projects of similar type, size and complexity.

1.5.2.2 If the Supplier of the steel fibres is not the manufacturer, the distributor shall document that they have a minimum five years of experience in distributing steel fibres from the same source.

1.5.2.3 If steel fibres are supplied from different manufacturing facilities the Supplier shall provide documentation that material being produced meets the same quality at all locations. The Supplier shall provide traceability of the fibre back to the manufacturing facility.

1.6 INSPECTION AND TESTS

1.6.1 Materials and concrete Work will be inspected and tested for conformance to CSA-A23.1 and to Specifications by an independent inspection/testing company selected and paid for by Owner.

1.6.2 Tests include the following:

1.6.2.1 Obtaining certification of cement

Concrete Floors and Finishing

- 1.6.2.2 Tests of aggregates
- 1.6.2.3 Verification of steel fibre content
- 1.6.2.4 Test for setting mixes of concrete and design of mixes
- 1.6.2.5 Concrete cylinder test. Three cylinders from each day's placement for each 75 m³ of concrete, or for each 30 m³ of concrete placed in small amounts on successive days.
- 1.6.2.6 Slump tests made on the same batch of concrete from which test cylinders are made.
- 1.6.2.7 Air entrainment tests in accordance with ASTM C173 and ASTM C231.
- 1.6.3 Tests will be made for conformance of Work to CSA-A23.1 in accordance with CSA-A23.2.
- 1.6.4 Inspection/testing company's reports of tests will be forwarded to Consultant and to Contractor with an opinion or reason for any abnormalities noted thereon.
- 1.7 PRODUCT DELIVERY, STORAGE AND HANDLING**
- 1.7.1 Store materials on Site in a manner to prevent damage thereto. Protect materials from inclement weather. Comply with CSA-A23.1, Clause 5.1.
- 1.7.2 Protect materials and Work of this section from damage. Protect other Work from damage resulting from this Work. Replace damaged Work which cannot be satisfactorily repaired.
- 1.8 ENVIRONMENTAL CONDITIONS**
- 1.8.1 During hot weather, conform to CSA-A23.1 Clause 7.4.
- 1.8.2 During cold weather, provide temporary heating and enclosures required. Mix, place and protect concrete in accordance with CSA-A23.1, Clause 7.4.
- 1.8.3 Use insulated polyethylene blankets over top of interior concrete slabs in addition to geosynthetic cloth when curing concrete in periods of cold weather.
- 1.8.4 Do not use propane heaters. All temporary heaters to be vented to outside. Do not use propane or gas powered vehicles during concrete placements.
- 1.9 VERIFICATION**
- 1.9.1 Verify actual sizes of equipment pads with the mechanical, process and/or electrical Contractors, in advance of placing concrete. If there is deviation from dimensions shown on Consultant's Drawings, inform the Consultant and request authorization to proceed.
- 1.10 TOLERANCES**
- 1.10.1 Concrete in place shall be plumb, level and true to linear building lines. Maximum variations (not accumulative) shall conform to CSA-A23.1, Clause 6.4.
- 1.10.2 Slabs-on-grade: slab flatness tolerances in accordance with CSA-A23.1, Table 22, Class C. Levelness tolerances (F_L) do not apply to inclined surfaces. Refer to CSA-A23.1.
- 1.10.3 A permitted variation in any part of the construction or in any section of Specification shall not be construed as permitting violation of more stringent requirements for any other part of construction or in any other Specification section.
- 1.11 WARRANTY**
- 1.11.1 Warrant Work of this section against defects and deficiencies for a period of one year from date Work is certified as substantially performed in accordance with the general conditions of the Contract.
- 1.11.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.

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- 1.11.3 Defects shall include but are not limited to de-bonding of deferred topping from structural slab, spalling and/or cracking.
- 2 Products
- 2.1 GENERAL**
- 2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.
- 2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.
- 2.2 MATERIALS**
- 2.2.1 Use one Product from that specified under each material. Source liquid admixtures for concrete from one manufacturer. Source liquid curing/sealing compound by same manufacturer which is supplying shake hardener.
- 2.2.2 **Portland cement:** Normal, type GU Portland cement conforming to CAN/CSA-A3001-03.
- 2.2.3 Coarse aggregate: CSA-A23.1, Clause 4.2.3.4, Group I, and Table 11; 40-5 mm for slabs on grade, 20-5 mm for other slabs, and 9 mm maximum aggregate size for concrete fill on concrete filled steel stair treads and landings. Coarse aggregate to be 100% crushed, in cubular size.
- 2.2.4 **Fine aggregate:** Conforming to CSA-A23.1, Clause 4.2.3.3 and Table 10.
- 2.2.5 **Water:** Conforming to CSA-A23.1, Clause 4.2.2.
- 2.2.6 **Formwork:** Furnish formwork in accordance with Structural Drawings.
- 2.2.7 **Steel dowels:** round, smooth type bars conforming to CSA G40.21. Use at floor slab construction joints.
- 2.2.8 **Diamond dowels, for floor slab on ground:** PNA Construction Technologies, Tel: (704) 821-7000 or 1-800-542-0214.
- 2.2.9 **Column isolators:** 1 mm thick (20 ga) sheet metal with Z275 galvanized coating to ASTM A653/A653M.
- 2.2.10 **Chairs and spacers:** Rigid type, as manufactured by Drummond and Reeves Ltd., Acrow Richmond, or Superior Concrete Accessories Ltd. of sufficient strength to rigidly support weight of reinforcement and construction loads. Use non-corrosive type over metal floor deck. Use precast concrete chairs with embedded tie wires for support of bottom and top reinforcing steel bar in slabs on grade.
- 2.2.11 **Shrinkage control fibres:** Bekaert "Dramix 3D" steel fibres conforming to ASTM A820, Type 1, and European Norm 14889- System 1 (structural), deformed, cold drawn steel wire; for slabs on grade, use Dramix 3D 55/60BL with a tensile strength of 1115 MPa (162,000 psi) for concrete slabs on grade. Use 3D 45/50BL for traprock topping and concrete fill in metal pan stair treads.

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- 2.2.12 **Shrinkage control macro fibres:** "Tuf-Strand SF" by Euclid Canada Inc. or "Strux 90/40" by W.R. Grace, conforming to ASTM C1116 Type III and tested to ASTM C1609 and/or ASTM C1399. Manufacturer shall provide information and dosage recommendations, testing data along with material technical and safety information and demonstration of suitability for use in regards to thorough distribution in mixing, proper placement, and finishing.
- 2.2.13 **Shrinkage control micro fibres:** Fibrillated and monofilament polypropylene fibres, "Fiberstrand 150" by Euclid Canada, "Fibermesh" by Fibermesh Canada Ltd. or "Fibrasol F" by Axim Concrete Technologies, 19 mm in length or Grace Fiber or Grace Micro Fiber with a dosage rate of 1.0 lb/cu yd for micro fiber or 1.5 lb/cu yd for fiber.
- 2.2.14 **Integral concrete hardener:** "Hard-Cem" by Cementec Industries Inc., or Consultant approved alternative.
- 2.2.15 **Waterproofing admixture:** "Euclid "Eucon Vandex AM 10", Everdure "Caltite", Sika "Sika 1 +/ViscoCrete 2100", Xypex "C-500 2%" or Kryton International Inc. "Krystol Internal Membrane (KIM) system".
- 2.2.16 **Water reducing, high range admixture (superplasticizer):** Conforming to ASTM C494 Type A & F.
- 2.2.17 **Water reducing, high range, and retarding admixture:** Conforming to ASTM C494 Type G.
- 2.2.18 **Water reducing and retarding admixture (for set retarding in hot weather):** Conforming to ASTM C494 Type B & D.
- 2.2.19 **Water reducing admixture:** Conforming to ASTM C494 Type A.
- 2.2.20 **Water reducing and accelerating admixture (for set accelerating in cold weather):** Conforming to ASTM C494 Type C & E.
- 2.2.21 **Premoulded joint filler:** Rigid grade, closed cell polyethylene or PVC foam, 6 mm thick, unless shown or noted otherwise, conforming to ASTM D1752, Type 1:
- 2.2.21.1 W.R. Meadows "Deck-O-Foam" pre-scored, conforming to ASTM 1622 and ASTM 3575.
- 2.2.21.2 CPD "Closed Cell Foam Joint Filler", conforming to ASTM D1056 and ASTM D1667.
- 2.2.22 **Premoulded joint filler adhesive:** For securing joint filler to abutting adjacent structures, as recommended or supplied by manufacturer of joint filler used.
- 2.2.23 **Backer rod type "A":** "Spal-Pro Rod" by Metzger-McGuire Co. or "CRL Retainer Spline" by C.R. Laurence, Mississauga, Ontario. Use with epoxy sawcut joint sealant for floor slab on grade only. Backer rod size to be slightly greater than joint width to ensure a snug, secure fit.
- 2.2.24 **Backer rod type "B":** Extruded closed cell, circular polyethylene foam, sized 25% larger than sawcut joint. Use with standard joint sealant for sawcuts in concrete on metal deck.
- 2.2.25 **Heavy duty sawcut joint filler - soft-cut sawcuts on grade:** A choice of either epoxy or polyurea as follows:
- 2.2.25.1 Epoxy: 2-component, 100% solids, self-levelling with minimum Shore "A" hardness of 80, tensile strength of 4.1 - 6.4 MPa and elongation of 60%. Install in sawcuts cut using a "Soff-Cut" saw by Soff-Cut International.
- 2.2.25.2 Polyurea: 2-component, 100% solids, self-levelling with minimum Shore "A" hardness of 80 and tensile strength of 6 - 9.65 MPa.
- 2.2.26 **Standard joint sealant:** 2-component chemically reactive polyurethane-modified conforming to ASTM C920, Type M, Grade NS, Class 25, grey.
- 2.2.27 **Traprock hardener:** Factory pre-mixed dry shake:

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- 2.2.27.1 CPD "Floor Hardener Pre-Mix (Premium)" or Euclid "Surflex TR".
- 2.2.28 **Liquid curing/sealer - water based acrylic:** Conforming to ASTM C309, Type 1, Class B and CSA-A23.1:
- 2.2.28.1 Sonneborn "Kure-N-Seal WB", Euclid "Aqua-Cure", W.R. Meadows "Vocomp-20", Sika "Floriseal W.B.", CPD "Cure & Seal 20 (Water Based)", or Dayton Superior "Safe Cure + Seal (J-18)".
- 2.2.29 **Water for curing:** Conforming to CSA-A23.1, Clause 4.2.2, clear and entirely free from any elements which might cause staining of concrete.
- 2.2.30 **Liquid densifying/hardening compound:** Proprietary blend of silicate polymers:
- 2.2.30.1 "Ashford Formula" by Duracon Consulting, Euclid "Euco Diamond Hard", Dayton Superior "Day-Chem Sure Hard (J-17)", W.R. Meadows "Liqui-Hard", Sika "Sikafloor 3S", or Master Builders "Mastertop CST".
- 2.2.31 **Geosynthetic cloth for wet curing:** Terrafix 240R or Consultant approved alternative.
- 2.2.32 **Polyethylene film for wet curing:** Minimum 0.1 mm thick, complying with maximum allowable moisture loss requirements of ASTM C156.
- 2.2.33 **Bonding agent:** Conforming to ASTM C881.
- 2.2.34 **Bond breaker:** Dayton Superior "Sure-Lift WB (J5) or Cresset "Crete-Lease 20-VOC" by Form and Build, 2-coat application, brush applied.
- 2.2.35 **High density insulation:** Dow Styrofoam "HI-40" or Owens-Corning "Foamular 400" unless shown or noted otherwise.
- 2.2.36 **Concrete topping to create slopes:** Stabilized concrete aggregate, lightweight insulating concrete conforming to ASTM C332, Group I, as manufactured by Specialty Vermiculite Canada Corp. or approved equivalent. Slip sheet: 6 mil polyethylene sheet.
- 2.3 CONCRETE MIX PROPORTIONS**
- 2.3.1 Furnish ready-mixed concrete conforming to CSA-A23.1, Clause 5.2.
- 2.3.2 **Concrete proportions**
- 2.3.2.1 Shall be in proportion in accordance with CSA-A23.1, Clause 4.3.1.
- 2.3.2.2 Slump on arrival on Site prior to addition of steel fibres and superplasticizer: 60 mm with a maximum tolerance of ± 20 mm for floors, 80 mm with maximum tolerance of ± 20 mm for other concrete.
- 2.3.2.3 Keep water-cementitious material ratio to a minimum to increase strength and durability of concrete, or as specified above.
- 2.3.2.4 Mix shrinkage control fibres into the slab mix where shown, at the rate of 0.9 kg/m³ of concrete.
- 2.3.2.5 Add shrinkage control fibres into the slab mix in the truck on Site at the specified dosage rate to the next highest half bag.
- 2.3.2.6 In no case shall the total amount of steel fibres added to each load of the ready mix concrete average less than the specified dosage rate.
- 2.3.2.7 Add superplasticizer as required to both fibre-reinforced concrete and plain concrete.
- 2.3.2.8 Confirm mix design to ensure conformance with requirements specified herein.
- 2.3.3 **Admixtures**
- 2.3.3.1 Add admixtures to concrete mix in accordance with manufacturer's recommendations. Have manufacturer make available, at no cost, upon 72 hours notice, services of a qualified, full-time field representative to assure proper use of admixtures.
- 2.3.3.2 Except where specified otherwise, comply with CSA-A23.1.
- 2.3.3.3 The use of calcium chloride or additional admixtures, other than those specified, is not permitted.

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- 3 Execution
- 3.1 EXAMINATION**
- 3.1.1 Examine previously constructed Work including placement and compaction of underfloor materials. Check thicknesses and review compaction test results of sub-floor fill to receive this Work. Report to Consultant in writing any defects or discrepancies. Commencement of Work implies acceptance of existing conditions.
- 3.1.2 Establish elevations of compacted underfloor base prior to commencing Work.
- 3.1.3 Ensure that placing of limestone is sequenced with placing of concrete to avoid displacement of limestone by construction traffic.
- 3.2 PLACING OF REINFORCING STEEL**
- 3.2.1 Place reinforcing steel in accordance with reviewed Shop Drawings and Structural Drawings.
- 3.3 SETTING AND BUILDING-IN**
- 3.3.1 Set and build in inserts, anchors, frames, angles, sleeves, plates, etc. supplied by other trades. Advise trades well in advance of scheduled placements to allow adequate time for supply of items to be built in. Have respective trades verify location of items supplied by them.
- 3.4 PLACING OF CONCRETE**
- 3.4.1 Check formwork immediately before placing concrete and make all adjustments as necessary.
- 3.4.2 Place concrete in accordance with CSA-A23.1, Clause 6.8.5.4, except as specified otherwise.
- 3.4.3 Place concrete in squares or rectangles. "L" shaped placements are not permitted.
- 3.4.4 Work concrete into complete contact with forms and embedded items. Consolidate concrete adjacent to side forms along the entire length of forms and ensure smooth surface finish after stripping of formwork.
- 3.4.5 Install sluices to limit height of free fall of concrete to 1.2 m maximum. Place concrete to prevent layering and segregation and vibrate sufficiently to ensure thorough compaction, maximum density and in accordance with CSA-A23.1, Clause 6.8.5.4. Hand spade concrete adjacent to forms with metal spatulas.
- 3.4.6 Check Work frequently for lines and levels with accurate instruments during placing of concrete. Closely monitor and record floor elevations using laser instruments.
- 3.4.7 Before placing fresh concrete against set concrete at construction joints, clean surfaces to remove dirt, scum, shavings, debris, laitance, etc.; grease dowels generously at construction joints. Provide bond break between pours.
- 3.4.8 Where floor drains occur, level floor around walls and provide minimum uniform slope of 1.6 mm per 300 mm to drains.
- 3.4.9 Install premoulded joint filler for full depth of slabs.
- 3.4.9.1 Except in areas to receive subsequent architectural floor finish, knife score joint filler through 75% of its thickness 6 mm from top of material to be set at finish floor elevation.
- 3.4.9.2 Set premoulded joint filler in adhesive.
- 3.4.9.3 Set scored face of filler against existing structure and ensure no adhesive is applied to top 6 mm portion which will be stripped just prior to installation of sealant.

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3.5 CONSTRUCTION JOINTS

- 3.5.1 Form construction joints. Dowels occur on construction joints unless detailed otherwise. Grease dowels generously just prior to new pour. Place bond break to adjacent slabs. Place galvanized circular steel forms as column isolation joints as shown.

3.6 FLOOR FINISHING

- 3.6.1 **Laser Screeding:** Screed, machine float and machine trowel floor surfaces to smooth, level and dense surfaces free from trowel marks, ridges and depressions.
- 3.6.2 **Power Screeding**
- 3.6.2.1 Power screed floor slabs with mechanical vibratory screeding equipment. Machine float and machine trowel floor surfaces to smooth, level and dense surfaces free from trowel marks, ridges and depressions. Use hand vibrators in non-strip poured concrete slab.
- 3.6.2.2 Immediately following floating, remove water accumulation from slab edges.
- 3.6.3 **Hand Screeding:** Use hand-held vibrators and hand screed, float and trowel surfaces in areas inaccessible to power equipment, to same density and surface quality specified for floors finished with power operated equipment.
- 3.6.4 **Exterior Slabs:** Power screed exterior floor slabs with mechanical vibratory screeding equipment. Float surface to provide a sidewalk "swirl" texture.
- 3.6.5 For concrete mixes containing steel fibre reinforcement, ensure that finishing process leaves surface free of protruding fibres. If fibres protrude from surface after concrete has set, remove protruding fibres. Fill any resulting groove in the floor with an epoxy cement paste, finish smooth and level with the floor
- 3.6.6 Do not contaminate or adulterate various floor finishing mixes.

3.7 TRAPROCK SHAKE HARDENER

- 3.7.1 Over freshly floated concrete, apply premixed traprock shake in two equal applications at right angles to a total minimum application rate specified. Distribute evenly. Float between application of shake and after second shake applications with power floats. Machine trowel to smooth, level and dense surface, in uniform colour, free from trowel marks, ridges, pinholes and other defects.
- 3.7.2 Vacuum dewater finished traprock topped/hardened floor to remove excess water from the surface of slab.

3.8 NON-METALLIC HARDENER

- 3.8.1 Power screed floor slab and float area indicated to receive non-metallic hardener.
- 3.8.2 Over freshly floated concrete, apply premixed non-metallic shake in two equal applications at right angles, to total application rate specified. Distribute evenly. Do not throw shake. Float between applications of shake and after second shake application with power floats. Machine trowel to smooth, level and dense surface, in uniform colour, free from trowel marks, ridges, pinholes and other defects.

3.9 MISCELLANEOUS FINISHES

- 3.9.1 In areas specified to receive subsequent epoxy or urethane floor overlay or coating, finish concrete floor surface with one pass steel trowel.
- 3.9.2 Install abrasive nosings to stair treads prior to placement of concrete and hand trowel treads to a swirl, non-slip surface.
- 3.9.3 On stair treads to receive resilient floor, steel trowel concrete to a smooth finish.

Concrete Floors and Finishing

3.10 SAWCUTTING CONTROL AND CONSTRUCTION JOINTS – SOFT CUT JOINTS

- 3.10.1 Sawcut control joints and construction joints in slab in straight lines, 3 mm wide xfor slab on grade, and 3 mm wide x for slab on metal deck, to depths as shown on drawings.
- 3.10.2 Perform "dry method" using "Soff-Cut saw" as soon as the slab will support the weight of the saw and operator without disturbing the final finish. Perform sawcutting from zero to two hours after final floor finishing or within a concrete cutability window of 1.1 MPa/10.5 kg/cm² to a maximum of 5.6 MPa/56.3 kg/cm². Replace manufacturer's patented anti-ravel skid plate with each new blade to avoid spalling and ravelling.
- 3.10.3 Take sawcut joints to face of columns.
- 3.10.4 After sawcutting, vacuum clean joints to remove dust and debris.
- 3.10.5 When cleaned joints are dry and prior to traffic being allowed over area, install temporary polyethylene backer rod in joints to prevent contamination of same.

3.11 CURING/SEALING OF STRIP POURED SLABS – GENERAL

- 3.11.1 Immediately after finishing of alternate strip pours, and prior to sawcutting, apply liquid curing/sealing compound to strip edges for width of 900 mm from edges.
- 3.11.2 At premoulded joints to be subsequently caulked, and after curing/sealing operations are complete, remove scored strip from top of isolation joints in floor slab. Clean joints above premoulded joint filler and place temporary polyethylene rope to prevent contamination of joint until sealant is applied.
- 3.11.3 Refer to "Floor Finishes Schedule" as specified previously herein for type of curing/sealing for various floor areas.

3.12 CURING/SEALING OF SLABS

- 3.12.1 At premoulded joints to be subsequently caulked, and after curing/sealing operations are complete, remove scored strip from top of isolation joints in floor slab. Clean joints above premoulded joint filler and place temporary polyethylene rope to prevent contamination of joint until sealant is applied.
- 3.12.2 Refer to "Floor Finishes Schedule" as specified previously herein for type of curing/sealing for various floor areas.

3.13 WATER CURING AND LIQUID COMPOUND SEALING

3.13.1 Winter Concreting

- 3.13.1.1 After sawcutting operations have been completed, water down entire area and cover with geosynthetic cloth and overlay with insulated polyethylene blankets. Remove geosynthetic cloth and blanket after seven consecutive days minimum and allow substrate to dry. When dry, approximately 48 hours, apply first coat of liquid curing/sealing compound at rate and by method recommended by manufacturer.
- 3.13.1.2 Apply second coat at same rate as first coat immediately after first coat has dried, and prior to traffic being allowed over area.

3.13.2 Non-Winter Concreting

- 3.13.2.1 After sawcutting operations have been completed, water down entire area and cover with filter cloth. Remove cloth after seven consecutive days minimum and allow substrate to dry. When dry, approximately 48 hours, apply first coat of liquid curing/sealing compound at rate and by method recommended by manufacturer.
- 3.13.2.2 Apply second coat at same rate as first coat immediately after first coat has dried, and prior to traffic being allowed over area.

Concrete Floors and Finishing

3.14 WATER CURING AND LIQUID DENSIFYING/HARDENING COMPOUND

3.14.1 Winter Concreting

3.14.1.1 After sawcutting operations have been completed, water down entire area and cover with geosynthetic cloth and overlay with insulated polyethylene blankets. Remove geosynthetic cloth and blanket after three consecutive days minimum and allow substrate to dry. On the fifth day, apply one coat of liquid densifying/hardening compound by method recommended by manufacturer.

3.14.1.2 Dry buff applied compound after it has cured for minimum 24 hours, to provide immediate gloss.

3.14.2 Non-Winter Concreting

3.14.2.1 After sawcutting operations have been completed, water down entire area and cover with filter cloth. Remove cloth after three consecutive days minimum and allow substrate to dry. On the fifth day, apply one coat of liquid densifying/hardening compound by method recommended by manufacturer.

3.14.2.2 Dry buff applied compound after it has cured for minimum 24 hours, to provide immediate gloss.

3.15 LIQUID COMPOUND CURING/SEALING – AGGREGATE SHAKES AND TOPPINGS

3.15.1 After sawcutting operations have been completed, cure and seal floor finished with shake hardener or topping with one coat of liquid curing/sealing compound at rate and by method recommended by manufacturer.

3.15.2 Apply second coat at same rate as first coat immediately after first coat has dried, and prior to traffic being allowed over area.

3.15.3 In static disseminating/spark resistant hardened floor, apply one coat of conductive curing/sealing compound only. After compound has hardened, sweep floor and Provide a temporary building paper covering over the entire area.

3.16 WATER CURING

3.16.1 Water cure floors designated to be surfaced with ceramic or quarry tile, and epoxy or urethane. Do not use curing/sealing compound.

3.16.2 Using geosynthetic cloth: Immediately after floors have been power trowelled and water sheen has dissipated, cover slabs with geosynthetic cloth for a minimum of seven days. Remove geosynthetic cloth in sections to execute required sawcutting of slabs, then replace as specified herein. Upon completion of curing period, remove and dispose of geosynthetic cloth cover, boards and ballast from the Site.

3.16.3 Using polysheet: Immediately after floors have been power trowelled and water sheen has dissipated, cover slabs with polyethylene sheet for a minimum of seven days. Lap end and side laps between polyethylene sheets a minimum of 300 mm and apply wood boards over laps to prevent sheet from displacing. Apply additional wood boards or other form of ballast in field of sheet as required to prevent wind and other forms of displacement. Remove polyethylene sheet in sections to execute required sawcutting of slabs, then replace as specified herein. Upon completion of curing period, remove and dispose of polyethylene sheet cover, boards and ballast from the Site.

3.17 JOINT FILLER

3.17.1 Do not apply filler in areas of concrete slab which are to receive quarry tile, ceramic tile, carpet, resilient flooring or epoxy topping system.

Concrete Floors and Finishing

- 3.17.2 Do not fill isolation joints, construction joints, and control joints sooner than 120 days after concrete pours. Execute joint sealing during cool, dry ambient conditions when slab is in contracted state to minimize future joint separation at sealant-filled joints. Provide filler maintenance if filler must be applied sooner than specified as approved by Consultant.
- 3.17.3 Clean sawcut joints with a high power industrial vacuum cleaner to remove dust and debris. Do a second pass of vacuum cleaner as required to render joints clean.
- 3.17.4 Fill joint with filler, finish top flush with the surface of the slab.
- 3.17.4.1 Using polyurea: Fill joint full depth with filler, finish top flush with the surface of the slab.
- 3.17.5 Prime walls of joint as recommended by filler manufacturer. Mix filler as directed by manufacturer. Coat surfaces of metal in contact with filler primer as recommended by filler manufacturer.
- 3.17.6 At sawcuts in concrete slabs on metal deck, provide type "B" backer rod, set to allow a sealant depth of 13 mm. Fill remainder of joint with standard joint sealant. Top of sealant to be slightly concaved from the surface of the slab.
- 3.17.7 Comply with sealant manufacturer's primer, application and temperature requirements. Mask floor to edge of joints and fill joint with joint filler. After initial set prime sealant surface and refill joints with sealant as required to produce slightly convex joint surface.
- 3.17.8 Remove 6 mm scored strip from top of premoulded joint filler. Caulk over premoulded joint filler with standard joint sealant.
- 3.17.9 Fill exterior sawn construction and control joints and over premoulded isolation joint filler with specified standard joint sealant.

END OF SECTION

Unit Masonry

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **Canadian Standards Association (CSA):**

1.2.2.1 CSA A82.1 - Burned Clay Brick (Solid Masonry Units Made From Clay or Shale)

1.2.2.2 CSA A165.1 - CSA Standards on Concrete Masonry Units

1.2.2.3 CSA A179 - Mortar and Grout for Unit Masonry

1.2.2.4 CSA S304 - Design of Masonry Structures

1.2.2.5 CSA W47.1 - Certification of companies for fusion welding of steel

1.2.2.6 CSA W48.1 - Carbon Steel Covered Electrodes for Shielded Metal Arc Welding

1.2.2.7 CSA W59 - Welded Steel Construction

1.2.2.8 CSA W117.2 - Safety in welding, cutting, and allied processes

1.2.3 **Underwriters' Laboratories of Canada (ULC):**

1.2.3.1 CAN/ULC 710.1 - Standard for Thermal Insulation - Bead - Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

1.3.1 Comply with CSA A371.

1.3.2 Check materials for damage and carefully unload. Remove unsatisfactory materials from the Site and replace with new materials to satisfaction of Consultant at no increase in Contract Price.

1.3.3 Store materials on Site in a manner to prevent damage thereto. Stockpile for easy heating if required. Protect from the weather. Do not concentrate storage on any part of the structure so as not to set up any strain beyond the designed load of any portion thereof.

1.3.4 Take particular care so as not to overload unsupported portions of the structure which have not attained their full strength.

1.3.5 **Protect the following:**

1.3.5.1 Masonry materials during storage and construction from wetting by rain, snow or ground water, or inter-mixture with earth or other materials.

1.3.5.2 Metal reinforcing or ties against corrosion or contamination, including ice, which will reduce or destroy bond.

1.3.5.3 Other Work from damage resulting from this Work.

1.3.5.4 Sills, ledges and projections from droppings of mortar.

1.3.6 Cold weather protection: Do not lay masonry at air temperatures below 5°C (41°F) without prior review by Consultant of proposed protective measures. Comply with CSA A371.

Unit Masonry

- 1.3.7 Cover tops of masonry walls not enclosed or sheltered during rain, at the end of each day's construction and at times when Work is not in progress, with waterproof covers temporarily secured against displacement, until flashings are completed. Drape cover over wall and extend 600 mm down both sides. Anchor securely in position. Protect exposed corners against droppings or damage from other trades, by boarding or other means.
- 1.3.8 Prevent grout or mortar from staining the face of masonry to be left exposed or painted. Immediately remove grout or mortar in contact with such masonry.
- 1.3.9 Repair or replace damaged Work to satisfaction of Consultant at no increase in Contract Price.
- 1.4 SCAFFOLDING**
- 1.4.1 Erect, maintain and remove on completion, scaffolding adequate for the proper execution of the Work.
- 1.4.2 Conform to "Occupational Health and Safety Act". Lay masonry from scaffolds erected on same side as face Work. Do not support scaffolding from finished building surfaces.
- 1.5 JOB MOCK UP**
- 1.5.1 Prior to commencing masonry Work, erect a sample wall panel mock-up consisting of specified materials, and illustrating bond, joint tooling, control joint, (insulation, air/vapour barrier), ties, etc. required for final Work. Coordinate with Section 07 21 00 for the provision of insulation and air/vapour barrier for mock-up purposes.
- 1.5.2 Build mock-up at Site, where directed, in full thickness and approximately 1200 mm x 1200 mm including also, the proposed range of colour, texture and workmanship to be expected in the completed Work.
- 1.5.3 Obtain Consultant's acceptance of visual qualities of the mock-up before start of Work. Retain mock-up during construction as a standard for judging completed Work; do not alter, move or destroy until Work is completed. Use sample panels to test proposed cleaning procedures.
- 1.5.4 Provide separate mock-up panel for brick veneer conforming to the same foregoing requirements
- 1.6 WELDING**
- 1.6.1 Retain a firm certified in accordance with [CSA W47.1](#) Division 1 or 2.1 to perform welding of anchor clips.
- 1.6.2 Employ welding operators licensed per [CSA W47.1](#) for types of welding required by the Work.
- 1.7 TEMPORARY BRACING**
- 1.7.1 Temporarily brace masonry Work during erection to prevent damage due to winds or other lateral loads until permanent structure provides adequate bracing.
- 1.8 SUBMITTALS**
- 1.8.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.8.2 **Samples:**
- 1.8.2.1 Submit to Consultant, two samples of each masonry unit in accordance with Contract requirements.

Unit Masonry

- 1.8.2.2 If coloured mortar is specified, submit a sample board incorporating specified unit masonry in selected coloured mortar.
- 1.8.2.3 Ensure materials used do not vary in any respect from approved samples. If variations occur in materials delivered to Site, Consultant may, at its discretion, reject such materials.
- 2 Products
- 2.1 GENERAL**
- 2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.
- 2.2 MATERIALS**
- 2.2.1 Source masonry unit from one manufacturer. Units to be of uniform texture and colour for each kind required.
- 2.2.2 **Brick veneer:** unless otherwise shown on drawings, provide standard metric modular hard burned clay brick masonry units, conforming to CSA A82.1 M. Units to be manufactured by Brampton Brick, Shaw Brick or Forterra Brick. Finish exposed ends of brick at external corners, headers, control joints, expansion joints and openings same as the face. Provide in finish and colour as shown on drawings. If finishes and colours are not shown on drawings, submit manufacturer's product data for Consultant review and selection.
- 2.2.3 **Concrete Block approved manufacturers:**
- 2.2.3.1 Shouldice Designer Stone
- 2.2.3.2 Permacon Group
- 2.2.3.3 Richvale York Block Inc.
- 2.2.3.4 Brampton Brick
- 2.2.3.5 Or Consultant approved alternate
- 2.2.3.6 Refer to Drawings for specified materials.
- 2.2.4 **Concrete blocks Lightweight:** unless otherwise shown on drawings, provide standard metric modular, moisture-controlled units conforming to CSA A165.1, Type H/15/C/M (and Type S/15/C/M). Do not use for walls in contact with earth or where exposed to the weather. For the purpose of fire-resistance rating, conform to the requirements of L220S as specified in the National Building Code.
- 2.2.4.1 Exposed surfaces: free of cracks, chips or other blemishes and broken corners. Include required sash blocks for control joints, solid block around openings for rolling steel doors or shutters where noted, and concrete block lintels over openings in concrete block walls unless steel lintels are shown.
- 2.2.4.2 Units on external corners of exposed interior block and block at door jambs: bullnosed type.
- 2.2.4.3 Special shapes: manufacture to shape shown; do not field cut stretcher units to make special shapes.
- 2.2.5 **Concrete blocks Normal weight:** unless otherwise shown on drawings, provide standard metric modular, moisture-controlled units conforming to CSA A165.1, Type S/15/A/M:
- 2.2.5.1 Exposed surfaces: free of cracks, chips or other blemishes, and broken corners. Use sash blocks at control joints, solid block around openings for rolling steel doors or shutters and where noted, and concrete block lintels over openings in concrete block walls unless steel lintels are shown.

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- 2.2.5.2 Units on external corners of exposed interior block and block at door jambs: bullnosed type.
- 2.2.5.3 Special shapes: manufacture to shape shown; do not field cut stretcher units to make special shapes.
- 2.2.6 **Mortar:** Conforming to CSA A179-M, Type "N", 1:1:6 ready mixed, as supplied by Maxi Mix or Daubois Inc. Use pre-mixed/pre-bagged/pre-gauged cement-lime requiring water to be added in the mixer per mortar manufacturer's directions. No loose sand allowed on site. Mix colour pigment manufactured by Harcros Pigment Canada or Solomon Colours, Inc. to produce coloured mortar colour; colour as selected by the Consultant.
- 2.2.7 **Parging mortar:** Conforming to CSA A179 M, Type "S" mixed with acrylic polymer liquid internal bonding admixture.
- 2.2.8 **Grout:** Conforming to CSA A179-M, coarse.
- 2.2.9 **Horizontal masonry reinforcement** (for single wythe masonry block walls): Welded wire, galvanized units in heavy duty truss or ladder 2 side rod design by Blok Lok, or Hohmann and Barnard, prefabricated in straight lengths of not less than 3m with matching corner "L" and intersection "T" units. Overall width to be such that side rods are positioned at the centreline of both face shells of the concrete block. Reinforcing gauge and finish to meet requirements of the Ontario Building Code and referenced CSA Standards.
- 2.2.10 **Ties from outer wythe to inner wythe:** Hot-dip galvanized of types as specified below complete with insulation support and V tie by Fero Corporation as distributed by Stuart & Associates:
- 2.2.10.1 Tying brick, concrete block and masonry unit veneers to metal studs: use Fero side mounting RAP ties attached to side of stud with U CAN fasteners.
- 2.2.10.1.1 Side mounting RAP plate length: to suit width of metal stud and thickness of sheathing/insulation.
- 2.2.10.1.2 V ties: of length to provide placement of V tie legs at the centreline of veneer. Provide side mounting RAP ties at 400 mm x 600 mm vertical spacing and 300 mm maximum spacing around wall openings, top, base and corners or as noted on Drawings.
- 2.2.11 **Cavity wall insulation:** as noted on drawings and as specified in section 07 21 00.
- 2.2.12 **Premoulded control joint gasket:** Hohmann and Barnard "Rubber Control Joint" in "Wide-Flange" design of type to suit wall thickness. (Use "Regular" design for control joints at pilasters or columns.) For fire-rated control joint gaskets, use fire-rated closed cell neoprene.
- 2.2.13 **Dampproof course and through-wall flashings:** "Blueskin SA" by Monsey Bakor, or "Sopralseal Stick" by Soprema, self-adhesive grade.
- 2.2.14 **Cavity wall ventilation inserts:** Hohmann and Barnard "QV Quadro-Vent". Colour as selected by the Consultant.
- 2.2.15 **Cavity wall drainage net:** High density polyethylene or polypropylene, 25 mm thick x 250 mm high x manufacturer's standard lengths "Mortar Net" with insect barrier.
- 2.2.16 **Foamed-in-place air seals:** Class 1, single component polyurethane foam conforming to CAN/ULC-S710.1, with flame spread rating of 20 or less and smoke developed of 25 or less. Density of 20.8 to 28.8 kg/m³, "Zerodraft Foam Sealant" by Canam Building Envelope Specialists Inc., or "Great Stuff Pro" by Dow Chemical Company, or "LEF" by Tremco.

Unit Masonry

- 3 Execution
- 3.1 MORTAR MIXING**
- 3.1.1 Mix mortar with the maximum amount of water consistent with workability to provide maximum tensile bond strength within the capacity of the mortar. Use a mechanical mixer. No hand mixing permitted.
- 3.1.2 Do not use mortar which has begun to set or if more than 2½ hours has elapsed since initial mixing. Retemper mortar during the 2½ hour period only as required to restore workability.
- 3.1.3 Place a thoroughly experienced, reliable and competent person in charge of mortar mixing.
- 3.2 GENERAL MASONRY CONSTRUCTION**
- 3.2.1 Carefully and neatly lay masonry, truly vertical and horizontal, with joints of uniform size as required to suit requirements for design coursing and bonding.
- 3.2.2 Tooth intersections of walls with alternating units, except as otherwise shown or where control joints and expansion joints occur.
- 3.2.3 Lay blocks in running bond except where shown otherwise. Lay in full mortar beds with face shell vertical joints filled. Align block webs vertically and with thicker ends of face shells up.
- 3.2.4 When thumbprint hard, tool exposed joints shallow concave with non-staining round jointer. Tool joints flush where shown and where gypsum wallboard, ceramic tile and resilient base are to be applied as finish.
- 3.2.5 Keep masonry walls 25 mm clear of underside of steel building frame, roof or floor and deck over. For non-fire rated masonry walls used as air plenum, pack the clear space with the specified material of either fibrous filler and spray seal combination, or foam-in-place. For non-fire rated masonry walls that are not used as air plenum, fill the clear space with specified foam strips. Compress to 50% of original thickness.
- 3.2.6 Lay brick in such a way that vertical joints in alternate brick courses are plumb from the top course to the bottom course.
- 3.2.7 Cut masonry units using a motor-driven table saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full-size units without cutting wherever possible.
- 3.2.8 Match coursing, bonding (colour and texture) of new masonry work with existing Work where indicated.
- 3.2.9 Build control joints in masonry walls at maximum 9000 mm and not less than 2 full block units from wall openings, unless shown otherwise. Provide joints using sash block units. Fill chase and joint with premoulded gasket full height of control joints. Leave a depth of 12 mm for caulking. Locate control joints in modular dimensions.
- 3.2.10 Coordinate building-in of anchors as required for the proper installation of the Work of other trades.
- 3.2.11 Build recesses to receive items recessed in masonry.

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3.3 REINFORCING AND TIES

- 3.3.1 Build-in continuous masonry reinforcement in horizontal courses terminating at vertical terminations such as control and expansion joints, full height of walls and partitions, at every second block course. Install reinforcing in first and second courses over door and window openings.
- 3.3.2 Maintain continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut, bend and lap reinforcing units as per printed directions of manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- 3.3.3 Build-in dovetail anchors.
- 3.3.4 Weld masonry anchor clips to structural steel in accordance with the following standards:
- 3.3.4.1 CSA W48.1 M - for electrodes. If rods are used, only coated rods are allowed.
- 3.3.4.2 CSA W59 M - for design of connections and workmanship.
- 3.3.4.3 CSA-W117.2 - for safety.
- 3.3.5 Thoroughly clean welded joints and expose steel for a sufficient space to perform welding operations. Touch-up disturbed primer paint with matching primer.

3.4 CAVITY WALL CONSTRUCTION

- 3.4.1 Lay block as specified under "General Masonry Construction"
- 3.4.2 Lay dampproofing course and through-wall flashings. Lap joints 50 mm minimum. Roll with steel hand roller to ensure proper contact at laps.
- 3.4.3 Extend flashing membrane one block course up the back wall and return into mortar joint a minimum 25 mm.
- 3.4.4 Install cavity wall ventilator inserts in vertical brick or block joints immediately over dampproof courses and through-wall flashings, at 600 mm o.c. Set 3 mm from the face of masonry unit. Ensure inserts are not plugged with mortar or debris. Slope flashings towards the exterior in order that any water that penetrates the exterior wythe and drains to the bottom, is directed back to the exterior through the inserts.
- 3.4.5 Install through-wall flashings at any interruption of the air space behind the face veneer.
- 3.4.6 Flashing above windows and doors that is discontinuous is to be turned up at ends to form a dam.
- 3.4.7 Place continuous run of drainage net on top of through-wall flashing.
- 3.4.8 Keep exterior wall cavities free from mortar droppings. Strike mortar joints facing cavity flush.

3.5 CAVITY WALL INSULATION

- 3.5.1 Place insulation in horizontal parallel courses in full bed of adhesive, tightly fitted between masonry reinforcement and in firm contact with adhesive. Apply adhesive in accordance with manufacturer's directions.
- 3.5.2 Cut and fit insulation to provide complete unbroken installation with minimum joints. Fit insulation tightly around ties. Butter insulation joints with adhesive.
- 3.5.3 Progressively install insulation, retaining wedges at maximum spacing of 400 mm horizontally at each masonry reinforcing course. Ensure that wedge presses insulation in tight and firm contact with adhesive. Wherever possible have wedge occur at junction of vertical and horizontal joint

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3.6 PARGING

- 3.6.1 Parge predampened masonry walls with mortar applied in two uniform coats to a total thickness of 19 mm. Scarify first parging coat to ensure full bond to subsequent coat.
- 3.6.2 Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 3 mm per m.
- 3.6.3 Damp cure parging for at least 24 hours and protect until cured.

3.7 FIELD QUALITY CONTROL

- 3.7.1 The Owner may engage an inspection and testing company to observe workmanship and to conduct block, mortar and grout strength tests in accordance with [CSA A165.1](#), [CSA A179](#), and [CSA S304](#), and will pay all costs thereto.

3.8 REPAIR, POINTING AND CLEANING

- 3.8.1 Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout; point to eliminate evidence of replacement.
- 3.8.2 Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar.
- 3.8.3 Point-up joints including corners, openings and adjacent Work to provide a neat, uniform appearance, properly prepared for application of sealant compounds.
- 3.8.4 Rake out to 12 mm depth, joints between sills and between ends of sills and masonry. Point to full 12 mm depth with pointing material specified. Tool pointing to a slightly concave smooth condition.
- 3.8.5 Clean exposed, unglazed masonry surfaces by wiping off excess mortar as the Work progresses. Dry brush at the end of each day's Work.

3.9 FINAL CLEANING

- 3.9.1 After mortar is thoroughly set and cured, clean 1/2 of sample wall panel. Obtain Consultant's acceptance of sample wall panel cleaning before proceeding to clean building masonry Work.
 - 3.9.1.1 Dry clean to remove large particles of mortar using wood paddles and scrapers. Use chisel or wire brush if required.
 - 3.9.1.2 Scrub down wall with stiff fibre brush.
- 3.9.2 Acid cleaning of masonry is not permitted.

END OF SECTION

Structural Metal Stud Framing

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated Galvanized or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process

1.2.3 Canadian General Standards Board (CGSB):

1.2.3.1 CAN/CGSB-1.181-M - Ready-Mixed Organic Zinc-Rich Coating

1.2.4 Canadian Sheet Steel Building Institute (CSSBI):

1.2.4.1 CSSBI 50M - Lightweight Steel Framing Manual

1.2.5 Canadian Standards Association (CSA):

1.2.5.1 CSA-S136 - Cold Formed Structural Steel Members

1.2.5.2 CSA W47.1 - Certification of Companies for Fusion Welding of Steel Structures

1.2.5.3 CSA W59-M - Welded Steel Construction (Metal Arc Welding)

1.2.6 Underwriters Laboratories - Canada (ULC)

1.3 DEFINITIONS

1.3.1 Steel Thickness:

1.3.1.1 Base Steel Thickness: Thickness of bare steel exclusive of coatings.

1.3.1.2 Design Thickness: Target or "nominal" thickness used to determine structural properties of the cold formed Products.

1.3.1.3 Minimum Thickness: Design thickness minus minimum allowable under-tolerance required by CSA S136 (95% of design thickness) or material specification; whichever is more stringent.

1.3.2 Designation Thickness: For the purposes of this specification; thicknesses provided will be minimum base steel thicknesses in accordance with CSA S136.

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination: Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Supply setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.5 DESIGN CRITERIA

1.5.1 Design to be based on Limit States Design principles using factored loads and resistances.

1.5.2 Loads, resistances and load and resistance factors to be in accordance with CSA-S136 and OBC.

Structural Metal Stud Framing

- 1.5.3 Wind Loads: As determined by OBC (1 in 50 probability) and Wind Cladding Study.
 - 1.5.4 Conform to requirements of ULC and authorities having jurisdiction for fire-rated assemblies.
 - 1.5.5 Maximum deflections for wall studs to be L/360.
 - 1.5.6 Adjust stud material thicknesses and spacing, as required by the design criteria
 - 1.5.7 Design connections between framing members.
 - 1.5.8 Design slotted connections to allow for roof or floor deflection. Design connections to accommodate vertical deflection movement of the structure, frame shortening and vertical tolerances without imposing axial loads onto the framing.
 - 1.5.9 Space framing members at maximum of 400 mm (16 inches). Use lesser stud spacings if required by the design criteria.
 - 1.5.10 Do not rely on collateral sheathing to help restrain member rotation and translation perpendicular to minor axis. Provide bridging at 1200 mm (40 inches) o.c. maximum. Space bridging at equal intervals over the span length of the member.
 - 1.5.11 Design metal stud exterior wall system to support cladding loads and superimposed loads transferred from window wall, curtain wall, window washing activities, and cladding loads.
 - 1.5.12 Design for local loading due to anchorage of cladding and interior wall mounted fixtures where shown.
 - 1.5.13 Provide head, sill and jamb members and connections to frame openings larger than 100 mm (4 inches) in any dimension.
 - 1.5.14 Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1.5.15 Steel Stud Designations: Colour code studs to CSSBI Technical Bulletin Vol.7.
- 1.6 SUBMITTALS**
- 1.6.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
 - 1.6.2 **Shop Drawings**
 - 1.6.2.1 Detailing erection diagrams including member sizes, locations, base metal thicknesses, and coatings. Indicate connection details, splice details, openings, dimensions, and design loads.
 - 1.6.2.2 Include necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coatings, and material types.
 - 1.6.2.3 Show splice details where permitted.
 - 1.6.2.4 Show temporary bracing required for erection purposes.
 - 1.6.2.5 Submit Shop Drawings bearing the seal and signature of a Professional Structural Engineer licensed in the province of Ontario.
 - 1.6.3 **Samples**
 - 1.6.3.1 Submit two – 300 mm long representative samples of studs, tracks, bridging, bracing, head and sill members, and screw and bolts if used. Label each sample with thickness of base metal and manufacturer of components.

Structural Metal Stud Framing

- 1.6.4 **Calculations**
- 1.6.4.1 Submit engineering calculations or data verifying the capacity of members to meet design requirements.

- 1.7 QUALITY ASSURANCE**
- 1.7.1 Subcontractor qualifications: Performed by tradesmen experienced and competent in the installation of metal stud framing system. Submit documented proof of compliance to this requirement.
- 1.7.2 Welding Qualifications: Qualify procedures and personnel according to CSA W59 and W47. 1 (steel) and W47.2 (aluminum).

- 1.8 PRODUCT DELIVERY, STORAGE AND HANDLING**
- 1.8.1 Deliver all materials to the Site, clean and undamaged, and in manufacturer's distinctly identified cartons or wrappings.

- 2 Products

- 2.1 ACCEPTABLE MANUFACTURERS**
- 2.1.1 Bailey Metal Products
- 2.1.2 Roll Formed Specialty
- 2.1.3 Corus Metal Profiles
- 2.1.4 Unifix Inc.
- 2.1.5 Or Consultant approved substitution

- 2.2 MATERIALS**
- 2.2.1 Steel: ASTM A653/A653M, galvanized to minimum Z275. Minimum grades: Grade A, 33 ksi minimum yield, for 1.22 mm (18 ga.) and thinner; and Grade D, 50 ksi minimum yield for 1.52 mm (16 ga.) and thicker.
- 2.2.2 Steel: To requirements of CSA S136 for mechanical properties.

- 2.3 COMPONENTS**
- 2.3.1 Wall stud members: Roll formed channel shaped structural stud steel sections; webs solid or punched, as required by design loading; capable of being nested where required; full length units without splices; factory stamped section designation marked. Member depth as indicated on Drawings.
- 2.3.2 Track: Maximum length roll formed channel shaped structural steel sections; size and material gauge matching that of framing member with which used; formed to configurations shown.
- 2.3.3 Bracing, strapping and bridging: Formed sheet steel channel, strip or bar shaped in sizes and gauges shown on reviewed Shop Drawings.
- 2.3.4 Plates, gussets, clips and other accessories: Finish formed sheet steel, thickness as designed by framing system manufacturer for use intended; manufacturer's standard shapes.
- 2.3.5 Zinc rich paint: For touch-up of galvanizing damage due to welding or erection, conform to CAN/CGSB-1.181-M.
- 2.3.6 Steel-to-steel fastenings: As follows:
- 2.3.6.1 Electrodes for welding: Comply with CSA W59-M.

Structural Metal Stud Framing

2.3.6.2 Self-drilling, self-tapping screws and bolts: Size, type and finish as required in reviewed design Drawings complete with required nuts and washers.

2.3.7 Steel-to-concrete anchors: Ramset "Mega" or Hilti "HSL" heavy-duty anchors installed in accordance with manufacturer's directions, to sizes shown. Load capacity when embedded in 25 MPa concrete shall not be less than:

Diameter	Pullout kN	Shear kN
8 mm	30.0	36.0
10 mm	43.6	57.2
12 mm	53.6	82.8
16 mm	83.6	149.6
20 mm	119.6	205.6

2.4 FABRICATION

2.4.1 Fabricate members with cut-outs to accommodate services. Unreinforced cut-outs in accordance with CSSBI-50M.

2.4.2 Fabrication Tolerances

2.4.2.1 Member depth (A): plus 2.4 mm, minus 1 mm

2.4.2.2 Flange width (B): plus 2.4 mm, minus 1 mm, except with gypsum board minimum 31 mm width

2.4.2.3 Lip length (C): plus 4 mm, minus 0 mm

2.4.2.4 Thickness (T): minus 0 mm

2.4.2.5 Corner angles: plus/minus 3 degrees

2.4.2.6 Length: plus/minus 1.5 mm

2.4.3 Mark each member for steel thickness exclusive of coating by colour coding.

3 Execution

3.1 INSPECTION OF JOB CONDITIONS

3.1.1 Examine surfaces to assure they are free from conditions that will adversely affect execution, permanence, or quality of Work.

3.1.2 Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 TEMPORARY BRACING

3.2.1 Temporary bracing shall be employed wherever necessary to withstand all loads to which the steel stud wall 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 wall system.

3.2.2 The erector shall ensure that during erection a margin of safety consistent with the requirements if the Ontario Building Code and CAN/CSA-S136 exists in the uncompleted structure.

3.3 INSTALLATION

3.3.1 Follow reviewed Shop/Erection Drawings for metal stud framing installation.

3.3.2 Install metal stud framing system in accordance with manufacturer's recommended installation methods, Shop Drawings, and this Specification.

Structural Metal Stud Framing

- 3.3.3 Welding
- 3.3.3.1 Welding: Performed by companies certified by CWB to CSA W47.1. Organizations to have welding procedures approved and welders qualified for base material types and thicknesses to be welded.
- 3.3.3.2 Welds to conform to CSA W59-M
- 3.3.3.3 Touch up welds with zinc-rich paint
- 3.3.4 Screws
- 3.3.4.1 Provide screws equal to or exceeding the minimum diameter as indicated on Shop Drawings.
- 3.3.4.2 Penetration beyond joined materials minimum three exposed threads.
- 3.3.4.3 Thread types and drilling capacity to conform to manufacturer's recommendations.
- 3.3.4.4 Installed screws covered by sheathing materials to have low-profile heads.
- 3.3.5 Erection Tolerances
- 3.3.5.1 Stud plumbness: Maximum L/500 of member length
- 3.3.5.2 Stud straightness: Maximum L/1000 of member length
- 3.3.5.3 Track camber: Maximum L/1000 of member length
- 3.3.5.4 Stud spacing: Maximum 3 mm from design spacing. Spacing error non-cumulative
- 3.3.6 Install tracks in single, full length sections without splices as much as possible. Where runners must be spliced, lap splices 150 mm over vertical stud member, with each end of splice continuously welded.
- 3.3.7 Secure each stud flange to each track flange by welding or with self-tapping, self-drilling. Construct corners using minimum of three studs, and door/window openings using minimum of two studs per jamb.
- 3.3.8 Install framing between studs for attachment of electrical boxes and other items required to be built into or supported by metal framing.
- 3.3.9 Provide horizontal bridging located at spacings and locations shown on reviewed Shop Drawings.
- 3.3.10 Make provisions for erection stresses. Provide temporary alignment and bracing required to carry and support temporary concentrated and imposed construction loads until Work is permanently stabilized.
- 3.3.11 Cut framing components by saw or shear neatly and squarely, or at angle required to fit squarely and tightly against abutting members. Torch cutting not allowed.
- 3.3.12 Follow CSSBI 50M for field cut holes in members.
- 3.3.13 Touch up metal stud framing bared by welding using zinc rich paint.
- 3.4 MANUFACTURER'S FIELD SERVICES**
- 3.4.1 Periodic review by metal stud framing design engineer to be performed to ensure compliance with Shop/Erection Drawings. Submit certified/signed reports of each site visit to Consultant. Final Site visit report to indicate compliance with Shop/Erection Drawings.

END OF SECTION

Metal Fabrications

05 50 00 – Metal Fabrications

1 General

1.1 WORK INCLUDES

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

- | | | | |
|----------|---------------------|---|---|
| 1.2.1.1 | ASTM A269 | - | Specification for Seamless and Welded Austenitic Stainless Steel Tubing and General Services |
| 1.2.1.2 | ASTM A325M | - | High-Strength Bolts for Structural Steel Joints (Metric) |
| 1.2.1.3 | ASTM A500 | - | Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes |
| 1.2.1.4 | ASTM A653/A653M | - | Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process |
| 1.2.1.5 | ASTM B308/B308M | - | Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles |
| 1.2.1.6 | ASTM D635 | - | Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position |
| 1.2.1.7 | ASTM E84 | - | Test Method for Surface Burning Characteristics of Building Materials |
| 1.2.1.8 | ASTM F436 | - | Hardened Steel Washers (for Use with High Strength Bolts) |
| 1.2.1.9 | ASTM F1554 | - | Standard Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength |
| 1.2.1.10 | CSA-G40.20/G40.21-M | - | General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel |
| 1.2.1.11 | CAN/CSA-S16.1 | - | Limit States Design of Steel Structures |
| 1.2.1.12 | CAN/CGSB-1.181 | - | Ready Mixed Organic Zinc Rich Coating |
| 1.2.1.13 | CGSB 85-GP-16M | - | Painting Galvanized Steel |
| 1.2.1.14 | CAN/CSA G164-M | - | Hot Dip Galvanizing of Irregularly Shaped Articles |
| 1.2.1.15 | CSA W47.1 | - | Certification of Companies for Fusion Welding of Steel Structures |
| 1.2.1.16 | CSA W48 Series | - | Electrodes |
| 1.2.1.17 | CSA W59-M | - | Welded Steel Construction (Metal Arc Welding) |
| 1.2.1.18 | CSA-W117.2 | - | Safety in Welding, Cutting and Allied Processes |
| 1.2.1.19 | CISC/CPMA 2.75 | - | Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association "A Quick-Drying Primer for Use on Structural Steel" |
| 1.2.1.20 | CISC | - | Canadian Institute of Steel Construction, "Code of Standard Practice" |
| 1.2.1.21 | SSPC | - | Steel Structures Painting Council, "Steel Structures Painting Manual, Vol. 2" |

Metal Fabrications

1.3 SUBMITTALS

- 1.3.1 All submittals as required by this Section, are shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.3.1.1 Clearly show and describe all items; sections, dimensions, erection details, anchors and fastenings, connection and jointing details.
- 1.3.1.2 Shop Drawings for support members shall bear the seal and signature of a licenced Ontario Professional Structural Engineer responsible for their design.

1.4 QUALITY ASSURANCE

- 1.4.1 Retain a firm certified in accordance with CSA W47.1 Division 1 or 2.1 to perform welding.
- 1.4.2 Employ welding operators licensed per CSA W47.1 for types of welding required by the Work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- 1.5.1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off-the-ground, covered storage locations. Do not load areas beyond the designed limits.
- 1.5.2 Handle and store metal materials at job Site in a manner to prevent damage to other materials, (to existing buildings) or property.
- 1.5.3 Handle components with care, and Provide protection for surfaces against marring or other damage. Ship and store members with cardboard or other resilient spacers between surfaces. Use lifting chokers of material which will not damage surface of steel members.
- 1.5.4 Use strippable coatings or wrappings to protect exposed surfaces of prefinished metal Work which does not receive Site finishing. Use materials recommended by finishers or manufacturers of metals, to ensure that method is sufficiently protective, easily removed, and harmless to the finish.
- 1.5.5 Prevent the formation of wet storage stain on galvanized articles by complying with the following measures:
 - 1.5.5.1 Stack articles or bundle to allow air between the galvanized surfaces during transport from Supplier. Load materials in such a manner that continuous drainage could occur.
 - 1.5.5.2 Raise articles from the ground and separate with strip spacers to provide free access of air to most parts of the surface. Incline in a manner which will allow continuous drainage. Do not lay galvanized steel on cinders, clinkers, wet soil or decaying vegetation.
 - 1.5.5.3 Handle galvanized articles in such a manner as to avoid any mechanical damage and to prevent distortion.
- 1.5.6 Tag metal fabrications, including associated anchor bolts, sleeves, and bases, or otherwise mark for ease of identification at Project site.

1.6 COORDINATION

- 1.6.1 Supply to concrete, masonry and/or other sections, materials requiring setting and/or building-in in concrete, masonry or other trades. This includes inserts, anchors, frames, sleeves, etc. Verify locations of said materials.

Metal Fabrications

1.7 PROJECT CONDITIONS

1.7.1 Field measurements: Take measurements at the building to assure proper fitting, fabrication, and erection of the Work. Check dimensions in the field, whether or not shown, upon which the accurate fitting together and building-in of the metal fabrication Work may depend or which affects the proper installation of the Work of others.

2 Products

2.1 MATERIALS

2.1.1 **General:** Metals shall be free from defects which impair strength or durability, or which are visible. Metals shall be new, of best quality and free from rust, waves or buckles, and clean, straight throughout entire length, sharply defined profiles and true in web and flange.

2.1.2 **Structural shapes, plates, etc.:** New material conforming to CSA-G40.20/G40.21-M, Grade 350W for W and H shapes, and Grade 300W for other shapes, and plates.

2.1.3 **Hollow structural sections:** New material conforming to CSA-G40.20/G40.21-M Grade 350W, Class C.

2.1.4 **Steel, sheet:** cold rolled, stretcher levelled, fully pickled, ASTM A1008/A1008M-09, Grade CS Type A exposed, matte finish, dry, unless otherwise indicated.

2.1.5 **Steel pipe:** ASTM A53 / A53M - 07, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015.

2.1.6 **Welding materials:** Conforming to CSA W48.1-M and CSA W59-M.

2.1.7 **High strength bolts, nuts and washers:** Conforming to ASTM A325M, with each type and size of bolt and nut of same manufacture and of same lot.

2.1.7.1 Bolts: Heavy, hexagon head high strength structural bolts, of standard size, of lengths required for thickness of members joined and for type of connection.

2.1.7.2 Nuts: Heavy hexagon semi-finished nuts per ASTM A563M.

2.1.7.3 Washers: Flat and smooth hardened washers, quenched and tempered.

2.1.8 **Machine bolts and anchor rods:** As specified below, complete with hexagon heads and nuts:

2.1.8.1 Common bolts: Conforming to ASTM A307, Grade A, of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

2.1.8.2 Anchor rods: Conforming to ASTM F1554, Grade 36, of lengths noted, but projecting not less than 13 mm beyond nut unless otherwise noted.

2.1.8.3 Nuts: per ASTM A563M.

2.1.9 **Primer paint:** Solvent reducible alkyd, light grey, in fast drying, lead and zinc-chromate free formulation conforming to CISC/CPMA 2.75. Use one brand of primer paint throughout the Work, in any of the following, tinted to the specified colour:

2.1.9.1 "97-680" by PPG Canada Inc.

2.1.9.2 Selectone "MR-05-3" by Selectone Paints Ltd.

2.1.9.3 "Kem Bond HS-B50WZ4" by Sherwin-Williams

2.1.10 **Primer paint:** SSPC-Paint 20, Paint Specification No. 20: Zinc-Rich Primers, Type I "Inorganic".

2.1.11 **Galvanized primer:** Zinc rich conforming to CAN/CGSB-1.181 for new galvanized metal in compliance with CGSB 85-GP-16M. For galvanized fabrications touchup to remain unpainted in finished Work, use:

2.1.11.1 W.R. Meadows of Canada Ltd. "Galvafruid"

Metal Fabrications

- 2.1.11.2 Kerry Industries "Z.R.C."
- 2.1.11.3 Niagara Paint Inc. "PL052898" zinc rich coating.
- 2.1.11.4 Aervoe Industries, Inc. 'Low VOC Cold Galvanize Coating 93% Zinc'
- 2.1.11.5 ZRC Worldwide 'ZRC Zero-VOC Galvanizing Compound'
- 2.1.12 **Galvanizing:** Hot dipped galvanizing with minimum zinc coating of 600 g/m² to CAN/CSA G164-M.
- 2.1.13 **Ladder rungs (on steel rails):** "Algrip" by Safe Walk Inc., "Mebac" by IKG Industries, "Slipnot" by W.S. Molnar Co. or Safety-Tread by Amico.
- 2.1.14 **Horizontal fall arrest system:** Stainless steel lifeline, eye rings, bolts nuts, and washers, and hot dipped galvanized wall brackets and base plates. Complete with two body harnesses, as manufactured and installed by:
 - 2.1.14.1 Pro-Bel Enterprises
 - 2.1.14.2 Ankor Engineering Systems Inc.; or
 - 2.1.14.3 Thaler Metal Industries Ltd.

2.2 BASIC MATERIALS - STAINLESS STEEL

- 2.2.1 Stainless steel sheet: To ASTM A167, type 304 to AISI No. 4 (2B) finish.
- 2.2.2 Stainless steel plate: To ASTM A167, type 304 to AISI No. 4 (2B) finish.
- 2.2.3 Stainless steel shapes: To ASTM A276, type 304 to AISI No. 4 (2B) finish
- 2.2.4 Stainless steel pipe: To ASTM 312, type 316, 180 grit finish.
- 2.2.5 Stainless steel fasteners: Type 304. Use self-tapping shake-proof flat-headed stainless steel screws on items requiring assembly by screws or as indicated.
- 2.2.6 Stainless steel bolts: Expansion bolts using high strength stainless steel conforming to ASTM A193, Grade B8, Type 316.

2.3 SHOP FABRICATION

- 2.3.1 Fabricate items that are to be built into masonry or concrete and deliver to Project site for setting; furnish items complete with bolts, anchors, clips, etc., ready to set. Furnish, completely install and connect other items. Erect items to proper lines and levels, plumb and true, and in correct relation to adjoining Work. Secure parts in a rigid and substantial manner using concealed connections where practicable.
- 2.3.2 Where necessary to secure Work to the structure by means of expansion bolts, cinch anchors, and similar connections, lay out the Work and install such connections, install the Work and bolt up, unless otherwise noted.
- 2.3.3 Provide bolts, shims, blocks, nuts, washers, wedging pieces, etc., required for complete installation, unless otherwise noted.
- 2.3.4 Drill field holes for bolts or rivets. Do not burn holes.
- 2.3.5 Furnish fitting-up bolts, drift pins, other tools and equipment and do necessary reaming of unfair holes found in field connections. New holes or enlargement of unfair holes by use of cutting torch is cause for rejection of the entire member. Replacement shall be made at Contractor's expense.
- 2.3.6 Mill joints to a tight, hairline fit; cope or miter corners. Form joints exposed to weather to exclude water.
- 2.3.7 Remove burrs from all exposed cut edges.

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- 2.3.8 Execute shop welding conforming with welding requirements specified under "Quality Assurance" and "Welding" herein.
- 2.3.9 Accurately cut, machine and fit joints so that finished Work presents a neat appearance.
- 2.3.10 Assemble members without twists or open joints.
- 2.3.11 Drill properly sized holes for connecting the Work of other trades where such can be determined prior to fabrication. Where possible, show such holes on Shop Drawings. Place holes so not to cause an appreciable reduction in strength of member.
- 2.3.12 Certain miscellaneous metal elements are listed with a corresponding description below. Such listing is intended to provide clarity or to specify requirements for the given elements, and not to represent the scope of metal fabrications work.

2.4 WELDING

- 2.4.1 Execute welding to avoid damage or distortion to the Work. Should there be, in the opinion of Consultant or inspection and testing company, doubt as to adequacy of welds, such welds shall be tested for efficiency and any Work not meeting specified standards shall be removed and replaced with new Work satisfactory to Consultant. Execute welding in accordance with the following standards:
 - 2.4.1.1 CSA W48-M - for electrodes. If rods are used, only coated rods are allowed
 - 2.4.1.2 CSA W59-M - for design of connections and workmanship
 - 2.4.1.3 CAN/CSA-W117.2-M - for safety
- 2.4.2 Thoroughly clean welded joints and expose steel for a sufficient space to perform welding operations. Neatly finish welds. Where exposed to view and finish painted, apply weld continuously and grind to a uniformly smooth finish.

2.5 CLEANING, SHOP PRIMING

- 2.5.1 Omit prime painting of miscellaneous metals that will be painted with epoxy as specified in Division 9.
- 2.5.2 Clean steel to SSPC SP3 or SP6 as required and remove loose mill scale, weld flux and splatter.
- 2.5.3 Shop prime with one coat of primer paint to dry film thickness of 0.025 mm (1 mil). Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7°C (45°F). Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.
- 2.5.4 Clean but do not paint surfaces being welded in field.
- 2.5.5 Do not paint surfaces embedded in concrete.
- 2.5.6 Do not paint surfaces in friction connections.

2.6 HOT DIP GALVANIZING

- 2.6.1 Galvanize members exposed to exterior elements when in final location; members embedded on the exterior side of exterior walls; members embedded in concrete; members specified in this section or noted on Drawings.
- 2.6.2 Repair of galvanized items: Repair coatings damaged by welding, cutting, or during handling, transport or erection using cold galvanizing compound specified, and as follows:
 - 2.6.2.1 Ensure surface is clean, dry, and free of oil, grease and corrosion.
 - 2.6.2.2 Power clean surface to near white metal condition, extending into undamaged galvanized coating.

Metal Fabrications

2.6.2.3 Apply touch up material to a dry film thickness of 0.203 mm (8 mils) minimum. If touched up Work is to remain exposed in the finished Work, apply a finish coat of aluminum paint to provide a colour blend with the surrounding galvanizing.

2.6.2.4 Coating shall be continuous, adherent, smooth and evenly distributed

2.7 BOLLARDS

2.7.1 Fabricate metal bollards from Schedule 40 steel pipe minimum.

2.7.2 Cap bollards with 6.4-mm- (1/4-inch-) thick steel plate.

2.7.3 Where bollards are indicated to receive controls for door operators, provide necessary cutouts for controls and holes for wire.

2.7.4 Where bollards are indicated to receive light fixtures, provide necessary cutouts for fixtures and holes for wire.

2.7.5 Cover bollards with manufacturer's standard 3mm thick, HDPE covers. Size covers as required to fit bollard sizes (including existing types)

2.7.5.1 Basis-of-Design: SureGuard Covers or approved equivalent.

3 Execution

3.1 ERECTION

3.1.1 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

3.1.2 Stairs, Rails and Handrails

3.1.2.1 Erect rigid and free from whip.

3.1.2.2 Continuously weld connections for railings attached directly to steel stringers. Where rails return to wall Provide end returns and wall brackets.

3.1.2.3 Provide temporary supports and bracing required to position stairs and landings.

3.1.2.4 Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length.

3.1.2.5 Continuously weld connections between handrails and balusters and in lengths of handrails.

3.1.2.6 Secure wall brackets to walls with through bolts and plate where these can be concealed, otherwise use bolts and expansion shields to achieve maximum rigidity of rail. Wood plugs for fixing to walls will not be permitted. Use metal anchoring devices.

3.1.3 Fit door frames and jambs with temporary steel spreaders to prevent springing frames and jambs out of shape.

3.1.4 Weld as specified herein.

3.1.5 Take adequate care to prevent damage to any material such as weld burns, etc.

3.1.6 Include all cutting and patching of masonry walls where necessary. Obtain Contractor's approval of cutouts in advance.

3.1.7 Insulate where necessary to prevent electrolysis due to dissimilar metal to metal contact, or metal to masonry and concrete. Use bituminous paint, butyl tape, building paper or other approved means.

3.1.8 Install materials in a good and workmanlike manner, cleaning and grinding all welding laitance and touching up primer where necessary.

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3.2 CONNECTIONS

- 3.2.1 Weld or high strength bolt main member connections. Use CISC double angle header connections wherever possible. High strength bolted connections shall be bearing type using 19 mm diameter bolts conforming to ASTM A325M. Secondary members may be bolted with machine bolts.
- 3.2.2 Perform high tensile bolted connections in accordance with CSA-S16.1. Accurately space holes of size 1.6 mm larger than the nominal diameter of the bolt. Install bearing type high tensile bolted connections unless shown otherwise on Drawings. Provide compressor or electrical equipment capable of supplying and maintaining required pressure at the wrench. Make connections without the use of erection bolts; some high tensile bolts will serve that purpose. Prevent nuts on bolts, except high tensile bolts, from becoming loose by burring bolt thread, by welding or by lock washers or lock nuts.
- 3.2.3 Execute welding as specified under shop welding in Part 2 and as follows:
- 3.2.3.1 Provide continuous welds on exterior Work to provide proper weathering.
- 3.2.3.2 Take necessary safety precautions in accordance with CSA standards when welding is carried out in cold weather.

3.3 FIELD TOUCH-UP

- 3.3.1 Paint bolt heads, washers, nuts, field welds and previously unprimed items. Touch up shop primer and galvanizing damaged during transit and installation with material to match shop primer or galvanize coating.
- 3.3.2 Clean off dirt on installed miscellaneous metal surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe and tube railings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed guardrails. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - 1. Show method of connecting and finishing members at intersections.

- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of steel products certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:

1. Uniform load of 0.73 kN/m applied in any direction.
2. Concentrated load of 0.89 kN applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

1. Concentrated load of 0.22 kN applied horizontally on an area of 0.093 sq. m.
2. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with as shown in the drawings.
2. Provide rubber gasket between steel handrail and aluminum guardrail.

2.4 STEEL

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Size: 16 gauge, .065" (1.65).

E. Finish/ Colour:

1. Handrail at stair locations: Powder coat black.
2. Handrail and ramp location: Powder coat black and field painted black where necessary at field welds / mechanical fastening locations to match aluminum guardrail.

2.5 FASTENERS

A. General: Provide the following:

1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
 2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads].
- C. Fasteners for Interconnecting Railing Components:
1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 3. Provide tamper-resistant screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group A1 stainless-steel bolts, ASTM F 738M, and nuts, ASTM F 836M.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting", and Section 09 96 00 "High-Performance Coatings".
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

- G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- H. Intermediate Coats and Topcoats: Provide products that comply with Section 09 91 13 "Exterior Painting", and Section 09 96 00 "High-Performance Coatings".
- I. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- J. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- K. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- M. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
 2. Provide rubber gaskets at all locations that the aluminum guardrail and steel meet.
- J. Form Changes in Direction as Follows:
1. As detailed.
 2. By bending or by inserting prefabricated elbow fittings.
 3. By flush bends or by inserting prefabricated flush-elbow fittings.
 4. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 6 mm or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide steel sleeves not less than 150 mm long with inside dimensions not less than 13 mm greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 STEEL FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Railings Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- B. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with primers specified in Section 09 91 13 "Exterior Painting".
 2. Do not apply primer to galvanized surfaces.
- C. Shop-Painted Finish: Comply with Section 09 91 13 "Exterior Painting."
1. Color: Black to match aluminum guardrail.
- D. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Color: Black to match aluminum guardrail.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 2 mm in 1 m.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 6 mm in 3.5 m.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 50 mm beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 150 mm of post.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 125 mm deep and 20 mm larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Leave anchorage joint exposed with 3-mm buildup, sloped away from post.

- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to aluminum guardrail with a rubber gasket provided between the aluminum and steel components.

3.5 ADJUSTING AND CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 0.05-mm dry film thickness.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13 "Exterior Painting", and Section 09 96 00 "High-Performance Coatings".
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

Wood Treatment

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **ASTM International (ASTM)**

- 1.2.2.1 ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- 1.2.2.2 ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 1.2.2.3 ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- 1.2.2.4 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 1.2.2.5 ASTM F2329/F2329M - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

1.2.3 **American Wood-Preservers' Association (AWPA)**

- 1.2.3.1 AWPA M2 - Standard for Inspection of Treated Wood Products.
- 1.2.3.2 AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.

1.2.4 **CSA Group (CSA)**

- 1.2.4.1 CSA O80 Series - Wood Preservation.
- 1.2.4.2 CSA O322 - Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.

1.2.5 **South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)**

- 1.2.5.1 SCAQMD Rule 1113 - Architectural Coatings.

1.2.6 **Underwriters Laboratory of Canada (ULC)**

- 1.2.6.1 CAN/ULC-S102 - Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, are to conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 Quality assurance submittals:

1.3.2.1 For products treated with fire-retardant by pressure impregnation submit following information certified by authorized signing officer of treatment plant:

1.3.2.1.1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.

1.3.2.1.2 Moisture content after drying following treatment with fire-retardant.

Wood Treatment

1.3.2.1.3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

1.3.2.2 Recommended metal connector and fastener materials and corrosion protection.

1.3.2.3 Product recommendation for field treatment.

1.4 SUSTAINABLE DESIGN SUBMITTALS

1.4.1 Submit in accordance with Section 01 33 00 - Submittal Procedures to confirm that products and procedures conform to specified sustainability requirements.

1.4.2 Submit evidence that work of this Section incorporates required percentage of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 QUALITY ASSURANCE

1.5.1 Plant inspection of products treated with preservative and fire-retardant by pressure impregnation will be carried out by designated testing laboratory to AWPA M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.

1.5.2 Each piece of lumber and plywood for preserved wood foundations to be identified by CSA O322 certified stamp.

1.5.3 Inspection and testing of insert materials will be carried out by a Testing Laboratory designated by Consultant.

1.5.4 Regulatory Requirements:

1.5.4.1 Each board or bundle of fire-retardant treated material to bear ULC label indicating Flame Spread Classification (FSC), and smoke developed.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

1.6.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.6.2 Store wood materials in a dry area. Stack 150 mm clear of floor and with 6 mm spacers 1200 mm apart across each layer.

1.6.3 Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.

2 Products

2.1 PRESERVATIVE TREATED WOOD MATERIALS AND APPLICATION

2.1.1 Provide preservative treated lumber and plywood in accordance with CSA O80 Series standards as specified below.

2.1.2 Lumber Battens in rainscreen cavities:

2.1.2.1 Use Category: 3.2

2.1.2.2 Clause: 9.7

2.1.3 Plywood Battens in rainscreen cavities:

2.1.3.1 Use Category: 3.2

2.1.3.2 Clause: 9.7 and 9.2.2.5.

2.1.4 Sawn Lumber Battens in rainscreen cavities:

2.1.4.1 Use Category: 3.2

2.1.4.2 Clause: 9.7

2.1.5 Cant strips above ground:

2.1.5.1 Use Category: 3.2

Wood Treatment

- 2.1.5.2 Clause: 9.2
- 2.1.6 Decking, above ground, exterior:
 - 2.1.6.1 Use Category: 3.2
 - 2.1.6.2 Clause: 9.2 and 9.2.2.5
- 2.1.7 Furring strips, above ground, exterior, between cladding and weather barrier:
 - 2.1.7.1 Use Category: 3.2
 - 2.1.7.2 Clause: 9.2 and 9.2.2.5
- 2.1.8 Building construction, interior, damp:
 - 2.1.8.1 Use Category: 2
 - 2.1.8.2 Clause: 9.
- 2.1.9 Preservative treatment for clear and stained finish: treated to CSA-O80 Series, odourless water-borne.
- 2.2 FIRE-RETARDANT TREATED MATERIALS AND APPLICATION**
 - 2.2.1 Provide fire retardant treated lumber for interior and exterior use conforming to CSA O80 Series standards, to provide the following characteristics when tested in accordance with CAN/ULC-S102:
 - 2.2.1.1 Flame Spread Classification: 25 or less.
 - 2.2.1.2 Smoke developed of not more than: 25.
 - 2.2.2 Kiln dry fire retardant treated products after treatment to the following moisture contents:
 - 2.2.2.1 Plywood: 15%.
 - 2.2.2.2 Lumber: 19%.
- 2.3 CORROSION PROTECTION FOR CONNECTORS AND FASTENERS FOR USE WITH TREATED WOOD**
 - 2.3.1 Connectors: Fabricated from steel sheet galvanized in accordance with ASTM A653 to minimum G185 coating or galvanized post fabrication to ASTM A123.
 - 2.3.2 Fasteners: Hot dip galvanized to ASTM A153/A153M Class C and D.
- 2.4 PRESERVATIVE FOR FIELD TREATMENT**
 - 2.4.1 Type recommended by manufacturer to suit specified pressure treated products.
- 3 Execution
- 3.1 CONSTRUCTION**
 - 3.1.1 Incorporate treated wood products into construction in accordance with Section 06 10 00 - Rough Carpentry.
 - 3.1.2 Use connectors and fasteners with specified corrosion protection in all construction with treated wood products.
 - 3.1.3 Provide barrier membrane where indicated.
- 3.2 FIELD TREATMENT**
 - 3.2.1 Comply with AWP A M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWP A M2.
 - 3.2.2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of recommended preservative before installation.
 - 3.2.3 Remove chemical deposits from surfaces of treated wood to receive applied finish.

Wood Treatment

END OF SECTION

Rough Carpentry

- 1 General
- 1.1 SUMMARY**
- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.2 REFERENCES**
- 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
- 1.2.2 **Canadian Standards Association (CSA):**
- 1.2.2.1 CSA O80 - Wood Preservation
- 1.2.2.2 CSA O121-M - Douglas Fir Plywood
- 1.2.3 **Underwriters Laboratories - Canada (ULC):**
- 1.2.3.1 CAN/ULC-S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- 1.2.4 **Forest Stewardship Council (FSC)**
- 1.3 QUALITY ASSURANCE**
- 1.3.1 Each piece of pressure treated lumber and fire retardant treated lumber supplied to the job Site shall be shop marked with the pressure treatment brand, and ULC monogram respectively, in accordance with CAN/CSA O80-M.
- 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING**
- 1.4.1 Store lumber in a dry area. Stack 150 mm clear of floor and with 6 mm spacers 1200 mm apart across each layer.
- 1.4.2 Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.
- 1.5 ROOF LUMBER PROTECTION**
- 1.5.1 During transit, storage, and immediately following installation, protect roof lumber from rainwater and condensation to prevent decay. Likewise, Provide protection whenever work is interrupted for whatever reason. Use waterproof tarpaulins tied down to prevent wind blow-off. Moisture control must be properly practiced to prevent the occurrence of lumber decay. Pressure treated lumber is not used in this Project.
- 2 Products
- 2.1 GENERAL**
- 2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.

Rough Carpentry

2.2 MATERIALS

- 2.2.1 General: all lumber and plywood used in this project shall be FSC – certified.
- 2.2.2 Dimension lumber: Grade stamped, dressed, kiln dried lumber having a maximum moisture content at time of installation, of 15% for 50 mm or less in thickness, and 19% for stock over 50 mm thick in accordance with NLGA.
 - 2.2.2.1 Interior blocking, furring, nailers: NLGA, 122c - Standard Light Framing Grade Spruce, Pine or Fir (S-P-F), S4S.
- 2.2.3 Fire retardant treatment of lumber and plywood: "Dricon" fire retardant treatment by J.A. Biewer or equivalent, conforming to [CAN/CSA-O80.20](#) and [CAN/CSA-O80.27](#) respectively, to provide a flame spread rating of 25 or less in accordance with ULC test method CAN/ULC-S102.
- 2.2.4 Plywood: 19 mm thick, unless otherwise shown or specified, waterproof, grade stamped exterior grade Douglas fir plywood in accordance with [CSA O121-M](#).
- 2.2.5 Loose insulation: Loose type; fiberglass by Owens-Corning Canada, mineral wool by Rockwool or approved equivalent by Owens Corning/Thermafiber.
- 2.2.6 Rough hardware: Bolts, anchors, nails, screws, expansion shields and other fastenings required to frame and fix rough carpentry as follows:
 - 2.2.6.1 Hardware for lumber to lumber in exterior locations: steel screws or spiral nails hot dip galvanized to ASTM A-153. Wood screws shall be countersunk head, full thread type.
 - 2.2.6.2 Hardware for lumber to metal in exterior locations: self tapping with fluoropolymer type barrier coating.
 - 2.2.6.3 Hardware for lumber to masonry or concrete in exterior locations: drilled-in expansion shields or drilled in self-tapping masonry concrete screws with fluoropolymer type barrier coating.
 - 2.2.6.4 Hardware in interior locations: as specified above, but with electrogalvanized coating.

2.3 SELECTION OF LUMBER PIECES

- 2.3.1 Carefully select all members; select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.
- 2.3.2 Discard wood members with defects which will render a piece unable to serve its intended function; lumber may be rejected by Consultant whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting.

3 Execution

3.1 ROOF LUMBER

- 3.1.1 Construct rough carpentry from wood pieces of longest available length.
- 3.1.2 After cutting treated lumber, apply two liberal coats of preservative on cut surfaces of lumber.
- 3.1.3 Fasten plywood, wood nailers and blocking at maximum 400 mm o.c. in staggered pattern unless noted otherwise.
- 3.1.4 Install vapour barrier under curb insulation and wood nailers, and in accordance with FM 1-90. Seal as required to provide vapour tight condition.
- 3.1.5 Unless held in place by plywood, mechanically fasten insulation to vertical surfaces using screw and plate method. Substrate to receive insulation shall be completely dry.

Rough Carpentry

3.2 MISCELLANEOUS WOODWORK

- 3.2.1 Install miscellaneous wood blocking, strapping and nailers required for attachment of Work of all trades, in addition to roof woodwork. Set accurately so that they will be completely concealed.
- 3.2.2 Except where steel supports are specifically shown, Provide wood blocking and supports in metal stud partitions for fastening of items such as casework and other wall mounted accessories. Have respective trades approve the location of such wood blocking.
- 3.2.3 Use fire retardant lumber for blocking/framing in ceiling spaces, partitions and bulkheads.
- 3.2.4 Install and secure 50 mm x 50 mm full length temporary spruce, pine or fir treads and landings on steel stairs shown to receive concrete fill.
- 3.2.5 Install temporary wood protection strips at door jambs in high traffic areas.

END OF SECTION

SHEATHING

1 GENERAL

1.1 SUMMARY

- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

- 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

- 1.2.2.1 ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus
- 1.2.2.2 ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
- 1.2.2.3 ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- 1.2.2.4 ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing
- 1.2.2.5 ASTM C834 - 17: Standard Specification for Latex Sealants
- 1.2.2.6 ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
- 1.2.2.7 ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials

1.2.3 Gypsum Association (GA)

- 1.2.3.1 GA-253 - Application of gypsum sheathing.

1.3 ACTION SUBMITTALS

- 1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.3.2 Product Data: Submit in accordance with Division 01 for each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 DELIVERY, STORAGE, AND HANDLING

- 1.4.1 Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

2 PRODUCTS

2.1 MANUFACTURERS

- 2.1.1 Products from the following manufacturers may be acceptable for inclusion into The Work, provided they meet requirements of Contract Documents.
- 2.1.1.1 Glass-Mat Gypsum Wall Sheathing:
- 2.1.1.1.1 CertainTeed Corporation
- 2.1.1.1.2 CGC Inc.
- 2.1.1.1.3 Continental Building Products

SHEATHING

2.1.1.1.4 Georgia Pacific Gypsum Corporation

2.2 WALL SHEATHING

2.2.1 Glass-Mat Gypsum Wall Sheathing: ASTM C1177/1177M. Products containing paper or organic facing materials are not acceptable.

2.2.1.1 Type and Thickness: Regular, 13 mm (1/2 inch) or Type X, 15.9 mm (5/8 inch) thick, as indicated on Drawings.

2.2.1.2 Acceptable Products:

2.2.1.2.1 "Dens-Glass Gold" by Georgia Pacific Gypsum Corporation

2.2.1.2.2 "GlasRoc" by CertainTeed Corporation

2.2.1.2.3 "Securock" by CGC Inc.

2.2.1.2.4 "Weather Defense Sheathing" by Continental Building Products.

2.3 FASTENERS

2.3.1 General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

2.3.2 Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

2.3.2.1 For steel framing less than 0.835 mm (0.0329 inch) thick, use screws that comply with ASTM C1002.

2.3.2.2 For steel framing from 0.84 to 2.84 mm (0.033 to 0.112 inch) thick, use screws that comply with ASTM C954.

2.4 PENETRATION TREATMENT MATERIALS

2.4.1 Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

3 EXECUTION

3.1 INSTALLATION

3.1.1 Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

3.1.2 Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated on Drawings and Schedules.

3.1.3 Securely attach to substrate by fastening as indicated on Drawings and Schedules, complying with manufacturer's instructions.

3.1.4 Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

3.1.5 Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.1.6 Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

SHEATHING

3.2 SHEATHING INSTALLATION

- 3.2.1 Comply with ASTM C1280, GA-253 and with manufacturer's written instructions.
- 3.2.2 Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- 3.2.3 Seal sheathing penetrations according to sheathing manufacturer's written instructions.

END OF SECTION

Bituminous Sheet Waterproofing

- 1 General
- 1.1 SUMMARY**
 - 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
 - 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
 - 1.1.2.1 Waterproofing membrane for exterior face of foundation wall
- 1.2 REFERENCES**
 - 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
- 1.3 SUBMITTALS**
 - 1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
 - 1.3.2 **Samples:**
 - 1.3.2.1 Submit duplicate samples of Product membranes
 - 1.3.3 **Manufacturer's Product data:** Submit for system which will be incorporated in the Work.
 - 1.3.4 **Documentary evidence:** Submit documentation of Subcontractor qualifications as specified under "Quality Assurance"
- 1.4 QUALITY ASSURANCE**
 - 1.4.1 Subcontractor qualification
 - 1.4.1.1 Experience: Minimum of 3 years experience in installing the specified waterproofing system, and having specialized equipment in proper operating condition to perform the Work in accordance with manufacturer's printed instructions.
 - 1.4.1.2 Applicators: Skilled workers who have successfully completed a course of instruction in torch applied membrane techniques.
 - 1.4.2 Manufacturer-access: Allow membrane manufacturer's representative full access to this Work for proper inspection prior to installation of membrane, for inspection of substrate and prior to any covering up of membrane. This includes mud slab, backfilling, etc.
- 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**
 - 1.5.1 Deliver and store materials undamaged in original containers with manufacturer's labels and seals intact. Store membrane rolls on end with selvage edges up, protected from moisture.
 - 1.5.2 Provide adequate protection of materials and Work of this section from damage by weather, traffic and other causes.
 - 1.5.3 Protect Work of other trades from damage resulting from the Work of this section. Make good such damage at no cost to Owner.
 - 1.5.4 Provide a 9 kg fire extinguisher fully charged and in operable condition at installation location, of proper type for materials being used and stored.
- 1.6 PROJECT CONDITIONS**
 - 1.6.1 Environmental requirements: Do not install materials in rain, frost, snow or other climatic conditions which could jeopardize proper application of materials. Refer to and comply with manufacturer's recommendations and limitations relative to this subject

Bituminous Sheet Waterproofing

1.7 WARRANTY

- 1.7.1 Warrant Work of this section against defects and deficiencies for a period of 5 years from date Work is certified as substantially performed in accordance with the general conditions of the Contract.
- 1.7.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.
- 1.7.3 Defects shall include, but not be limited to, that which occurs or become apparent within Warranty Period in conjunction with membrane manufacturer's warranty; such defects to include but not to be restricted to excavation and backfilling and any restoration of landscaping or other disturbed Work, leakage, failure to stay in place, lifting and deformations.

2 Products**2.1 GENERAL**

- 2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.
- 2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 MATERIALS

- 2.2.1 Use products of only one manufacturer for the Work of this Section
- 2.2.2 **Primer:** as recommended by Manufacturer
- 2.2.3 **Waterproofing and reinforcing membrane:** rubberized asphalt reinforced with a minimum 4 mils (0.1 mm) polyethylene sheet, forming a minimum 60-mil (1.5 mm) membrane.
- 2.2.3.1 Carlisle Canada "Miradri 860/861"
- 2.2.3.2 Henry equivalent
- 2.2.3.3 Soprema equivalent
- 2.2.4 **Drainage mat/composite drainage layer:** Consisting of a lightweight, 3-dimensional, high-impact polymeric core and filter fabric. Fabric bonded to dimples of core to maintain a rigid surface and prevent fill materials from blocking flow channels.
- 2.2.4.1 Carlisle Canada "Miradrain 9800"
- 2.2.4.2 Henry equivalent
- 2.2.4.3 Soprema equivalent

3 Execution**3.1 EXAMINATION**

- 3.1.1 Inspect surfaces to be covered by this Work.
- 3.1.2 Before commencing Work, ensure environmental and Site conditions are suitable for installation of material in accordance with manufacturer's recommendations.
- 3.1.3 Ensure substrates are sound, free of frost, moisture, hollows, honeycombing, dirt, debris, contamination by concrete treatment Products, oils, grease, etc., which could affect the adhesion or physical integrity of the waterproofing membrane.

Bituminous Sheet Waterproofing

3.1.4 Report to Consultant in writing of any conditions which may prejudice a proper installation. Commencement of Work implies acceptance of existing conditions.

3.2 SURFACE PREPARATION

3.2.1 Remove frost, moisture, form scale, oil, form release agents and any other foreign materials from concrete to be waterproofed.

3.2.2 Rout out unsound concrete, honeycombed pockets, faulty construction joints, to sound concrete and repair with grout and allow to dry for 24 hours.

3.3 INSTALLATION – GENERAL

3.3.1 Install as recommended by manufacturer.

3.4 DRAINAGE BOARD

3.4.1 Place composite drainage panels with fabric side up. Peel back fabric and interlock core with minimum 75 mm overlap. Fold fabric as recommended by manufacturer.

3.4.2 Enclose all terminal ends of composite drainage system by folding fabric over or under core material, making sure that no core is exposed.

3.4.3 Place fill material by pushing material onto panels. Do not use construction equipment or machinery directly on composite drainage system.

3.5 FIELD QUALITY CONTROL

3.5.1 Check completed membrane welds for continuity after cooling by use of a screwdriver run along welded seams. Joints shall indicate an uninterrupted extrusion of melted asphalt material from the joint.

3.5.2 Inspect completed membrane and flashings for punctures, tears and discontinuous weld seams. Apply additional layer of waterproofing membrane over punctures and tears, extending beyond damaged area or open seam in all directions, torch in-place.

END OF SECTION

Thermal Insulation

07 21 00 – Thermal Insulation

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM D1621 - Standard Practice for Operating Salt Spray (Fog) Apparatus

1.2.2.2 Underwriters' Laboratories of Canada (ULC):

1.2.2.3 CAN/ULC-S701 - Thermal Insulation, Polystyrene, Boards and Pipe Covering

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

1.3.1 Deliver materials to Site, clean and undamaged, and in manufacturer's distinctly identified cartons or wrappings. Remove unsatisfactory materials from Site and replace at no cost to the Owner.

1.3.2 Take precautionary measures to avoid fires and abide by fire protection regulations.

1.3.3 Place suitable forms or skids under the insulation upon delivery to protect the insulation from absorbing dampness from the surrounding terrain or floor. Cover material with approved tarpaulins and secure. Do not store insulation in direct contact with the earth, road surface, or floors.

1.3.4 Store materials indoors at Site, in an area at a temperature of not less than 4°C (39°F) for a minimum of 12 hours prior to use.

1.4 PROTECTION

1.4.1 Place protective covers, boards, tapes and take other measures to protect all surfaces, and in particular the building cladding, from being marred or contaminated.

1.4.2 Supervise the Work of other trades where such Work is closely associated with the Work of this section and report any damage.

1.5 SUBMITTALS

1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.5.2 Samples: Submit representative samples of each specified insulation material, insulation clips, adhesives, fasteners, and other material for review.

1.5.3 Manufacturer's Product data:

1.5.3.1 Submit manufacturer's Product data sheets for Products proposed for use in the Work of this section.

1.5.3.2 Submit data and installation instructions for materials and prefabricated devices, providing descriptions sufficient for identification at the place of the Works.

1.5.3.3 Submit data from manufacturer's or independent laboratory indicating compatibility and adhesive results of proposed materials.

Thermal Insulation

- 2 Products
- 2.1 GENERAL**
- 2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.
- 2.2 MATERIALS**
- 2.2.1 **Batt insulation:** Glass fibre batts by Owens Corning Canada, Rockwool Inc. or Fibre Glass Building Insulation by CertainTeed, in density as required to meet R-Values as shown on Drawings.
- 2.2.2 **Rigid Insulation (Below Grade Insulation at Vertical Conditions)**
- 2.2.2.1 Extruded polystyrene, closed-cell, smooth skin, to CAN/ULC S701, Type 4, 30 psi compressive strength.
- 2.2.2.2 SM by Dow Chemical Co. or Foamular 300 by Owens Corning.
- 2.2.3 **Rigid Insulation (Below Grade Insulation at Horizontal Conditions)**
- 2.2.3.1 Extruded polystyrene, closed-cell, smooth skin, to CAN/ULC S701, Type 4.
- 2.2.3.2 Compressive strength, ASTM D1621, 275 kPa (40 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
- 2.2.3.3 Highload 40 by Dow Chemical Co. or Foamular 400 by Owens Corning.
- 2.2.4 **Rigid Insulation (High Density)**
- 2.2.4.1 Extruded polystyrene, closed-cell, smooth skin, to CAN/ULC S701, Type 4.
- 2.2.4.2 Compressive Strength, ASTM D1621, 690 kPa (100 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
- 2.2.4.3 Highload 100 by Dow Chemical Co. or Foamular 1000 by Owens Corning.
- 2.2.5 **Foil Faced Semi-Rigid Insulation (Behind Precast Panels)**
- 2.2.5.1 Foil faced, 703 Series FRK faced glass fibre by Owens Corning
- 2.2.5.2 RXL40 FSK faced mineral fibre board by Rockwool
- 2.2.5.3 Use "Insulok" or "Bailey" metal retainer channels impaled in the insulation to secure insulation in place.
- 2.2.6 **Semi Rigid insulation:** Rockwool "Cavity Rock " Or approved equivalent by Thermafiber.
- 2.2.7 **Foamed-in-place air seals:** One component polyurethane foam for installation within closures and fillers; "Enerfoam" by Abisko Manufacturing Inc. or "Foam Sealant" by Canam Building Envelope Specialists Inc.
- 2.3 ACCESSORIES**
- 2.3.1 Fasteners**
- 2.3.1.1 Soft washer and pin type; direct fasten type: HDPE polyethylene washer, corrosion resistant fastener, pin length to suit insulation thickness. Provide Hilti 'X-IE' or ITW InsulFast Fastener.
- 2.3.1.2 Galvanized steel perforated base insulation hangers with washer retainer to be adhered to surface to receive board insulation with hanger adhesive, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place. Self-adhesive impaling pins are unacceptable.
- 2.3.2 Adhesives**
- 2.3.2.1 Polystyrene foam insulation adhesive: Canadian Adhesive "Lepage PL Premium" or approved equivalent
- 2.3.2.2 Glass fibre or mineral wool insulation adhesive: Henry "200-02"

Thermal Insulation

- 2.3.2.3 For installing insulation clips direct to masonry, concrete or metal: High strength, resilient adhesive having a drying time of 0 - 30 minutes (rapid initial set), and 24 hours final set. Adhesive shall be compatible with insulation and air/vapour barrier and shall be non-corrosive to galvanized steel and membrane air/vapour barrier.
- 2.3.2.4 Mechanical fasteners to concrete: Galvanized "Gripcon" screws with plastic plates. For use with vinyl faced insulation, use white head screws and white plastic plates to match vinyl.
- 2.3.2.5 Insulation clips: Insul-Anchors, adhered to substrate with Tactoo adhesive and with self locking washers by Continental Stud Welding. Clip size and type to suit application and insulation thickness. Alternative adhesive at obstructions: Air-Bloc 21 by Henry.
- 2.3.3 **Drill-in plastic insulation anchor** with oversize head; hammer-in installation.
- 2.3.3.1 Acceptable Products: 'IDP Insulation Anchor' by Hilti, length to suit insulation thickness.
- 2.3.4 **Batt insulation restraint:** Zinc coated woven wire and mechanical fasteners.
- 3 Execution
- 3.1 MECHANICAL FASTENERS**
- 3.1.1 Install rigid insulation on masonry, concrete, metal, behind precast panels and where use of wedges is not possible using stick clips.
- 3.1.2 Use five stick clips per 600 mm x 1200 mm x up to 75 mm thick. Use 600 mm x 1200 mm x 100 mm thick or thicker.
- 3.1.3 Apply clips with mastic adhesive, allowing it to "ooze" out through the perforations and/or around the clip base.
- 3.1.4 Install clips to liquid membrane by softening membrane with torch and installing fasteners into softened areas. Supplement with a small power activated pin fastener applied through fastener base to structure.
- 3.1.5 Support adhesive-installed clips in place until adhesive has set
- 3.2 RIGID MINERAL FIBRE INSULATION**
- 3.2.1 Clean surfaces to receive rigid insulation free of moisture, grease and oil. Ensure surfaces are reasonably smooth and free of mortar projections.
- 3.2.2 Knife cut and fit boards neatly around beams, pipes, ducts, openings and corners, reinforcing and bonding ties, and other obstructions.
- 3.2.3 Butt insulation boards together and stagger joints to ensure thermal tight construction. Apply firm hand pressure to level insulation boards.
- 3.2.4 Where cutting is necessary, use the largest module of insulation possible to reduce the number of joints. Patch holes and tears with the same material.
- 3.2.5 Do not install insulation in any part of the building where protection against inclement weather has not yet been provided, and where the insulation could thereby be exposed to damage.
- 3.2.6 Insulation on liquid membrane air/vapour barrier: Apply board in 100% bond to 3.2 mm thick liquid air/vapour barrier.
- 3.2.7 Where more than one layer of insulation is required, stagger successive layer joints with the joints of the preceding layer and bed in adhesive trowelled solidly over the preceding layer.

Thermal Insulation

3.3 HIGH DENSITY INSULATION

3.3.1 Place high density insulation under or within poured-in-place concrete in accordance with the Drawings.

3.3.2 Foamed-In-Place Insulation:

3.3.2.1 Install foam insulation at jambs of all doors and windows in accordance with manufacturer's recommendations.

3.3.2.2 Insulation will be inspected by the Consultant prior to the installation of the internal caulking seal.

3.4 LOOSE INSULATION

3.4.1 Install in exterior hollow metal frames, wall voids formed by metal closures, and at locations where loose insulation packing is shown on Drawings.

3.5 WALL VOID INSULATION

3.5.1 Fill exterior wall voids, such as within and around beams, under metal closures at sills of openings, and other miscellaneous locations as shown, using specified glass fibre or mineral fibre material.

3.6 BATT INSULATION

3.6.1 Install batt insulation between steel studs; at metal closures and where shown elsewhere. Extend nailing flanges over stud faces and secure with adhesive or sheet metal screws. Install batts with vapour barrier face on warm side. Tape at top and bottom of stud spaces and at junctions with other materials, provide a complete vapour seal.

3.7 PATCHING

3.7.1 Perform cutting and patching necessary to accommodate irregularities in the Work including piping, ductwork and electrical conduit projecting through the insulation.

3.7.2 Ensure the continuity of the insulation where such above items project through the insulation. Allow for expansion and contraction and linear movement of these items.

3.7.3 Where there is a possibility of heat loss through ductwork or conduit which passes through the insulation, extend insulation around the duct or conduit a distance of 300 mm minimum on both sides of the barrier.

3.7.4 After installation under other sections of heating equipment and other construction adjacent to the Work of this section, conduct an inspection and replace insulation as necessitated by unavoidable minor damage caused in the course of the Work of the other sections.

3.8 FIELD QUALITY CONTROL

3.8.1 Insulation installations will be inspected and approved by the Consultant prior to the installation of ceiling and wall finishing materials. Notify Consultant 48 hours in advance of inspection.

END OF SECTION

Exterior Insulation and Finish Systems

- 1 General
- 1.1 SUMMARY**
- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein, including but not limited to:
 - 1.1.2.1 Systems shall comply with requirement of CAN/ULC S134 and shall be certified permitted to be used in non-combustible construction as it is defined in the Ontario Building Code.
 - 1.1.2.2 Anchorages, fasteners, and accessories required for the system
 - 1.1.2.3 Joint sealing
 - 1.1.2.4 Seal cracks in existing concrete wall with sealant prior to installation of finish system
- 1.1.3 Provide Work of this section in accordance with the Contract Documents including but not limited to the following, and as shown on drawings:
 - 1.1.3.1 Cementitious board system: Proprietary finish coating on cementitious board sheathing supported by either metal stud framework or building substrate.
 - 1.1.3.2 Insulation system: Proprietary finish coating on insulation back-up supported by cementitious board and metal stud framework, or building substrate.
 - 1.1.3.3 Directly applied system: Proprietary finish coating system directly on building substrate
- 1.2 DESIGN REQUIREMENTS**
- 1.2.1 Design to CAN/CSA S136-01 and Building Code.
- 1.2.2 Design for expansion and contraction of component materials of the Works produced by an exterior surface temperature range of -35 °C to +60 °C.
- 1.2.3 Design cladding system to accommodate and withstand the following without permanent deformation or damage to, or failure of, cladding system or building structure:
 - 1.2.3.1 Movement within cladding system, and between cladding system and building structure.
 - 1.2.3.2 Cladding system dead loads, snow loads, ice loads, and wind loads, and combinations thereof, in accordance with the building code.
 - 1.2.3.2.1 Design wind loads shall be based on at least 1/50 hourly wind pressure values as indicated in building code and greater values as required.
- 1.2.4 Erection tolerances of structure.
- 1.2.5 Design to allow positive drainage of condensation occurring within cladding system to exterior of building envelope or drainage outlet.
- 1.2.6 Design metal systems to the Architectural Sheet Metal Manual by SMACNA unless otherwise indicated.
- 1.2.7 Design system to meet tolerances specified.
- 1.3 DELIVERY, STORAGE AND HANDLING**
- 1.3.1 Deliver all materials to the Site clean and undamaged, and in manufacturer's distinctly identified cartons or wrappings. Remove unsatisfactory materials from the Site and replace at no cost to the Owner.
- 1.3.2 Pile insulation on a flat surface off the ground in a cool, dry location out of sunlight, protected from the weather and other damage, and at temperatures not less than 40 deg F. Store non-proprietary accessories (i.e. sealant) per respective manufacturer's printed directions.

Exterior Insulation and Finish Systems

1.3.3 Cover materials with a suitable tarpaulin to protect contents from exposure to weather and damage or loss by wind. Keep insulation dry at all times. Do not expose to flame.

1.4 SUBMITTALS

1.4.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.4.2 Shop Drawings:

1.4.2.1 Show location and extent of system and finish applications of the types required. Show joint sealant treatment materials, colours and finishes; control joint locations, sizes, profiles and joint treatments; details of terminations at end of each days work; large scale details, including relationships with adjacent construction; installation sequence and methods of connections; edge treatment at discontinuous edges of insulation boards; and accessories and other pertinent information required for proper and complete installation.

1.4.2.2 In addition, prepare design Drawings of metal support system and show component details, depth and gauge designations, location and spacings of framing members. Show bearing, anchorage, loadings, temporary bracing, welds, types and location of mechanical fasteners, splices, permanent bracing, bridging and strapping. Indicate material finishes, accessories and items required of other work for complete installation.

1.4.3 Samples:

1.4.3.1 Submit one 200 mm x 200 mm sample of each system specified for review. Samples shall include stud supports as the case may be, fasteners, adhesive, insulation, reinforcing mesh, base coat and finish coat in texture and colour selected by Consultant.

1.5 QUALITY ASSURANCE

1.5.1 Work shall be performed by the material manufacturer's licensed applicator employing tradesmen experienced and competent in the installation of the specified systems and finishing thereof. Submit to the Owner, applicator's current certificate of approval by the material manufacturer as proof of compliance to this requirement.

1.5.2 During the Work provide the services of a fully qualified representative of the system manufacturer to perform part time field inspection.

1.5.3 Manufacturer Qualifications: Provide Work of this Section by a manufacturer who is EQI Licensed or a member in good standing with the EIFS Council of Canada.

1.5.4 Site Mock-ups

1.5.4.1 Provide five 1200 mm long x 1200 mm high mock-ups to serve as field samples. Samples shall be representative of the types specified, and in selected colour and texture finish, and subject to the acceptance of the Consultant. Mock-ups shall not form part of the finished Work.

1.5.4.2 Approved mock-ups shall be the minimum standard of workmanship for the entire Project.

1.6 WARRANTY

1.6.1 Warrant Work of this section against defects and deficiencies for a period of 5 years from date Work is certified as substantially performed in accordance with the general conditions of the Contract.

1.6.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.

1.6.3 Defects shall include, but not be limited to, cracking, warping and leaking.

Exterior Insulation and Finish Systems

1.6.4 Provide a 5-year warranty for the finish system. Further to warranty definition in the Letter of Warranty, the system shall remain in place, and that should the materials become defective and/or cracking, warping, leaking occur within the Warranty Period, the affected Work shall be replaced at no cost to Owner and at times convenient to Owner

2 Products

2.1 GENERAL

2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.

2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 EIFS Performance: Comply with CAN/ULC S716.1 and manufacturer's issued CCMC Evaluation Report and with the following:

2.2.1.1 Design system in accordance with CAN/ULC S716.3 and EIFS Best Practice Guide.

2.2.1.2 Weathertightness: Ensure system is resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.

2.2.1.3 System Fire Performance:

2.2.1.3.1 System shall comply with requirements of Ontario Building Code, CAN/ULC-S716.1 and CAN/ULC-S134.

2.2.1.4 Structural Performance: EIFS assembly and components shall comply with the requirements of the Ontario Building Code.

2.2.1.4.1 Substrate Maximum System Deflection Normal to Wall Plane: L/240.

2.2.1.5 Impact Performance:

2.2.1.5.1 Provide higher impact resistance of system up to 1.8 metres above grade and in locations indicated on Drawings.

2.2.1.6 Bond Integrity: Free from bond failure within EIFS components or between EIFS and substrates, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

2.2.1.7 Provide flashing at doors, windows, sills, roof and wall intersections, abutments of lower walls with higher walls, above projecting features, and, at wall bases.

2.2.1.8 Include minimum 19 mm (3/4 inch) expansion joints as indicated on Drawings and Schedules and at locations as follows:

2.2.1.8.1 At substrate expansion joints;

2.2.1.8.2 At changes in building height;

2.2.1.8.3 At changes in substrate material;

2.2.1.8.4 At changes in roof, building shape or structural system;

2.2.1.9 Include expansion joint between EIFS and adjacent materials.

2.2.1.10 Include sealant joints and air barrier connections at penetrations through EIFS.

2.2.1.10.1 Design joints with secondary moisture protection and drain joints to exterior;

2.2.1.10.2 Design joints to prevent air movement around building between sealant and air barrier;

2.2.1.10.3 Design joints using two stage seals, closed cell backer rod, bond breaker tape, primer and accessories in accordance with Section 07 92 00.

2.2.1.10.4 Connect to building air barrier systems and vapour retarders in accordance with requirements of Section 07 27 15.

2.2.1.11 Sealant Adhesion: Conforming to ASTM C1382.

Exterior Insulation and Finish Systems

2.3 SYSTEM DESCRIPTION

2.3.1 Comply with requirements of the Ontario Building Code and local authorities having jurisdiction and the Ontario Association of Architects requirements, which shall be minimum requirements and more stringent requirements where specified herein.

2.3.2 The Work involves a texture-finished multi-coat proprietary plaster system as manufactured by one of the following:

2.3.2.1 STO Industries

2.4 STEEL STUD FRAMING

2.4.1 **Framing Members:** roll formed channel shaped light structural stud steel sections; webs solid or punched, as required by design loading; capable of being nested where required; full length units without splices; factory stamped section designation marked.

2.4.1.1 Gauge: as designated on reviewed shop drawings.

2.4.1.2 Sheet steel material: ASTM A653/A653M.

2.4.1.3 Fabrication tolerances:

2.4.1.3.1 Length: as required or ordered, ± 1.5 mm

2.4.1.3.2 End burr: 3 mm maximum

2.4.1.3.3 Bends: ± 1 degree

2.4.1.3.4 Twist: 1.5 degrees per 2400 mm length

2.4.1.3.5 Sweep: ± 1.5 mm per 2400 mm length

2.4.1.3.6 Camber: ± 1.5 mm per 2400 mm length

2.4.1.3.7 Flatness: ± 1.5 mm per 88 mm

2.4.2 **Runners:** maximum length roll formed channel shaped structural steel sections; size and material gauge matching that of framing member with which used; formed to configurations shown.

2.4.3 **Bracing, strapping and bridging:** formed sheet steel channel, strip or bar shaped in sizes and gauges shown on reviewed shop drawings.

2.4.4 **Plates, gussets, clips and other accessories:** finish formed sheet steel, thickness as designed by framing system manufacturer for use intended; manufacturer's standard shapes.

2.4.5 **Finish for framing system components and accessories:** manufacturer's standard oil alkyd based rust inhibitive metal primer.

2.4.6 **Fastenings as follows:**

2.4.6.1 Electrodes for welding: Comply with manufacturer CSA W59-M.

2.4.6.2 Self-drilling, self-tapping screws and bolts: Size, type and finish as required in reviewed design Drawings complete with required nuts and washers.

2.4.6.3 Anchorage devices: Approved power driven appropriate for use as required in reviewed design Drawings.

2.5 SHEATHING

2.5.1 Fiberglass-mat faced gypsum sheathing, 13 mm thick DensGlass by Georgia Pacific, conforming to: ASTM C1177.

2.6 AIR BARRIER MEMBRANE

2.6.1 Non-cementitious, polymer-based, water resistant, protective coating used as a secondary weather barrier and air barrier over approved exterior substrates meeting the following performance criteria.

2.6.1.1 Water Vapour Permeability: minimum 700 ng/Pa.s.m² (ASTM E 96 - Method A).

2.6.1.2 Air Leakage: maximum 0.0101 L/s.m² (ASTM E283)

Exterior Insulation and Finish Systems

2.6.2 Flexible Air Barrier Membrane Strips: Manufacturer's standard self-adhesive air barrier detailing strips, compatible with both the air barrier and insulation adhesive.

2.7 INSULATION BOARD

2.7.1 Aged expanded polystyrene conforming to CAN/ULC S701, Type I, with a flame spread rating and smoke developed of not more than 25 per CAN/ULC-S102. Board shall further conform to additional requirements of finish system manufacturer. Minimum 10 mm deep geometrically-designed providing an effective drainage plane.

2.7.2 Insulation Fastening, using one of the following as recommended by EIFS System manufacturer

2.7.2.1 Adhesive: Acrylic polymer mixed with CSA-A5, Type 10, Normal Portland cement.

2.7.2.2 Insulation fasteners: "ISO Insulation Fasteners" by ITW Construction Products, or equivalent by Durabond, Dryvit, STO, DuROCK, Adex, or BASF at 300 mm o.c. in both directions for securing insulation to concrete.

2.7.2.3 Temporary plastic fasteners: Plastic fasteners recommended by the system manufacturer for attaching reinforcing mesh and accessories to insulation boards.

2.8 FINISHING COMPONENTS

2.8.1 Reinforcing mesh: Open weave, glass fibre fabric of twisted multi-end strands, treated to be compatible with system materials; widths as required, weighing a minimum of 152 g/m², 400 g/m² for intermediate mesh, and 500 g/m² for heavy duty mesh.

2.8.2 Base coat: Cementitious coating of polymer modifiers, Portland Cement Type 10, silica sand mixed with a mixer approved by manufacturer.

2.8.3 Primer: Silicone emulsion primer as recommended by the system manufacturer.

2.8.4 Surface finish: Factory prepared, waterproof, self-bonding emulsion acrylic-based synthetic plaster material containing elastomeric binder, sand or aggregates graded to produce finish texture, as shown on drawings.

2.9 SEALANT

2.9.1 Sealant: Dow Corning "790" complete with compatible primer and foam rod oversized 25% of joint width. Colour to match adjacent wall finish system.

2.9.2 Accessories: Casing beads, corner beads, reveal mouldings and control joints shall be zinc-coated. Conform to ASTM B69 as manufactured by Keene Corporation, or UV treated PVC as manufactured by Vinyl Tech Plastic Components or approved equivalent. Finish to match adjacent system finish(es).

2.9.3 Colours: As selected by the Consultant from manufacturer's standard colour range, submitted colours to match adjacent finish(es).

3 Execution

3.1 EXAMINATION

3.1.1 Examine substrates to receive the work of this section and insure that work of other sections is complete and that there are no conditions which will adversely affect the work of this section.

3.1.2 Notify the Construction Contractor immediately of any unsatisfactory conditions. Do not proceed with the work of this section until unsatisfactory conditions have been corrected.

3.1.3 Commencement of the work of this section implies acceptance of surfaces and conditions.

Exterior Insulation and Finish Systems

3.2 MIXING

- 3.2.1 Mix and prepare adhesive, base coat and surface finish in accordance with system manufacturer's mixing and preparation methods. Use a clean container free of foreign substances. Do not use containers which have come in contact with petroleum Products.
- 3.2.2 Do not use additives or any other materials of any kind such as rapid binders, anti-freeze, accelerators, fillers or pigments.

3.3 GENERAL INSTALLATION

- 3.3.1 Comply with CAN/ULC-S716.2, criteria in CCMC Evaluation Report, and to EIFS manufacturer's written recommendations for installation of EIFS as applicable to each type of substrate indicated on Drawings and Schedules.
- 3.3.2 Install systems in accordance with manufacturer's installation methods, Shop Drawings and this Specification. Comply with system manufacturer's requirements regarding terminations at end of each days work and resumption of Work.
- 3.3.3 Do not install faulty or damaged members.
- 3.3.4 Maintain Work in safe and stable condition during erection. Furnish necessary scaffolding and temporary bracing and shoring required to hold members from displacement until permanent connections have been made.
- 3.3.5 System terminations:
 - 3.3.5.1 Apply detail mesh to substrate at all locations where insulation terminates for backwrapping purposes.
 - 3.3.5.2 Attach Detail mesh around the perimeter of all openings, penetrations, and other system terminations by applying a ribbon of adhesive mixture on the substrate and embedding the Detail mesh into the wet mixture.
 - 3.3.5.3 Position the Detail mesh so that a minimum of 64 mm extends onto the insulation board. Keep the mesh, which is not embedded, clean.

3.4 LIGHT STRUCTURAL STUD FRAMING AND SHEATHING

3.4.1 Framing:

- 3.4.1.1 Erect stud system in the factory or in the field in accordance with reviewed shop drawings.
- 3.4.1.2 Install runners in single, full length sections without splices wherever possible. Where runners must be spliced, lap splices 150 mm over vertical stud member, with each end of splice continuously welded.
- 3.4.1.3 Secure each stud flange to each runner flange by welding or with self-tapping, self-drilling screws or bolts, of type as per reviewed shop drawings.
- 3.4.1.4 Construct corners using minimum of 3 studs.
- 3.4.1.5 Install framing between studs for attachment of items required to be built into or supported by metal framing.
- 3.4.1.6 All welds shall be effective. Repair inadequate welds, burnthroughs, etc.
- 3.4.1.7 Provide horizontal bridging located at spacings and locations shown on reviewed Shop Drawings.
- 3.4.1.8 Secure stud framing system to building superstructure with connections to accommodate structural deflection and movement.
- 3.4.1.9 Make provisions for erection stresses. Provide temporary alignment and bracing required to carry and support temporary concentrated and imposed construction loads.
- 3.4.1.10 Cut framing components neatly and squarely, or at angle required to fit squarely and tightly against abutting members.

3.4.2 Sheathing:

Exterior Insulation and Finish Systems

3.4.2.1 Apply sheathing horizontally and screw-attach to exterior of each stud with 25 mm cadmium plated screws spaced 10 mm from ends and edges and 200 mm o.c.

3.5 INSULATION SYSTEM

3.5.1 Apply a starter strip of mesh reinforcing to the wall at the base line, prior to installation of insulation. The starter strip shall be used to seal/protect the bottom of the first course of insulation. It shall be wide enough to adhere 100 mm of mesh onto the wall, be able to wrap around the board edge and cover approximately 100 mm on the outside surface of the insulation board.

3.5.2 Follow the above procedure at all exposed insulation board edges.

3.5.3 At all locations, insulation shall be completely encapsulated by the mesh or substrate.

3.5.4 Machine sculpture insulation to the profiles shown.

3.5.5 Install insulation with mechanical fasteners. Apply in running bond pattern with long edge oriented horizontally. Stagger and interlock edges at corners. Butt all joints tight except as shown otherwise. Pre-cut to fit corners and projections prior to adhesive application.

3.5.6 Areas where insulation/finish system meets dissimilar material or terminates, shall have the insulation cut back from the adjoining material a minimum of 6 mm to a caulking joint. Prior to caulking, edges of insulation board shall be coated with ground coat and allowed to dry.

3.5.7 Surface mount accessories with plastic fasteners pushed into insulation boards.

3.5.8 Embed starter strips of mesh in ground coat at all door and window openings, termination points and expansion joints. Do not mechanically fasten.

3.5.9 Before installing reinforcing fabric over previously installed starter strips, examine surfaces. Make corrections required to produce flat surface.

3.5.10 Do not move or disturb installed boards.

3.5.11 Check surface planeness of installed boards. Sand high areas and out-of-plane board edges flush, smooth and level.

3.5.12 At perimeter of building to a height of 1800 mm above grade, apply a heavy duty reinforcing fabric over insulation and starter strips. Accomplish this by applying primer/adhesive mixture over entire face surface of insulation boards, then embedding fabric into wet mixture. Cover over fabric with mixture so that no fabric fibres or colour is visible.

3.5.12.1 Apply fabric with tight butt joints, with no fabric laps.

3.5.12.2 Along top discontinuous edge of reinforcing fabric, bring primer/adhesive to feather edge.

3.5.12.3 Allow primer/adhesive to form positive bond. Protect from damage and weather while curing.

3.5.13 Install standard reinforcing fabric to cover full extent and height of previously installed heavy duty reinforcing fabric and starter strips (other than those on grade), and balance of insulation. Apply fabric to be continuous at corners, with fabric end and edge joints lapped 200 mm minimum. Secure reinforcing fabric to insulation with plastic fasteners as recommended by the manufacturer.

3.5.14 At discontinuous insulation board edges, terminate fabric along line even with bottom of insulation board.

3.5.15 Apply finish treatment as specified.

Exterior Insulation and Finish Systems

3.6 DIRECTLY APPLIED SYSTEM

- 3.6.1 Apply standard reinforcing fabric to substrate with primer/adhesive mixture in accordance with previously specified requirements.
- 3.6.2 Apply base coat and finish coats in accordance with requirements under "Finish Treatment" article herein.

3.7 AIR BARRIER MEMBRANE

- 3.7.1 Mix and apply air barrier membrane mixture in accordance with manufacturer's written instructions.
- 3.7.2 Allow the mixture to set for five (5) minutes. Re-mix and retemper by adding a small amount of water to achieve the desired workability.
- 3.7.3 Use a stainless steel trowel to apply the air barrier membrane mixture to the approved substrate. A uniform thickness of approximately 1.6 mm of air barrier mixture is recommended.
- 3.7.4 Provide flexible air barrier membrane strips where air barrier meets adjacent building elements or membrane spans, control joints, changes in substrate construction or expansion joints.
- 3.7.5 Install drip flashings and trim to provide positive drainage. Seal top edge of sheet metal flashings with air barrier membrane strip.

3.8 INSULATION BOARD

- 3.8.1 Precut insulation board to fit around corners, obstructions and the like. Gaps in insulation are not to exceed 3 mm.
- 3.8.2 Apply adhesive to insulation board using the notched trowel method. Affix insulation board to substrate.
- 3.8.3 Insulation board shall be applied with long edge oriented horizontally. Insulation board joints shall be offset from sheathing board joints a minimum of 200 mm.
- 3.8.4 The insulation board shall be applied to the substrate in a running bond pattern with offset vertical joints.
- 3.8.5 Corners require the insulation boards be staggered and interlocked.
- 3.8.6 Rasp entire surface of insulation smooth in a circular manner. Provide reveals cut into insulation, pattern as indicated. Reveals shall be cut in straight lines with sharp corners.

3.9 FINISH TREATMENT

3.9.1 Reinforcing Mesh

- 3.9.1.1 Areas within 3 m of grade to receive a layer of heavy duty mesh and a layer of standard mesh applied in accordance with manufacturer's written instructions.
- 3.9.1.2 Areas at balconies shall receive intermediate mesh.
- 3.9.1.3 All other areas shall receive standard mesh.

3.9.2 System Base Coat

- 3.9.2.1 Mix factory prepared base coat material thoroughly. No additives other than water will be permitted. Apply to prepared insulation boards.
- 3.9.2.2 Apply base coat continuously in one level operation. Maintain wet edge and avoid cold joints or staging marks, to accomplish uniform finish.
- 3.9.2.3 Protect base coat system from contaminants and other damage detrimental to system appearance and performance.

Exterior Insulation and Finish Systems

3.9.3 **System Finish Coat**

3.9.3.1 Mix factory prepared and coloured finish material thoroughly. No additives other than water will be permitted. Apply to prepared base coat.

3.9.3.2 Apply finish continuously in a simultaneous operation with levelling and texturing occurring at the same time. Maintain wet edge and avoid cold joints or staging marks, to accomplish uniform texture finish specified.

3.9.3.3 Achieve final desired texture matching that of approved sample.

3.9.3.4 Protect system from weather, contaminants and other damage detrimental to system appearance and performance.

3.10 **CONTROL JOINTS, PANEL JOINTS**

3.10.1 Install in locations recommended by system manufacturer in accordance with system manufacturer's standards.

3.10.2 Install foam rod where required and apply sealant in existing control and panel joint locations specified or where "Sealant" is noted on the Drawings in accordance with sealant manufacturer's written instruction.

3.11 **FIELD QUALITY CONTROL**

3.11.1 During the progress of the work of this Section, the exterior insulation and finish system manufacturer or his authorized representative is to inspect the installation and submit report to Construction Contractor in writing.

3.12 **ADJUSTMENT AND CLEANING**

3.12.1 After erection, touch up coatings removed or damaged during erection.

3.12.2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

3.12.3 Wash down exposed interior and exterior surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths. Wipe interior surfaces clean as part of final clean-up.

3.12.4 Remove excess sealant with recommended solvent.

END OF SECTION

13-06-2018: Revised Roxul to Rockwool

Vapor Retarders

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.1.2.1 Polyethylene vapour retarders.

1.1.2.2 Vapour-variable barriers.

1.1.2.3 Auxiliary materials required for a complete installation.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

1.2.2.2 ASTM E96 - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

1.2.3 Canadian General Standards Board (CGSB)

1.2.3.1 CAN/CGSB-51.34 - Vapour Barrier, Polyethylene Sheet for Use in Building Construction

1.2.4 Underwriters' Laboratories of Canada (ULC):

1.2.4.1 CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.2.4.2 CAN/ULC S102.2 - Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

1.3 ACTION SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 **Product Data:** Submit product data in accordance with Division 01 for the following:

1.3.2.1 Submit manufacturer's instructions, printed product literature and data sheets for the Vapor Retarders work and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

1.4.1 **Manufacturer Qualifications:** Provide Products for Work of this Section by manufacturer with minimum 10 years' experience in the manufacture of such materials.

1.4.2 **Single Source Responsibility:** Ensure primary materials provided in this Section are obtained from 1 source by a single manufacturer and secondary materials are obtained from sources recommended by primary materials manufacturers.

1.5 DELIVERY, STORAGE AND HANDLING

1.5.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.5.2 **Delivery and Acceptance Requirements:** deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

Vapor Retarders

- 1.5.3 Storage and Handling Requirements: Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- 1.5.4 Replace defective or damaged materials with new.
- 2 Products
- 2.1 POLYETHYLENE VAPOR RETARDERS**
- 2.1.1 Polyethylene Vapor Retarders: CAN/CGSB-51.34, with not less than 0.15-mm- (6-mil-) thick sheet, with maximum permeance rating of 60 ng/Pa x s x sq. m (1 perm) based on testing per ASTM E96/E96M (Procedure B).
- 2.1.2 Location: In exterior wall assemblies in conjunction with a vapour-permeable air barrier product. Identified on Drawings as: "6mil POLY VAPOUR BARRIER"
- 2.1.3 Acceptable Products: "CGSB Vapor Barrier" by Layfield or approved equivalent.
- 2.2 VAPOUR-VARIABLE BARRIERS ("SMART VAPOUR RETARDERS")**
- 2.2.1 0.05-mm-thick polyamide-6 (nylon-6) film or from polyethylene copolymer membrane with polypropylene reinforcement grid with not less than 0.15-mm- (6-mil-) thick sheet generally complying with minimum criteria of ASTM D4397, except with following additional properties:
 - 2.2.1.1 Vapour Permeability:
 - 2.2.1.1.1 At 35 percent RH and less): maximum 60ng/Pa x s x sq. m (1 perm) based on testing per ASTM E96/E96M (Procedure B).
 - 2.2.1.1.2 Above 35 percent RH, but less than 60 percent RH: minimum 286 ng/Pa x s x sq. m (5 perms) based on testing per ASTM E96/E96M (Procedure B).
 - 2.2.1.2 Fire Performance Criteria: comply with following criteria based on testing performed by a recognized testing agency acceptable to Authorities Having Jurisdiction.
 - 2.2.1.2.1 Test Method: CAN/ULC-S102/S102.2 with following results:
 - 2.2.1.2.1.1 Flame-Spread Rating: not more than 25.
 - 2.2.1.2.1.2 Smoke-Developed Classification: not more than 50.
 - 2.2.1.2.3 Location: Identified on Drawings as "SMART VAPOUR BARRIER"
 - 2.2.2 Acceptable Products:
 - 2.2.2.1 "MemBrain™ Continuous Air Barrier & Smart Vapor Retarder" by CertainTeed Corp.
 - 2.2.2.2 "Intello Plus" by 475 High Performance Building Supply
 - 2.2.2.3 Approved equivalent.
- 2.3 ACCESSORIES**
- 2.3.1 Vapour Retarder Tape: Pressure-sensitive tape of type recommended by vapour retarder manufacturer for sealing joints and penetrations in vapour retarder, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- 2.3.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.
- 2.3.3 Adhesive for Vapor Retarders: Product recommended by vapour retarder manufacturer and has demonstrated capability to bond vapour retarders securely to substrates indicated.
- 2.3.4 Vapour Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- 2.3.5 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Vapor Retarders

- 3 Execution
- 3.1 EXAMINATION**
- 3.1.1 Verify actual site conditions and location of adjacent materials prior to commencing work. Notify Consultant in writing of any conditions which would be detrimental to the installation. Commencement of work implies acceptance of previously completed work.
- 3.1.2 Ensure services are installed and inspected before installation of vapour retarder.
- 3.2 PREPARATION**
- 3.2.1 Clean substrates of substances that are harmful to vapour retarders, including removing projections capable of puncturing vapour retarders.
- 3.3 INSTALLATION OF VAPOR RETARDERS**
- 3.3.1 Place vapour retarders on side of construction indicated on Drawings.
- 3.3.2 Extend vapour retarders to extremities of areas to protect from vapour transmission. Secure vapour retarders in place with adhesives, vapour retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapour retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fibre insulation.
- 3.3.3 Repair tears or punctures in vapour retarders immediately before concealment by other work. Cover with vapour retarder tape or another layer of vapour retarders.
- 3.4 SEALING JOINTS AND PENETRATIONS**
- 3.4.1 Seal vertical joints in vapour retarders over framing by lapping no fewer than two studs and sealing with vapour retarder tape according to vapour retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
- 3.4.2 Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapour retarders with vapour retarder tape to create an airtight seal between penetrating objects and vapour retarders.
- 3.4.3 Apply continuous bead of sealant to substrate at perimeter of sheets.
- 3.4.4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- 3.4.5 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - 3.4.5.1 Install moulded box vapour barrier in accordance with manufacturer's instructions.
 - 3.4.5.2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.
- 3.5 PROTECTION**
- 3.5.1 Protect vapour retarders from damage until concealed by permanent construction.

END OF SECTION

UNDER SLAB VAPOUR RETARDERS

07 26 16 – Under Slab Vapour Retarders

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.1.2.1 Puncture-resistant vapour retarders under slabs-on-grade.

1.1.2.2 Miscellaneous sealing materials and tapes to connect and seal openings, joints, protrusions and junctions.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed standard:

1.2.2 **American Society for Testing and Materials (ASTM):**

1.2.2.1 ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method

1.2.2.2 ASTM E96 - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

1.2.2.3 ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.2.2.4 ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

1.2.2.5 ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

1.2.2.6 ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

1.2.3 **British-Adopted European Standard**

1.2.3.1 BS EN 15804 - Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products

1.2.4 **International Organization for Standardization (ISO):**

1.2.4.1 ISO 14025 - Environmental labels and declarations – Type III environmental declarations – Principles and procedures

1.2.4.2 ISO 21930 - Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Preinstallation Meetings: Conduct preinstallation meeting at Place of the Work prior to installation. Review requirements of Contract Documents and coordination requirements with other trades.

1.4 SUBMITTALS

1.4.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

UNDER SLAB VAPOUR RETARDERS

- 1.4.2 **Product Data:** Submit product data in accordance with Division 01 for the following:
- 1.4.2.1 Submit manufacturer's instructions, printed product literature and data sheets for the UNDER SLAB VAPOUR RETARDERS work and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.4.2.2 Provide copies of WHMIS Safety Data Sheets (SDS) with each submission. Include descriptions of product characteristics, limitations, finishes, and construction details, as well as instructions for maintaining each type of material.
- 1.4.3 **Certificates:** Submit manufacturer's certificate in accordance with requirements of Division 01. Ensure certificates confirm that installed products meet requirements of specifications and that requisite field reviews have been completed by manufacturer. Upon request, submit reports of such field reviews.
- 1.5 CLOSEOUT SUBMITTALS**
- 1.5.1 Operation and Maintenance Data: Submit operation and maintenance data for under slab vapour retarder work for inclusion in operation and maintenance manuals specified in Division 01.
- 1.6 QUALITY ASSURANCE**
- 1.6.1 Manufacturer Qualifications: Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three (3) years.
- 1.6.2 Installer Qualifications: Use experienced installers having minimum of five (5) years' experience in application and installation of products. Ensure installers are trained and certified by product manufacturer.
- 1.6.3 Source Limitations and Responsibility: Ensure primary materials specified in this Section are provided by a single manufacturer. Ensure secondary materials are obtained from sources recommended by primary materials manufacturers. Ensure each material is from the same production run, has identical physical characteristics, and is similar in appearance for each contiguous area.
- 1.7 DELIVERY, STORAGE, AND HANDLING**
- 1.7.1 Deliver, handle, and store materials in accordance with manufacturer's instructions.
- 1.8 WARRANTY**
- 1.8.1 Warrant work of this Section against defects and deficiencies in accordance with requirements of Division 01. Provide standard or custom warranty in which manufacturer agrees (i.e. materials warranty) to correct defects or deficiencies in pre-applied sheet waterproofing work for a period of 10 years from date of Substantial Performance of the Work. Repair or replace defective components of work within the specified warranty period.
- 2 Products
- 2.1 MANUFACTURERS**
- 2.1.1 Subject to compliance with requirements specified in Contract Documents, Products by one of the following manufacturers may be acceptable for use on this Project:
- 2.1.1.1 GCP Applied Technologies; www.gcpat.com
- 2.1.1.2 Layfield Construction Products; www.layfieldgroup.com
- 2.1.1.3 Stego Industries, LLC; www.stegoindustries.com
- 2.1.1.4 W.R. Meadows of Canada; www.wrmeadows.com
- 2.2 REGULATORY REQUIREMENTS**
- 2.2.1 Comply with governing codes and regulations.

UNDER SLAB VAPOUR RETARDERS

2.3 DESIGN AND PERFORMANCE REQUIREMENTS

- 2.3.1 Provide vapour retarder under slabs-on-grades in all locations applied on prepared subbase prior to placement of concrete slabs.
- 2.3.2 Ensure vapour retarder can resist effects of vapour penetration from ground through building enclosure.
- 2.3.3 Compatibility between materials is essential.

2.4 MATERIALS

- 2.4.1 Under slab plastic vapor retarder: Resin based, sheet vapour retarder membrane conforming to ASTM E1745 (Class A) with the following characteristics:
 - 2.4.1.1 Water vapour permeance (ASTM E96 or ASTM F1249): less than 5.7 ng/s.m².Pa (0.1 perms).
 - 2.4.1.2 Puncture resistance (ASTM D1709): over 2,200 grams (4.8 lbs).
 - 2.4.1.3 Tensile strength (ASTM E154): ≥ 8.77 kN per m (50 lbs force/inch)
 - 2.4.1.4 Minimum thickness: 0.38 mm (15 mils)
 - 2.4.1.5 Acceptable Products:
 - 2.4.1.5.1 "Perminator 10mil & 15mil" by W. R. Meadows of Canada ; www.wrmeadows.com
 - 2.4.1.5.2 "Florprufe 120" by GCP Applied Technologies; www.gcpat.com
 - 2.4.1.5.3 "Stego® Wrap" Vapor Barrier" by Stego Industries, LLC; www.stegoindustries.com
 - 2.4.1.5.4 "VaporFlex" by Layfield Construction Products
 - 2.4.1.6 Location: Identified on Drawings as "15mil POLY VAPOUR BARRIER "

2.5 AUXILIARY MATERIALS

- 2.5.1 Provide auxiliary materials recommended by vapour retarder manufacturer for intended use and compatible with vapour retarder. Ensure liquid-type auxiliary materials comply with VOC limits of authorities having jurisdiction.
- 2.5.2 Seam Tape: Provide manufacturer's recommended high density tape with pressure sensitive adhesive; minimum 100 mm (4 inch) wide.
- 2.5.3 Pipe Collars: Construct pipe collars from vapor retarder material and pressure sensitive tape in accordance with manufacturer's instructions.

3 Execution

3.1 EXAMINATION

- 3.1.1 Verification of Conditions:
 - 3.1.1.1 Verify actual site dimensions and location of adjacent materials prior to commencing work. Notify Consultant in writing of any conditions which would be detrimental to the installation. Commencement of work implies acceptance of previously completed work.

3.2 PREPARATION

- 3.2.1 Prepare surfaces in accordance with manufacturer's instructions.
- 3.2.2 Level, tamp, or roll earth or granular material beneath slab base.

3.3 INSTALLATION

- 3.3.1 Install materials to manufacturer's instructions and requirements of ASTM E1643.
- 3.3.2 Unroll vapor retarder with the longest dimension parallel with direction of concrete pour.
- 3.3.3 Lap vapor retarder over footings and seal to foundation walls.
- 3.3.4 Overlap joints minimum of 152 mm (6 inch) and seal with manufacturer's tape.

UNDER SLAB VAPOUR RETARDERS

- 3.3.5 Seal penetrations (including pipes) with manufacturer's pipe boot.
- 3.3.6 Penetrations in vapor retarder are not permitted except for reinforcing steel and permanent utilities.
- 3.3.7 Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area minimum of 152 mm (6 inches) and taping all four sides with tape.
- 3.4 PROTECTION**
- 3.4.1 Protect membrane in accordance with manufacturer's recommendations until placement of concrete. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

END OF SECTION

VAPOUR PERMEABLE AIR BARRIERS

07 27 15 – Vapour Permeable Air Barriers and Water Resistive Barriers

1 GENERAL

1.1 SUMMARY

- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
 - 1.1.2.1 self-adhering, vapour permeable, sheet air barriers.
 - 1.1.2.2 auxiliary materials and accessories required for a complete air barrier assembly installation.

1.2 REFERENCES

- 1.2.1 Conform to the latest edition of the following. Where standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed standard:

1.2.2 AATC

- 1.2.2.1 AATC 127 - Test Method for Water Resistance: Hydrostatic Pressure

1.2.3 American Society for Testing and Materials (ASTM):

- 1.2.3.1 ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- 1.2.3.2 ASTM C920 - Standard Specification for Elastomeric Joint Sealants
- 1.2.3.3 ASTM C1193 - Standard Guide for Use of Joint Sealants
- 1.2.3.4 ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension
- 1.2.3.5 ASTM D570 - Standard Test Method for Water Absorption of Plastics
- 1.2.3.6 ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting
- 1.2.3.7 ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
- 1.2.3.8 ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives
- 1.2.3.9 ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- 1.2.3.10 ASTM D4073 - Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes
- 1.2.3.11 ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating
- 1.2.3.12 ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- 1.2.3.13 ASTM D6135 - Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing
- 1.2.3.14 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- 1.2.3.15 ASTM E96 - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
- 1.2.3.16 ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
- 1.2.3.17 ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

VAPOUR PERMEABLE AIR BARRIERS

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|------------|---|---|---|
| 1.2.3.18 | ASTM E783 | - | Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors |
| 1.2.3.19 | ASTM E1186 | - | Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems |
| 1.2.3.20 | ASTM E2556/E2556M | - | Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment |
| 1.2.3.21 | ASTM G154 | - | Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials |
| 1.2.4 | Canadian Construction Materials Centre (CCMC) | | |
| 1.2.4.1 | CCMC 07102 | - | Water Resistance Test for High-Performing Water-Resistive Barrier |
| 1.2.4.2 | CCMC 07251003 | | |
| 1.2.5 | International Organization for Standardization (ISO): | | |
| 1.2.5.1 | ISO 9001 | - | Quality management systems — Requirements |
| 1.2.5.2 | ISO 14025 | - | Environmental labels and declarations – Type III environmental declarations – Principles and procedures |
| 1.2.5.3 | ISO 21930 | - | Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services |
| 1.2.6 | Underwriters' Laboratories of Canada (ULC): | | |
| 1.2.6.1 | CAN/ULC S710.1 | - | Standard for Thermal Insulation - Bead - Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification |
| 1.2.6.2 | CAN/ULC S711.1 | - | Standard for Thermal Insulation - Bead-Applied Two Component Polyurethane Air Sealant Foam Part 1: Material Specification |
| 1.2.6.3 | CAN/ULC S741 | - | Standard for Air Barrier Materials - Specification |
| 1.2.6.4 | CAN/ULC S742 | - | Standard for Air Barrier Assemblies – Specification |
| 1.3 | DEFINITIONS | | |
| 1.3.1 | Air barrier Material: A primary material that controls the movement of air into and out of a building. | | |
| 1.3.2 | Air barrier Accessory: the materials or products which are used to connect different air barrier materials to form a continuous air barrier assembly. | | |
| 1.3.3 | Air barrier Assembly: a collection of air barrier materials (ie. self-adhered sheet air barriers, liquid applied membranes, medium density sprayed polyurethane foam, mechanically fastened commercial building wraps and boardstock air barriers) and air barrier accessories (ie. sealants, tapes and transition membranes) assembled together to form a continuous barrier to air infiltration into the environmental separator. | | |
| 1.3.4 | Water-resistive Barrier: a water repellent membrane intended to resist liquid water that is located behind the cladding and interconnected with flashings, window and door openings, or other penetrations of the building enclosure in order to drain water that passes through the cladding out to the exterior. It is designed to prevent water from reaching building components that could be damaged by moisture. | | |
| 1.4 | ADMINISTRATIVE REQUIREMENTS | | |
| 1.4.1 | Site Meetings: Schedule, and conduct pre-installation meeting at Project Site, in order to coordinate work of this Section, with work of related Subcontractors. | | |
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VAPOUR PERMEABLE AIR BARRIERS

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- 1.4.1.1 Ensure attendance of Subcontractor performing work of this Section and representatives of manufacturers and fabricators involved in, or affected by, installation and coordination with other materials and installations that have preceded or will follow. Advise Consultant and Owner in advance of scheduled meeting dates.
- 1.4.1.2 Agenda: As a minimum, include the following:
- 1.4.1.2.1 sequence of construction, coordination with substrate preparation, air barrier and Water Resistive Barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, air leakage and bond testing, protection of installed materials and details of construction.
- 1.4.1.2.2 Review progress of other construction activities and preparations for the particular activity under consideration.
- 1.4.1.3 Record significant discussions, agreements, and disagreements, including required corrective measures and actions.
- 1.4.1.4 Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
- 1.4.2 Sequencing:
- 1.4.2.1 Sequence work to permit installation of materials in conjunction with related materials and seals.
- 1.4.2.2 Do not install air barrier and Water Resistive Barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.
- 1.5 ACTION SUBMITTALS**
- 1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.5.2 **Product Data:** Submit product data in accordance with Division 01 for the following:
- 1.5.2.1 Submit manufacturer's instructions, printed product literature and data sheets for the VAPOUR PERMEABLE AIR BARRIERS work and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.5.2.2 Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- 1.5.3 **Shop Drawings:** Submit Shop Drawings showing the following:
- 1.5.3.1 locations and extent of air barrier and Water Resistive Barrier assemblies and details of all typical conditions,
- 1.5.3.2 intersections with other envelope assemblies and materials,
- 1.5.3.3 membrane counter-flashings,
- 1.5.3.4 complete details showing how gaps in construction will be bridged, treatment of inside and outside corners, and sealing of miscellaneous penetrations such as conduits, pipes, electric boxes and similar items.
- 1.5.3.5 Include details of interfaces with other materials that form part of air barrier and Water Resistive Barrier assemblies.
- 1.6 INFORMATIONAL SUBMITTALS**
- 1.6.1 **Product Certificates:** Submit certificates from air-barrier manufacturer, certifying compatibility of air barriers, Water Resistive Barrier and accessory materials with Project materials that connect to or that come in contact with air barrier and Water Resistive Barrier.
- 1.6.2 **Manufacturer's Instructions:** submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
- 1.7 QUALITY ASSURANCE**
- 1.7.1 Manufacturer Qualifications:

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- 1.7.1.1 Provide products by a firm specializing in the manufacture of air barriers and Water Resistive Barriers who has successfully produced work similar in design and extent to that required for the project, in not less than three (3) projects of similar size and scope and whose work has resulted in construction with a record of successful in-service performance for a minimum period of ten (10) years.
- 1.7.1.2 Manufacturer shall have a program of continuous quality management implemented conforming to the requirements of ISO 9001. Submit proof of certification upon request.
- 1.7.1.3 Ensure manufacturer has sufficient production capacity, organized quality control and testing procedures, and published written and illustrated installation manuals to produce and properly install assemblies required without causing delay in progress of the Work.
- 1.7.2 Installer Qualifications:
 - 1.7.2.1 Company specializing in performing work of this section with minimum five (5) years documented experience with installation of air barrier and Water Resistive Barrier systems
- 1.7.3 Mockups: Build mockups to set quality standards for materials and execution.
 - 1.7.3.1 Build integrated mockups of exterior wall assembly, incorporating backup wall construction, cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers and Water Resistive Barriers, and sealing of gaps, terminations, and penetrations of assembly.
 - 1.7.3.1.1 Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier and Water Resistive Barrier before external insulation and cladding are installed.
 - 1.7.3.1.2 Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - 1.7.3.1.3 If Consultant determines mockups do not comply with requirements, reconstruct mockups and apply air barrier and Water Resistive Barrier until mockups are approved.
 - 1.7.3.2 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Consultant specifically approves such deviations in writing.
 - 1.7.3.3 Allow 24 hours for inspection of mock up by Consultant before proceeding with remainder of Work of this Section.
- 1.7.4 Source Limitations: Obtain primary air-barrier and Water Resistive Barrier materials and air-barrier and Water Resistive Barrier accessories from single source from single manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

- 1.8.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- 1.8.2 Avoid spillage: immediately notify Consultant if spillage occurs and start clean up procedures.
- 1.8.3 Clean spills and leave area as it was prior to spill.
- 1.8.4 Remove and replace liquid materials that cannot be applied within their stated shelf life.
- 1.8.5 Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

- 1.9.1 Environmental Limitations:
 - 1.9.1.1 Install air barrier and Water Resistive Barrier within range of ambient and substrate temperatures, and moisture content recommended by material manufacturer.
 - 1.9.1.2 Protect substrates from environmental conditions that affect air barrier and Water Resistive Barrier performance.

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- 1.9.1.3 Do not apply air barrier or Water Resistive Barrier to a damp or wet substrate or during snow, rain, fog, or mist.
- 1.9.1.4 Do not leave membrane exposed to sunlight/UV for more than 30 days, unless otherwise recommended by manufacturer.
- 1.9.2 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.10 WARRANTY

- 1.10.1 Material Warranty: Provide material manufacturer's standard product warranty, for a minimum of five years from date of Substantial Performance of the Work.
- 1.10.2 Installation Warranty: Provide a two-year installation warranty from date of Substantial Performance of the Work, including all materials of the air barrier and Water Resistive Barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of attachment, loss of cohesion/adhesion and failure to cure properly.
- 1.10.3 Warranty: include coverage of installed materials which:
 - 1.10.3.1 Fail to achieve airtight and watertight seal.
 - 1.10.3.2 Exhibit loss of adhesion or cohesion.
 - 1.10.3.3 Do not cure.

2 PRODUCTS

2.1 MANUFACTURERS

- 2.1.1 Products from the following manufacturers may be acceptable for inclusion into The Work, provided they meet requirements of Contract Documents:
 - 2.1.1.1 Self-adhering Sheet Air Barriers:
 - 2.1.1.1.1 Henry Company
 - 2.1.1.1.2 SRP Canada Inc.
 - 2.1.1.1.3 Soprema.
 - 2.1.1.1.4 IKO Industries
 - 2.1.1.1.5 Dörken Systems, Inc.;
 - 2.1.1.1.6 3M

2.2 PERFORMANCE REQUIREMENTS

- 2.2.1 Provide air-barrier assembly and seals with adjacent construction that are capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies must be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- 2.2.2 Air Leakage Criteria (system): air leakage of air barrier assembly must not to exceed 0.2 L/(s·m²) under a pressure differential of 75 Pa (0.04 cfm/ft² @ 1.57 psf) when tested in accordance with CAN/ULC S742 (Minimum A1).
- 2.2.3 Unless specifically noted otherwise, air barrier materials specified herein must be permeable and must have minimum water vapour transmission not below 572 ng/s·m²·Pa (10 perms) when tested in accordance with ASTM E96 (Method A).
- 2.2.4 Ensure assembly can accommodate movements of building materials by providing expansion and control joints as required. Provide appropriate accessory materials to accommodate expansion / control joints, changes in substrate and perimeter conditions at such locations.

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- 2.2.5 Ensure air barrier and Water Resistive Barrier assembly is capable of withstanding combined design wind, fan and stack pressures (positive and negative) on building envelope without damage or displacement, and transfer required loads to structure.
- 2.2.6 Join air barrier and Water Resistive Barrier assembly in airtight and flexible manner to the air barrier and Water Resistive Barrier materials of adjacent assemblies, allowing for relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement as applicable.
- 2.2.7 Connections to Adjacent Materials: Provide air barrier and Water Resistive Barrier accessory materials to prevent air leakage at the following locations:
- 2.2.7.1 Foundation and walls, including penetrations, ties and anchors.
- 2.2.7.2 Walls, windows, curtain walls, storefronts, louvers and doors.
- 2.2.7.3 Different assemblies and fixed openings within those assemblies.
- 2.2.7.4 Wall and roof connections.
- 2.2.7.5 Floors over unconditioned space.
- 2.2.7.6 Walls, floor and roof across construction, control and expansion joints.
- 2.2.7.7 Walls, floors and roof to utility, pipe and duct penetrations.
- 2.2.7.8 Seismic and expansion joints.
- 2.2.7.9 All other potential air leakage pathways in the building envelope.
- 2.2.8 Unless otherwise noted, it is responsibility of this Section to Provide and maintain continuity of air seal to adjacent dissimilar materials. Provide materials to ensure positive support and continuity of air barrier and Water Resistive Barrier.
- 2.2.9 Material Compatibility:
- 2.2.9.1 Ensure compatibility between various types of air barriers and Water Resistive Barriers and other interfacing materials. Select combination of base materials, transition, bridging and reinforcing membranes, adhesives and accessories from various materials specified in this Section, so that when cured, they are compatible and give bonding characteristics equivalent to shear strength of selected air barrier and Water Resistive Barrier materials used.
- 2.2.9.2 Do not allow air barrier and Water Resistive Barrier materials to come in contact with chemically incompatible materials.
- 2.3 SELF-ADHERING SHEET VAPOUR PERMEABLE AIR BARRIER**
- 2.3.1 Self-Adhesive, Vapour Permeable, 3 layer Tear-resistant spun-bonded polypropylene (PP) fabric thermally bonded to polymeric middle layer with factory applied adhesive on PP bottom sheet.
- 2.3.1.1 Physical and Performance Properties:
- 2.3.1.1.1 Air Permeance: Maximum 0.02 L/s x sq. m of surface area at 75-Pa (0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft.) pressure difference; CAN/ULC S741.
- 2.3.1.1.2 Vapor Permeance: Not less than 700 ng/Pa x s x sq. m (12 perms); ASTM E96/E96M, Desiccant Method (Procedure A).
- 2.3.1.1.3 Resistance to Puncture: Minimum 180 N (40 lbf); ASTM E154.
- 2.3.1.1.4 Tensile Strength: Minimum 3.5 N/mm (20 lbs/inch); ASTM D882.
- 2.3.1.1.5 Water Resistance: Minimum 550 mm; AATC 127.
- 2.3.1.1.6 Peel Strength: Minimum 0.875 N/mm (5 lbs/inch); ASTM D903.
- 2.3.1.1.7 Lap Adhesion: Minimum 0.875 N/mm (5 lbs/inch); ASTM D1876.
- 2.3.1.1.8 Pull Adhesion: Minimum 110 kPa (16 psi) or substrate failure; ASTM D4541.
- 2.3.1.1.9 Tear Propagation: Minimum 40 N (8.9 lbf); ASTM D4073
- 2.3.1.1.10 Self-Sealability: Pass; ASTM D1970
- 2.3.1.1.11 Crack Bridging: Pass at -26 deg C (-14.8 deg F)
- 2.3.1.1.12 Low Temperature Flexibility: Pass at -30 deg C (-22 deg F)
- 2.3.1.1.13 Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.

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- 2.3.1.1.14 Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 21 deg C (70 deg F); ASTM D570.
- 2.3.1.2 Acceptable Products:
- 2.3.1.2.1 "Blueskin VP160" by Henry Company
- 2.3.1.2.2 "Air Outshield-SA-280" by SRP Canada Inc.
- 2.3.1.2.3 "Soprasedal Stick VP" by Soprema.
- 2.3.1.2.4 "AquaBarrier VP" by IKO
- 2.3.1.2.5 "DELTA@VENT SA" by Dörken Systems, Inc.;
- 2.3.1.2.6 "Air Barrier 3015VP" by 3M
- 2.3.1.2.7 "Air-Shield SMP" by W.R. Meadows Canada.

- 2.3.2 Location: Identified on Drawings as "SELF-ADHERED AIR BARRIER MEMBRANE (VAPOUR PERMEABLE)"

2.4 ACCESSORY MATERIALS

- 2.4.1 General: Accessory materials recommended by manufacturer to produce a complete assembly.
- 2.4.2 Primer: Liquid waterborne or solvent-borne primer recommended for substrate by air-barrier material manufacturer.
- 2.4.3 Termination Mastic: manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- 2.4.4 Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- 2.4.5 Seam tape: In accordance with water-resistive barrier manufacturer's written recommendation
- 2.4.6 Flashing: Self-adhering, water-resistive flashing membrane in accordance with water-resistive barrier manufacturer's written recommendations. Provide as follows:
- 2.4.6.1 Window Flashing, including corners.
- 2.4.6.2 Penetration Flashing
- 2.4.7 Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.5 mm (0.0187 inch) thick, and Series 300 stainless-steel fasteners.
- 2.4.8 Sprayed Polyurethane Foam Sealant (for filling gaps, penetrations and openings): One-component conforming to CAN/ULC S710.1 or two-component conforming to CAN/ULC S711.1, foamed-in-place, polyurethane foam sealant, 24- to 32-kg/cu. m (1.5- to 2.0-lb/cu. ft.) density; flame-spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- 2.4.8.1 Acceptable Products:
- 2.4.8.1.1 "Zerodraft Air Sealant Foam and Insulating Sealant" by Zerodraft (Division of Canam Building Envelope Specialists Inc.), www.zerodraft.com
- 2.4.8.1.2 "Handi-Foam®" by Fomo Products, Inc.; www.fomo.com
- 2.4.8.1.3 "GREAT STUFF PRO™ Series" Foam Sealant by DuPont de Nemours Inc.
- 2.4.8.1.4 "Exo LEF" or "ExoAir Flex Foam" by Tremco Incorporated, an RPM company
- 2.4.9 Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 92 00, Joint Sealants.

3 EXECUTION

3.1 EXAMINATION

- 3.1.1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

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- 3.1.1.1 Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
- 3.1.1.2 Verify that concrete has cured and aged for minimum time period recommended by manufacturer.
- 3.1.1.3 Verify that concrete is visibly dry and free of moisture.
- 3.1.1.4 Verify that masonry joints are flush and completely filled with mortar.
- 3.1.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- 3.2.1 Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for application.
- 3.2.2 Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- 3.2.3 Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- 3.2.4 Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- 3.2.5 Bridge and cover isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with overlapping tapes approved by manufacturer.
- 3.2.6 At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- 3.2.7 Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION OF SELF-ADHERING SHEETS

- 3.3.1 Install self-adhering sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D6135.
- 3.3.2 Apply and firmly adhere self-adhering sheets horizontally over area to receive air barrier. Accurately align sheets and maintain uniform lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
- 3.3.3 Prime each substrate accepting adhesive-backed building wrap.
- 3.3.4 Position and bond adhesive-backed building wrap to substrates. Avoid formation of wrinkles or bubbles.
- 3.3.5 Press adhesive-backed air barrier firmly in place with J roller or similar technique.
- 3.3.6 Seal non-shingled laps with mastic or tape as recommended by manufacturer.
- 3.3.7 Provide supplemental mechanical attachment at soffits with inverted surfaces and terminations, when required by manufacturer.
 - 3.3.7.1 Apply membrane sheets such that they shed water naturally without interception by a sheet edge, unless edge is sealed with termination mastic as specified in this Section. Install successive courses of membrane and provide minimum following overlaps:
 - 3.3.7.1.1 End laps: minimum 150 mm (6 inches)
 - 3.3.7.1.2 Side laps: aligned at 75 mm (3 inches)
 - 3.3.7.1.3 Roll all membrane seams with roller.
- 3.3.8 Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic or tape as recommended by manufacturer.

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- 3.3.9 Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
- 3.3.10 Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
- 3.3.11 Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- 3.3.12 Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone-sealant extrusion so that a minimum of 75 mm (3 inches) of coverage is achieved over each substrate. Maintain 75 mm (3 inches) of full contact over firm bearing to perimeter frames with not less than 25 mm (1 inch) of full contact.
- 3.3.13 Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier membrane with foam sealant.
- 3.3.14 At end of each working day, seal top edge of air-barrier material to substrate with termination mastic or tape as recommended by manufacturer.
- 3.3.15 Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- 3.3.16 Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 150 mm (6 inches) beyond repaired areas in all directions.
- 3.3.17 Continuously connect, seal and tie primary air barrier material into vertical and horizontal planes of the following materials:
- 3.3.17.1 roof air barrier,
 - 3.3.17.2 concrete below-grade structures,
 - 3.3.17.3 windows and exterior doors,
 - 3.3.17.4 curtain wall,
 - 3.3.17.5 storefront,
 - 3.3.17.6 louvers,
 - 3.3.17.7 exterior doors, and
 - 3.3.17.8 other intersection conditions.
- 3.3.18 Install transition membranes where required by design or construction sequence.
- 3.3.19
- 3.3.20 Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.
- 3.4 FIELD QUALITY CONTROL**
- 3.4.1 Manufacturer's Field Services:
- 3.4.1.1 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 this Section.
 - 3.4.1.2 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.

VAPOUR PERMEABLE AIR BARRIERS

3.5 CLEANING AND PROTECTION

- 3.5.1 Protect air-barrier and Water Resistive Barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- 3.5.1.1 Protect air barrier and Water Resistive Barrier from exposure to UV light and harmful weather exposure as required by manufacturer.
- 3.5.1.2 Protect air barrier and Water Resistive Barrier from contact with incompatible materials and sealants not approved by manufacturer.
- 3.5.2 Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

Steel Siding

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1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Coated Alloy with Improved Formability

1.2.2.2 ASTM C920 - Standard Specification for Elastomeric Joint Sealants

1.2.3 Canadian Sheet Steel Building Institute

1.2.4 Canadian Standards Association (CSA):

1.2.4.1 CSA-S16.1 - Limit States Design of Steel Structures

1.2.4.2 CSA-S136 - North American specification for the design of cold-formed steel structural members

1.2.5 Underwriters Laboratories - Canada (ULC):

1.2.5.1 CAN/ULC S710.1 - Standard for Thermal Insulation - Bead - Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification

1.3 DESIGN CRITERIA

1.3.1 Design metal siding, soffits and fasteners to support a positive wind load of 0.96 kN/m² (20 lbs/sq.ft.) and a negative wind load of 0.575 kN/m² (12 lbs/sq.ft.), with maximum deflection of L/180th of the span at full load. Components of siding system shall not vibrate when subjected to the effects of wind.

1.3.2 Yield stress shall not exceed 230 Mpa (33,000 psi).

1.3.3 Base general design on CAN/CSA-S16.1 and CAN/CSA-S136.

1.3.4 Conform to the rainscreen principle of design as advocated by National Research Council of Canada (NRC).

1.3.5 Design metal siding assemblies capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

1.4 TESTING

1.4.1 The Owner may employ an independent testing company to perform quality control testing for each coil of sheet metal to be coated, as specified under "Source Quality Control", and will pay all costs thereto

1.5 SUBMITTALS

1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.5.2 **Shop Drawings:** identifying

Steel Siding

- 1.5.2.1 Materials, gauges and dimensions. Include all fixings, fasteners, sealants
- 1.5.2.2 Layouts and installation details; building movement provisions
- 1.5.2.3 All conditions at parapet, windows, doors, junctions, corners, trims, and interface with other finishes
- 1.5.2.4 General notes indicating material and installation compliances with the Specifications
- 1.5.3 **Samples**
- 1.5.3.1 Submit to Consultant, two - 300 mm x sheet width prepainted sample sections of each siding and liner panel profile painted to colour specified. Ensure finished Work matches accepted samples in colour, gloss and texture.
- 1.5.3.2 Submit to coating material manufacturer, two - 300 mm x 300 mm prepainted samples from each coil of coated steel for the manufacturer to verify quality of coating application.
- 1.5.3.3 Submit to independent testing company upon request, two - 300 mm x 300 mm prepainted samples from each coil of coated steel for the testing company to verify quality and performance of coating application.
- 1.5.4 **Test results:** Submit to the Consultant in duplicate, reports of the following:
- 1.5.4.1 Coating applicator's in-house quality control meeting "Source Quality Control" requirements herein.
- 1.5.4.2 Coating manufacturer's testing of coating application quality.
- 1.6 **QUALITY ASSURANCE**
- 1.6.1 Installer: Manufacturer's construction forces or by an installer accredited by the deck manufacturer.
- 1.6.2 Coating system: Sourced from one coating manufacturer for entire Project as required to ensure colour match.
- 1.6.3 Metal coating system application: Applicator to ensure materials are applied in accordance with quality and performance specifications published by specified coating manufacturers for each coating system specified.
- 1.7 **DELIVERY, STORAGE AND HANDLING**
- 1.7.1 Comply with CSSBI guidelines, and the requirements specified herein.
- 1.7.2 Store materials on Site in a manner to prevent damage thereto, or deterioration of finish. Galvanized surfaces which show evidence of "white rust" will not be accepted. Store away from chemically aggressive substances and away from site traffic.
- 1.7.3 Stack panels tilted to provide water run-off, free from ground contact on firm, level, non-staining supports extending full width of sheet and spaced not more than 450 mm apart.
- 1.7.4 Where possible, pile individual sheets or panel length and types separately. Cover components with non-plastic sheet coverings loosely shrouded over stacks, to protect from direct sunlight and moisture penetration. Anchor coverings to prevent blow off. Vent to allow air movement but not to allow entry of wind driven rain.
- 1.7.5 Conduct transport of materials to job site storage compound in such a manner to prevent in-transit damage. These measures include, but are not limited to crating, polyethylene wrapping system, etc.
- 1.8 **WARRANTY**
- 1.8.1 Generally, warrant Work of this section against defects and deficiencies for a period of 2 years from date Work is certified as substantially performed in accordance with the general conditions of the Contract.

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1.8.2 Finish Warranty: Furnish siding manufacturer's written warranty covering failure of the factory-applied exterior finish on metal for 20 years. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1.8.3 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.

2 Products

2.1 GENERAL

2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.

2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 SHEET METAL MATERIALS

2.2.1 General: Source siding from one manufacturer.

2.2.2 Steel sheet: Conforming to ASTM A653/A653M, Grade A, with minimum base steel thicknesses as specified, Z275 zinc coating, and prepainted as specified.

2.2.3 **Ribbed exterior sheets:** 0.60 mm (24 ga), 38 mm depth, in any one of the following: VicWest "CL 6025 SR", Agway "6-150NF".

2.2.4 **Sub-girts, Z-bars:** One piece and adjustable types made from sheet steel in 1.214 mm (18 ga), with Z275 zinc coating.

2.2.5 **Closures and flashings:** Of same material and thickness as specified for exterior sheets, prepainted to match adjacent siding where exposed to view.

2.2.6 **Interior corner stiffeners:** Steel sheet in required thickness, zinc coating type to match liner sheet.

2.2.7 **Prefinished metal sills:** 2 piece sill system complete with formed drip as shown, fabricated of same material as specified for exterior sheets, prepainted to match adjacent siding. Metal thickness shall be as required but not less than 0.95 mm (20 ga.).

2.3 COATING SYSTEM

2.3.1 Metal coating system for exterior sheets: Silicone modified polyester (SMP) system, coil coated using US Steel Supply "WeatherX" or ArcelorMittal "Perspectra Series". Coil coated surface pretreated and primed prior to application of coating.

2.3.1.1 Unexposed surface primed and wash coat finished

2.3.1.2 Colour: As selected by Consultant from prepainted coil manufacturer's standard colour selection.

2.4 ACCESSORIES

2.4.1 **Insulation:** Owens-Corning Canada "AF703" fibreglass, or approved equivalent.

2.4.2 **Adhesive:** Rapid setting, synthetic rubber based adhesive, Henry "830-05".

2.4.3 **Fasteners**

Steel Siding

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- 2.4.3.1 Flat profile exterior sheet fasteners: Manufacturer's standard concealed fastening system.
- 2.4.3.2 Type AB fasteners: Stainless steel, self-tapping sheet metal screws with colour matched nylon heads as manufactured by the Atlas Bolt and Screw Co. of Canada Ltd., Construction Fasteners Inc. "Weatherguard", Leland Industries or approved alternative.
- 2.4.3.3 Type B fasteners: Hex head cadmium plated high carbon steel, self-tapping sheet metal screws.
- 2.4.3.4 Concrete/masonry fasteners: Trufast "Tap-Grip", Weatherguard "Confas" or Buildex/Redhead "Tapcon".
- 2.4.4 **Concealed sealant:** Tremco "Butyl Sealant" to TT-S-001657, Type 1.
- 2.4.5 **Exposed sealant:** Non-sag type, 1 part polyurethane per ASTM C920, Type S, Grade NS, Class 25, in colour selected by Consultant.
- 2.4.5.1 Sika "RC-I", Tremco "Dymonic", or Sonneborn "NP-1".
- 2.4.6 **Thermal insulators:** Self adhering cork tape, minimum 3 mm thick x width of subgirt, "1620X" by Jacobs & Thompson Inc.
- 2.4.7 **Neoprene rib closures:** Closed-cell, moulded to fit rib profile.
- 2.4.8 **Butyl tape:** Tremco 440 II Tape, 3 mm x 25 mm wide.
- 2.4.9 **Bituminous paint:** Bakor 810-07 Non-Fibered Asphalt Roof and Foundation Coating.
- 2.4.10 **Zinc rich primer:** Primer for touch up of galvanized sheet steel; W.R. Meadows "Galvafruid", Kerry Industries "Z.R.C." or Niagara Paint Inc. "PL052898".
- 2.4.11 **Insulated expansion joint:** Lexsuco "LP-6" expansion joint, complete with prefabricated tapered end and corner sections, PVC extension wings, PVC overcover, splice kits and self-tapping stainless steel sheet metal or wood screws.
- 2.4.12 **Flexible expansion joint flashing:** Lexsuco "F-20" for interior and Lexsuco "FR40" for exterior.
- 2.4.13 **Siding to roof air/vapour barrier connections and expansion joint membrane:** Reinforced modified vinyl membrane sheet, Lexsuco "FR-40". Bond to substrates with Lexsuco "CA-103" adhesive.
- 2.4.14 **Loose insulation:** Fiberglass or mineral wool batt insulation as manufactured by Owens-Corning Canada Inc. or Roxul.
- 2.4.15 **Foamed-in-place air seals:** Class 1, single component polyurethane foam conforming to CAN/ULC-S710.1, with flame spread rating of 20 or less and smoke developed of 25 or less. Density of 20.8 to 28.8 kg/m³.
- 2.4.15.1 "Zerodraft Foam Sealant" by Canam Building Envelope Specialists Inc., "Great Stuff Pro" by Dow Chemical Company, or "LEF" by Tremco.
- 2.5 BACKPAINTING**
- 2.5.1 Factory paint backside of uninsulated metal siding and flashings including Z-bars to be installed over concrete or concrete block wall surfaces with 2 coats of bituminous paint specified
- 3 Execution
- 3.1 SILL ANGLE**
- 3.1.1 Install sill angles with expansion anchors and seal to achieve a weathertight condition.

Steel Siding

- 3.1.2 Accomplish airtightness by applying a continuous ribbon of sealant along the two extremities of the installed sill angle on both interior and exterior sides. Likewise, seal between adjacent lengths of angle. Finish exposed sealant to a smooth, uniform condition. Remove excess sealant. Clean and prime concrete accordingly prior to applying sealant in accordance with sealant manufacturer's directions. Comply with Sealant Work - General Requirements herein.

3.2 FACE SHEET ASSEMBLY

- 3.2.1 Install Z-bars at building structural girt locations. Fasten to metal liner through cork tape with Type "B" fasteners.
- 3.2.2 Fasten Z-bars to concrete block at spacing indicated using masonry fasteners.
- 3.2.3 Install continuous thermal barrier cork tape between liner sheets and sub-girts. Direct metal-to-metal contact will not be accepted.
- 3.2.4 Install insulation with adhesive. Tightly butt joints.
- 3.2.5 Install corner supports, interior corner pieces, closures and related accessories, etc. rigid and tight.
- 3.2.6 Secure exterior face sheets to sub-girts in accordance with the manufacturer's standards.
- 3.2.7 Face sheets shall generally span three or more supports. Jointing of face sheets shall be over structural supports with a minimum 100 mm overlap. There shall be no apparent difference between face sheets of the same colour. Remove and replace off-colour sheets.
- 3.2.8 When cutting or drilling prefinished material, exercise care to ensure that cuttings do not remain to rust on exposed prefinished surfaces and be removed as quickly as possible. Where practicable, conduct cutting and drilling so that cuttings do not strike or accumulate on exposed cladding.
- 3.2.9 Closures, Flashing, And Trim
- 3.2.9.1 Install all closures, flashing and trim as required to produce a neat, finished, weathertight installation. Provide formed steel closures around openings. Provide proper end laps sealed with sealant in all long runs to allow for thermal movement and to remain weathertight. Secure all such members in accordance with manufacturer's recommendations, but at minimum 3000 mm o.c. Bed exposed flashing and trim, and members subject to rain penetration, in sealant. Apply sealant around siding, and openings in siding, and below metal flashings to siding.
- 3.2.9.2 Copings and scuppers: Coordinate installation under the roofing section.
- 3.2.9.3 Wall expansion joints: Install metal trim at joints as shown.
- 3.2.9.4 Gutters and downspouts: Install where and as shown; lap joints in direction of flow. Provide tail pieces for downspouts; secure downspouts to wall. Slope gutters to downspouts. Seal all joints.
- 3.2.9.5 Install premolded closures at top and bottom ends of siding materials, at cap flashings, and above sill or ledge flashings to keep building weathertight; and, vermin and insect protected.
- 3.2.9.6 Set closures in place with a daub of sealant to keep closure from falling out when metal flexes.
- 3.2.9.7 Prime surfaces as required by sealant manufacturer. Tool caulked joints. Remove excess sealant.

Steel Siding

3.3 EXPANSION JOINT ASSEMBLIES

- 3.3.1 Install insulated flexible flashings or flexible flashings at siding and roof transitions between liner panel, girt and roof curb. Install on a continuous butyl tape on each support. Roll flashing to tape with a steel roller to achieve a completely air tight seal. Butt tape ends tightly to each other.
- 3.3.2 At siding expansion joints install flaps of insulated flexible flashings in a continuous butyl tape applied on each supporting member. Roll flashing to tape with a steel roller to achieve completely air tight seal. Butt tape ends tightly to each other.
- 3.3.3 Lap joints of insulated flexible flashings and flexible flashings a minimum of 100 mm and heat weld.

3.4 TEMPORARY OPENINGS FOR EQUIPMENT ACCESS

- 3.4.1 Leave temporary openings in siding for equipment access at locations shown on Drawings.
- 3.4.2 Remove temporary closures and close openings with permanent siding assembly after equipment has been delivered in the building.

3.5 SEALANT WORK

3.5.1 Preparation

- 3.5.1.1 Prepare joints to receive compound and verify suitability. Failure of compound in the future, due to claimed unsuitability of joint, will not be valid. Installation of compound is considered as evidence that joint is suitable to receive compound.
- 3.5.1.2 Clean recesses to receive compound to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to compound's performance.
- 3.5.1.3 Apply masking tape to metal surfaces adjacent to recesses to prevent smearing or staining of such metal surfaces.
- 3.5.1.4 Depth of recess to receive compounds are not to exceed 1/2 the joint width up to a maximum of 12 mm and not less than 6 mm at centre of joint. Where depth of recess is in excess of specified depth, place back-up material in recess, forced into place under compression, to provide 6 mm recess depth.

3.5.2 Installation

- 3.5.2.1 Use materials as received from manufacturers, without additives or adulteration. Use one manufacturer's Product for each kind of Product specified.
- 3.5.2.2 Install compound immediately after adjoining Work is in condition to receive such Work. Fill joints completely, regardless of variation of joint widths, and to proper depth as specified. Install compounds under pressure, without smearing adjacent surfaces. Sealant compounds must have full and uniform contact with, and adhesion to, side surfaces of recess.
- 3.5.2.3 Finish face of compound in recesses smooth and even. At recesses in angular surfaces, finish compound with a flat face, flush with face of material at each side. At recesses in flush surfaces, finish compound with a concave face, flush with face of material at each side.
- 3.5.2.4 Surface of compounds to be free from dirt, stain or other defacements and be uniform in colour.

3.6 TOUCH UP

- 3.6.1 Touch up marred prepainted surfaces with air dry formulation to match pre-finished material, or replace if necessary.
- 3.6.2 Clean and touch up marred galvanized surfaces after installation, with zinc rich primer.

Steel Siding

3.7 CLEANING-UP

3.7.1 Leave siding Work clean and free of grime, dirt and sealant stains. Remove stains on adjacent Work of other trades resulting from sealant Work.

END OF SECTION

Modified Bituminous Membrane Roofing

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1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board

1.2.2.2 ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

1.2.2.3 ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

1.2.3 Canadian General Standards Board (CGSB):

1.2.3.1 CGSB 37-GP-56M - Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing

1.2.4 Canadian Standards Association (CSA):

1.2.4.1 CSA A123.4-M - Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems

1.2.4.2 CSA B111 - Wire Nails, Spikes and Staples

1.2.5 Factory Mutual Engineering Corporation (FM):

1.2.5.1 FM - "Loss Prevention Data, Insulated Steel Deck 1-28", FM "Approval Guide"

1.2.6 Underwriters Laboratories - Canada (ULC)

1.2.6.1 CAN/ULC-S107 - Methods of Fire Tests of Roof Coverings

1.2.6.2 CAN/ULC-S126 - Standard Method of Test for Fire Spread Under Roof-Deck Assemblies

1.2.6.3 CAN/ULC-S704 - Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

1.2.6.4 CAN/ULC-S770 - Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.3 ROOFING SUBCONTRACTOR

1.3.1 Subcontractor to be trained and approved by the manufacturer of roofing system to be installed, with minimum 5 years working experience on projects of similar size and in climates similar to that of this Contract

1.4 QUALITY ASSURANCE

1.4.1 Design criteria for materials, and roofing system construction: per CSA A123.21 for geographic location of project and wind uplift criteria indicated on Drawings.

Modified Bituminous Membrane Roofing

1.4.2 Work force: Skilled, well-trained, competent and experienced roofing tradesmen and foremen supervisors fully conversant with standards, methods and techniques required for the installation of the roofing system specified. Installers must be certified by roofing manufacturer.

1.4.3 Fire performance: Comply with CAN/ULC-S107 Class A, or B, or C as specified in the Ontario Building Code.

1.5 INSPECTION AND TESTING

1.5.1 Inspection and testing will be carried out by an independent testing and inspection company employed and paid for separately by the Owner.

1.5.2 Be responsible for having the representative of the roofing warrantor on Site to inspect installation at the start of installation, as Work proceeds and to certify the assembly as "Approved" upon completion.

1.6 SUBMITTALS

1.6.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.6.2 Product Data:

1.6.2.1 Submit Product data showing the following: Vapour retarder, roof insulation, fiberboard overlay, fasteners, tapered insulation, Two-ply modified bitumen roofing base and flashing membrane, roof accessories

1.6.3 Layouts:

1.6.3.1 Identify: Insulation fastener layout, layout of tapered insulation, layout of building area indicating roofing sequence, equipment set up and material laydown area, roof expansion joint system.

1.6.4 Proposed method of exhausting smoke and fumes from the kettle when set up inside the building.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

1.7.1 Deliver materials to the Site, properly protected, with manufacturers' seals and labels intact. Carefully unload and place in temporary storage facilities in a manner to prevent damage thereto.

1.7.2 Store and handle polyisocyanurate insulation in accordance with Technical Bulletin #109 "Storage and Handling Recommendations for Polyiso Roof Insulation" published by the Polyisocyanurate Insulation Manufacturers Association (PIMA).

1.7.3 Store materials at the Site within temporary sheds or trailers. Do not use wet, damp, frozen or damaged materials. Storage sheds or trailers for the following materials must be well sealed and heated to at least five degrees warmer than the exterior ambient temperature to ensure materials remain dry:

1.7.3.1 Two-ply modified bitumen membrane

1.7.3.2 Sealants

1.7.3.3 Adhesives

1.7.3.4 Other materials which are adversely affected by cold weather

1.7.4 Do not store more than 1 day's supply of materials on the roof at any time. On roof, stack materials on pallets at least 100 mm above roof surface, and completely cover with incombustible waterproof tarpaulin whenever Work is interrupted, or when there is precipitation of any kind:

1.7.4.1 Securely tie covering to the pallets in such a way as to be weathertight and to prevent tarpaulin from blowing off in a windstorm.

Modified Bituminous Membrane Roofing

- 1.7.4.2 Plastic covers and shrinkwrap covers by manufacturers are not acceptable for Project site storage and shall be removed upon delivery and prior to Site storage.
- 1.7.5 Distribute materials stored on the roof to stay within designated live load limits of the roof construction. Provide ample bases under equipment and materials to distribute the weight to conform to these live-load limits. Do not store materials on, or transport materials across, completed roof areas.
- 1.7.6 Do not lift rigid insulation in slings which will damage insulation edges. Remove damaged insulation and replace with new material at no cost to Owner.

1.8 PROTECTION

- 1.8.1 Protect workers and property in accordance with the Occupational Health and Safety Act.
- 1.8.2 Protect the Work of this section from damage. Replace damaged Work which cannot be satisfactorily repaired, restored or cleaned, at no cost to the Owner.
- 1.8.3 Where hoisting occurs adjacent to building surfaces, hang tarpaulins to protect walls and other surfaces.
- 1.8.4 Have a 9 kg dry chemical fire extinguisher fully charged and in operable condition at every location where open flames are used.
- 1.8.5 Provide firewatch for minimum 2 hours after torching operations. Use infra-red heat sensors to check for hot spots.
- 1.8.6 Protection covering: Place a 19 mm thick plywood underlaid with 25.4 mm thick polystyrene insulation board adhered to same, over all roofed areas when working from, or over, such roof surfaces. Provide such protection below hoist rigs, ladders, pallets of material, and in other circumstances where the roofing membrane is exposed to potential damage.
- 1.8.7 Do not store materials on new roofing.

1.9 ENVIRONMENTAL REQUIREMENTS

- 1.9.1 Do not install materials in rain, cold, moisture, frost, snow or other climatic conditions which would incorporate moisture into the roof materials.

1.10 WARRANTY

- 1.10.1 Submit in duplicate copies, two warranty provisions which shall run concurrently commencing from period specified in the general conditions.
- 1.10.1.1 Standard workmanship warranty (by Roofing Contractor): Warrant the roofing and flashing membranes against workmanship defects for a period of 2 years and agree to promptly make good any defects which occur or become apparent within the Warranty Period, such defects to include but not to be restricted to leakage, failure to stay in place, lifting and deformations. Temporary repairs done during inclement weather shall be replaced with permanent Work as soon as weather permits. Use Ontario Industrial Roofing Contractors' Association "Standard Form of Warranty".

Modified Bituminous Membrane Roofing

1.10.1.2 Total systems warranty (by Roofing Material Manufacturer): Warrant the roofing and flashing membranes and components of the roofing system from defects caused by workmanship and material deficiencies for a period of 10 years, with no dollar limit, and agree to promptly make good, at no increase in Contract Price, any defects which occur or become apparent within the Warranty Period, such defects to include but not to be restricted to leakage, failure to stay in place, lifting and deformations. Temporary repairs done during inclement weather shall be replaced with permanent Work as soon as weather permits. The warranty shall cover the cost of labour, workmanship and material to restore the roof to a watertight condition. Warranty shall be issued by the Supplier of roofing components, herein referred to as "Roofing Warrantor".

2 Products

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

2.1.1 Conform to CRCA Roofing Specification Manual as amended to date of this Specification, as applicable, except where indicated or specified otherwise. Do roofing work employing roofing Products, plates and fasteners conforming to FM data for proposed roofing system. Conform to most stringent requirements.

2.1.2 Wind uplift resistance: Comply with CSA A123.21 for values indicated on Structural Engineer's drawings. Ensure roofing assembly complies with required uplift specified.

2.1.3 Ensure materials are compatible and satisfactory to membrane manufacturer and comply as a minimum with requirements of local jurisdictional authorities. Select appropriate type of insulation on basis of compatibility when incorporated into roofing system, required thermal value and ability to adhere components permanently and in a rigid manner in finished roofing system.

2.2 ROOFING MATERIALS

2.2.1 Vapour retarder support panel: Glass fibre reinforced gypsum core, glass mat faced, conforming to ASTM C1177. Thickness as shown on drawings.

2.2.2 Vapour retarder: Self adhered SBS modified bituminous membrane, polyester reinforced, bottom surfaced with a release sheet, conforming to CGSB 37-GP-56M, *Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing*.

2.2.3 Insulation: Polyisocyanurate foam rigid roof insulation board, conforming to ASTM C1289, Type 2, Class 2, Grade 3, manufactured with HCFC-free blowing agent bonded to inorganic, coated glass facers on top and bottom surfaces during the manufacturing process meeting the requirements of CAN/ULC-S126 and CAN/ULC-S107, conforming to CAN/ULC-S704 and CAN/ULC-S770 for Long Term Thermal Resistance (LTTR) R-values, approved and listed by Factory Mutual Global for Class 1-60 windstorm classification and FM4450 approval requirements for Class 1 fire as a component in roof deck construction. Provide insulation with square edges and, having total LTTR value as shown on Drawings or as a minimum having a total LTTR value of R30.6, and in minimum two layers. Acceptable Products:

2.2.3.1 E'NRG'Y 3 CGF as supplied by Johns Manville.

2.2.3.2 "IkoTherm III" by IKO Industries Ltd.

2.2.3.3 "ACFoam III" by Atlas

2.2.3.4 "SopralSO Plus" by Soprema

2.2.4 Roof insulation around roof drains: 38 mm thick inorganic glass fibre with glass scrim reinforced kraft facing; Johns Manville Canada Inc. "Base Cap Roof Insulation", or use specified polyisocyanurate insulation in 25.4 mm thickness with 13 mm thick fibreboard cover or "Gemini Series: Pre-cut Crickets" by Altas Roofing Corporation.

Modified Bituminous Membrane Roofing

- 2.2.5 Overlay board: 1220 mm x 2440 mm x 12.5 mm thick, Asphalt Core Board.
- 2.2.5.1 Asphalt Core Board rigid panel composed of an asphaltic core sandwiched between two layers of non-woven glass fibre reinforcement.
- 2.2.6 Tapered boards:
Provide factory-tapered insulation boards fabricated to slope of not less than 1:48 (1/4 inch per 12 inches) unless otherwise indicated. Refer to Drawings for specific slopes. Tapered insulation to be of identical composition as roof insulation board.
- 2.2.7 Bitumen: Asphalt conforming to CSA A123.4, and of the following types:
- 2.2.7.1 Type 2 for mopping grade modified bitumen roofing.
- 2.2.7.2 Type 3 for installation of tapered insulation, board overlay, and mopping grade modified bitumen flashings.
- 2.2.8 Roofing and flashing membrane: 2-ply modified bitumen reinforced membrane system, composed of torch grade base ply and torch grade cap sheet with grey colour granule surface:
- 2.2.8.1 Henry "modifiedPLUS NP180 p/p " and "modifiedPLUS NP250 gT4 FR"
- 2.2.8.2 IKO "IKO Torchflex TP-180-FF-Base" and " PreVENt Premium TP-250-Cap "
- 2.2.8.3 Soprema "Sopralene Flam 180 " and "Sopralene Flam 250 FR GR"
- 2.2.9 Roof expansion joint system in new roofs: Consisting of the following:
- 2.2.9.1 Flexible flashing and air/vapour barrier: Lexsuco "FR20"
- 2.2.9.2 Foam insulation: Dow "Ethafom"
- 2.2.9.3 Flexible flashing overcover: Lexsuco "FR40"
- 2.2.10 Roofing nails: Conforming to CSA B111, Table 12, galvanized steel or aluminum, of sufficient length to penetrate wood blocking minimum 19 mm, and with minimum 10 mm diameter head.
- 2.2.11 Precast concrete walkways: minimum 45 MPa air entrained, 600 mm x 600 mm x 38 mm complete with pedestals, standard grey, set on a 25 mm Dow "Styrofoam SM" insulation cushion fully adhered the size of the pad.
- 2.3 ROOF DRAINS**
- 2.3.1 General: Epoxy finished cast iron body, removable bayonet locking mushroom type metal dome strainer, non-puncturing waterproofing membrane flashing clamp with integral gravel stop.
- 2.4 SHEET METAL FLASHING**
- 2.4.1 As specified in Section 07 60 00.
- 2.5 ROOF ACCESSORIES**
- 2.5.1 Miscellaneous supports: Aluminum sheathed preinsulated miscellaneous support units complete with internal steel pipe support and base plate with adjustable cap; Thaler Roofing Specialties Products Inc. "ARS-550".
- 2.5.2 Lighting supports: Aluminum sheathed preinsulated lighting support units complete with internal steel pipe support and base plate, anchor stud cap to accommodate conduit and pipe support, stopper bolts, and fix position holders: Thaler Roofing Specialties Products Inc. "MERS-730".
- 2.5.3 Guy wire jackets: Aluminum sheathed pre-insulated jackets with storm collar flashing as per Drawing, of size, quantity and in locations as shown or required.
- 2.5.4 Roof hatch: Bilco "Type S-20" c/w lock, separate padlock clasp, insulated curb and cover painted.", 750 mm x 900 mm in size and as follows:

Modified Bituminous Membrane Roofing

- 2.5.4.1 1.9 mm (14 ga) thick galvanized steel cover with 25.4 mm thick fibrous glass insulation covered by 0.76 mm thick (22 ga) galvanized steel liner.
- 2.5.4.2 Prefabricated curb of minimum 1.9 mm thick (14 ga) galvanized steel, 300 mm high. Equip curb with metal cap flashing to match curb and insulate with 25.4 mm thick rigid fibre board.
- 2.5.4.3 Zinc plated and chromate sealed hardware.
- 2.5.5 Hatch Safety guard: of 38 mm O.D. dia. welded pipe grab rails on two corners of hatch for ease of entry to, or exit from, the building, in compliance with Ministry of Labour requirements. Reinforce curb as required with four 6 mm thick through bolted hot-dip galvanized corner steel straps. Secure grab rails to same through flat bar brackets welded to bottom of rails.
- 2.5.5.1 Bilco "Bil-Guard RL2-S Hatch Railing System"
- 2.5.5.2 Consultant approved alternative

3 Execution

3.1 EXAMINATION

- 3.1.1 Ensure that lumber nailer plates and all other wood blocking are installed and secure, and that other similar elements on roof are properly placed and secure. If any defective Work is covered and roofing must be removed to correct such defects, execute corrections at no additional cost to Owner.
- 3.1.2 Ensure that deck flutes are clear of water, ice or snow.

3.2 GENERAL ROOFING REQUIREMENTS

- 3.2.1 Use full size insulation and overlay boards wherever possible, and minimum half boards at abutting vertical surfaces. Exceptions are on vertical or cant surfaces, and other such locations.
- 3.2.2 Place insulation and overlay boards in tight contact at joints between boards and abutting surfaces. When cutting boards cut completely through the board thickness; do not break or tear board to fit a detail. Any areas of insulation system having voids will be rejected.
- 3.2.3 Do not lay more insulation and overlay boards than can be completely covered as a finished roofing system on the same day.

3.3 VAPOUR RETARDER

- 3.3.1 Install vapour retarder in conjunction with insulation placement. Overlap side lap 100 mm on top of ribs, and end laps 150 mm, and seal with full bed of adhesive. Use adhesive to seal laps only. Install vapour retarder parallel to deck flutes.
- 3.3.2 Provide removable galvanized sheet metal supports at vapour retarder end joints to enable proper lapping and sealing of joints. Place perpendicular to deck flutes. Lap and seal vapour retarder end joints only at sheet metal supports. Remove metal supports after sealing laps.
- 3.3.3 Apply vapour retarder to deck areas taking care not to puncture or damage vapour retarder and extend vertically, in a full bed of adhesive to top of abutting vertical projections including curbs, parapets, etc. Seal ends to substrates with adhesive to provide continuity of building air/vapour retarder envelope.

3.4 ROOF INSULATION

- 3.4.1 Install insulation in straight parallel rows. Stagger side joints in adjacent rows 50% in the long dimension.

Modified Bituminous Membrane Roofing

- 3.4.2 Install insulation with the long dimension perpendicular to metal roof deck rib direction. Cut boards as required to achieve minimum 38 mm bearing of edges on metal deck ribs.
- 3.4.3 Secure insulation to metal roof deck using screw and plate type fasteners as specified. Space fasteners in accordance with FM 1.28 standard for 1-60 wind uplift conditions.
- 3.4.4 Generally, do not locate fasteners less than 150 mm from edge of insulation boards. Fasteners are only effective when they are driven through and engage the top flange of the steel deck. Snap chalk line on insulation over flange centres as required to ensure proper placement or fabricate a template to ensure proper placement of fasteners.
- 3.4.5 Drive fasteners so that plate bears on the insulation without damage to, puncturing or deformation to board or board surface, and so that fastener threaded shank locks securely into deck ribs. Fasten partial pieces of board per FM requirements but in no case shall each cut board piece have less than two fasteners.
- 3.5 INSULATION AROUND ROOF DRAINS**
- 3.5.1 Do not, in any case, use bare polyisocyanurate insulation at depressed area around roof drains. Place fibreboard covering, core cut to fit around drain. Install same as for main insulation.
- 3.6 OVERLAY BOARD**
- 3.6.1 Place overlay board to insulation in a full bedding of Type 3 asphalt bitumen, or install overlay board with a full bed of adhesive as recommended by board and insulation manufacturer. Apply and control bitumen within EVT temperature range specified.
- 3.6.2 Terminate board overlay 1000 mm square from roof drain perimeter. Taper board 75 mm from edges down to 0 mm at edges.
- 3.6.3 Press and move board overlay in place while asphalt is within its EVT temperature range, to obtain full adhesion without trapped air pockets. Butt joints tight to adjacent boards and abutting surfaces, cut to fit as required. Ensure that corners of insulation do not curl.
- 3.6.4 Stagger all joints of overlay a minimum of 25% relative to joints of insulation below.
- 3.7 TAPERED BOARDS**
- 3.7.1 Install tapered board over board overlay to provide backslopes and crickets where indicated using Type 3 asphalt bitumen, or with a full bed of adhesive as recommended by board and insulation manufacturer. Apply and control bitumen within EVT temperature range as specified herein. Do not mechanically fasten.
- 3.7.2 Press and move tapered board in place while asphalt is within its EVT temperature range to obtain full adhesion without trapped air pockets. Butt joints tight to adjacent boards and abutting surfaces, cut to fit as required. Ensure that all edges are fully adhered with asphalt.
- 3.8 TEMPORARY CUT-OFF STRIPS**
- 3.8.1 Plan and conduct Work so that each area of roof system begun one day is completed the same day, including base flashing, and roof penetration flashings.
- 3.8.2 Where entire roof area cannot be completed in a day's operations, install temporary roof cut-off strips.
- 3.8.3 Provide temporary flute-filler strips in conjunction with cut-off strips, to preclude entry of water under finished roofing system. Ensure that flow of water is away from newly completed roofing areas.

Modified Bituminous Membrane Roofing

3.8.4 Remove all such temporary cut-off strips completely, including temporary flute-filler strip, prior to recommencement of roofing system construction operations.

3.9 TWO-PLY MODIFIED BITUMEN MEMBRANE ROOFING AND FLASHING

3.9.1 Base Sheet Roofing Installation

3.9.1.1 Begin application of the base sheet at the lowest edge or drain. Proceed up the slope from the lowest point. Position and unroll base sheet to achieve correct overlap and alignment. Re-roll one end a minimum of 3000 mm and adhere membrane to substrate. Complete application of remainder of sheet.

3.9.1.2 Install base sheet with cap sheet at roof drains as specified herein under "Roof Drains".

3.9.2 Base Sheet Flashing Installation

3.9.2.1 Lay base sheet flashing in vertical strips one metre wide to curb surfaces extending on to flat roof surface minimum 100mm (from toe of curb. Provide 75 mm (side laps staggered minimum 100 mm (from laps of base sheet of roof membrane.

3.9.2.2 Backtorch flashing directly to substrates, proceeding from bottom to top and therefore resulting in uniform adhesion over entire surface. Nail top leading edge to nailer at 300 mm (on centre as applicable.

3.9.3 Cap Sheet Roofing Installation

3.9.3.1 Unroll cap sheet membrane dry over base sheet for alignment. Starting from lowest point on roof from perimeter curb, back torch cap sheet to adhere to base sheet. Extend cap sheet to base of curb. Observe the presence of asphalt bead pushed out in front of membrane interface as cap sheet is laid.

3.9.3.2 Stagger cap sheet seams from base sheet seams minimum of 300 mm (. Provide 75 mm (side laps and 150 mm (end laps. Embed surface granules on end laps by heating and use of round-nosed roofing trowel, prior to installation of next sheet.

3.9.3.3 During installation take care to avoid asphalt seepage greater than 5 mm (at seams.

3.9.3.4 Install cap sheet (with base sheet) at roof drains as specified under "Roof Drains".

3.9.4 Cap Sheet Flashing Installation

3.9.4.1 Lay cap sheet flashing in strips one metre wide to curb surfaces as shown, extending on to flat roof surface minimum 150 mm (from toe of curb. Provide 75 mm (side laps staggered minimum 100 mm (from cap sheet roofing laps and from base sheet flashing laps.

3.9.4.2 Embed surface granules on laps over cap sheet roofing by heating and use of round-nosed roofing trowel. Use chalk lines to ensure straight interface line on flat of roof.

3.9.4.3 Torch weld cap sheet flashing directly to cap sheet roofing, and to base sheet flashing, proceeding from bottom to top. Torch weld to extent required to soften membrane asphalt at sheet interface, providing uniform adhesion over entire surface of baseflashing. Extend cap sheet as shown and nail top leading edge to nailers 300 mm (on centre as applicable.

3.10 EXPANSION JOINTS IN NEW ROOF

3.10.1 Lap membrane air/vapour retarder 150 mm (into roof vapour retarder and seal. Carry up on steel channel members and metal curbs and over top forming a "U" configuration. Use adhesive recommended by membrane manufacturer. Lap end joints minimum 100 mm (and fuse using hot air welding methods in accordance with the printed directions of the flashing manufacturer. Fill "U" void with preformed foam insulation.

3.10.2 Install 2 ply base flashing to specified requirements. Carry up and over wood blocking. Terminate at edge of wood blocking and nail on at 200 mm (o.c.

3.10.3 Over base flashing, install flexible flashing membrane. Adhere to substrate and lap joints as specified for air/vapour retarder above.

Modified Bituminous Membrane Roofing

3.10.4 Connect wall expansion joint system to roofing expansion joint system.

3.11 ROOF ACCESSORIES

3.11.1 Install prefabricated roof accessory units in accordance with manufacturer's details and directions.

3.11.2 Set prefabricated miscellaneous roof accessory units, in a full bed of roofing cement and cover with 2 plies of roofing membrane. Install removable cap in a full bed of sealant.

3.11.3 Coordinate installation of skylights. Prior to flashing installation, check installed units and ensure correct seating to roof deck and that skylight curb is ready to receive membrane flashing.

3.12 ROOF DRAINS

3.12.1 Ensure that drain outlet pipes fit centred in rainwater leaders below.

3.12.2 Temporarily remove clamping ring and dome assembly to allow placing of roof insulation and membrane roofing.

3.12.3 Place insulation flush to roof drain. Neatly trim top corner of insulation and let partly under the lip of the roof drain body clamping surface.

3.12.4 Secure roof drain flange with underdeck clamp.

3.12.5 Extend flood coat of asphalt and slag/gravel to base of metal dome strainer.

3.13 ROOF WALKWAYS

3.13.1 Backtorch a layer of modified bitumen cap sheet over area to receive pavers. Extend out 150 mm from paver edges.

3.13.2 Cut polystyrene underlayment allowing a 25 mm setback around paver perimeter. Place over previously laid of modified bitumen cap sheet.

3.13.3 Gently place pavers on polystyrene, accurately align, with top surface flush from paver to paver.

3.14 CLEANING

3.14.1 Remove stains and/or droppings of asphalt, caulking or other adhesive from the Work of other trades and adjacent site surfaces.

END OF SECTION

Total Roofing System Limited Warranty

07 52 00.01 – Total Roofing System Limited Warranty

The Modified Bituminous Membrane System consists of roofing Products supplied by the Roofing Supplier and an approved method of installing those Products. The Roofing Supplier hereby warrants that Roofing Supplier's supplied Products used in the Roofing System, as applied to the building specified below, will be free from defects in materials or workmanship and that the installation of those Products will be free from defects in workmanship. In the event that said Roofing System fails due to defects in materials or workmanship within a period of 10 years from the date installation is completed, the Roofing Supplier will, at its option, make repair or replacement of said Roofing System including the cost of the component roofing Products and the installation thereof.

This warranty does not cover structural damage to the roof physically inflicted by accidents, man-made causes, acts of God, acts of nature and the like or damage arising through misuse, abuse or use of said Roofing System in any way other than that specifically recommended by the roofing manufacturer.

This express warranty is in lieu of all other warranties expressed or implied, whether by law or otherwise, and the Roofing Supplier's liability shall not extend beyond the Warranty Period. The Owner's sole and exclusive right and remedy and the Roofing Supplier's sole obligation for any failure of the Roofing System shall be as provided under this warranty. The Roofing Supplier shall not be liable for consequential damages of any nature arising from failure of the Roofing System. In no event shall the Roofing Supplier's liability under this warranty or otherwise exceed the original cost to the Owner of the Roofing System including the cost of the component Roofing Products and the installation thereof.

This warranty will extend to the Owner identified below for the building specified upon the Owner's acceptance of its terms. It shall not be assignable but shall re-issue to subsequent owners during the Warranty Period for the balance of the Warranty Period upon their acceptance of its terms by written signature on a duplicate form and its submittal to the Roofing Supplier.

Claims under this warranty should be directed to the Roofing Supplier.

Building Owner

Address of Building

Area of Building

Date Installation Complete

Agreed

Date Final Inspection and Approved

The Roofing Supplier

Modified Bituminous Membrane Roofing

By _____

Building Owner

By _____

Serial Number

END OF SECTION

Flashing and Sheet Metal

07 60 00 – Flashing and Sheet Metal

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.2.2.2 ASTM C920 - Standard Specification for Elastomeric Joint Sealants

1.2.3 Canadian General Standards Board (CAN/CGSB):

1.2.3.1 CAN/CGSB-1.108 - Bituminous Solvent Type Paint

1.2.4 Canadian Standards Association (CSA International):

1.2.4.1 CSA B111-74 - Wire Nails, Spikes and Staples

1.2.5 Factory Mutual Engineering Corporation (FM):

1.2.5.1 FM 1-49 - Perimeter Flashing

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

1.3.1 Protect the Work of this section from damage. Replace damaged Work which cannot be satisfactorily repaired, restored or cleaned, at no cost to Owner.

1.4 DESIGN REQUIREMENTS

1.4.1 Design members to withstand wind loads as calculated in accordance with the building code and to cladding design wind loads indicated in wind study report, to maximum allowable deflection without permanent deformation.

1.5 WARRANTY

1.5.1 Warrant Work of this section for 1 year from damage including but not restricted to loosening and splitting of the flashing seams.

1.6 SUBMITTALS

1.6.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.6.2 Submit detailed Shop Drawings showing proposed method of shaping, forming, jointing, fastening, and application of sheet metal Work. Submit lists of materials to be used.

1.6.3 Submit a representative sample section of prepainted metal flashing illustrating "S" lock jointing, minimum 600 mm long. Submit sample well in advance of material fabrication.

Flashing and Sheet Metal

- 2 Products
- 2.1 GENERAL**
- 2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.
- 2.2 MATERIALS**
- 2.2.1 **Prepainted sheet steel exposed to view:** 0.607 mm (24 ga) minimum thickness, commercial quality type conforming to ASTM A653/A653M, with Z275 (G90) zinc coating designation, prepainted with baked-on "WeatherX" by Valspar Paint, "Perspectra Series" by Agway Metals, or "Stelcolour Series 8000" by Stelco Inc. in colour selected by Consultant.
- 2.2.2 **Sheet steel concealed from view:** 0.045 mm (26 ga) minimum thickness, commercial quality to ASTM A653/A653M, with Z275 (G90) zinc coating designation.
- 2.2.3 **Utility sheet aluminum:** Furnish plain (embossed) pattern, 1.2 mm minimum thickness.
- 2.2.4 **Flexible flashing membrane:** self-adhesive grade rubberized membrane backed by high density polyethylene, minimum 1 mm (40 mils) minimum, standard temperature grade.
 - 2.2.4.1 Blueskin Roof RF200 by Henry
 - 2.2.4.2 Ice & Water Shield by W.R. Grace Co. of Canada Ltd
 - 2.2.4.3 Lastobond Shield by Soprema
- 2.3 ACCESSORIES**
- 2.3.1 Sealant: Multi-component polyurethane, Sika "Sikaflex 2C NS/SL", Tremco "Dymeric" or "Vulkem 227", or Sonneborn "NP-2", conforming to ASTM C920, Type M, Grade NS, Class 25.
- 2.3.2 Sealer for sealant boxes: "Chemlink M1 primer and 1-Part Pourable Sealer" as distributed by Building Resource.
- 2.3.3 Starter strips: Furnish a continuous run of starter strips of Z275 galvanized sheet metal, 20 gauge thick, of height shown on Drawings, with metal flashing interlocked to the starter strip. Where shown on the Drawing or where starter strips are exposed to view, use same prepainted metal as for flashing.
- 2.3.4 Isolation coating: to CAN/CGSB-1.108, bituminous type.
- 2.3.5 Fasteners: Conforming to CSA B111 of same material as sheet metal secured, of type, length and size suitable for the particular conditions. Where exposed fasteners are permitted, use colour matched nylon heads with cupped neoprene washers.
- 2.4 SHEET METAL FABRICATION**
- 2.4.1 Brakeform prepainted sheet material to form copings shown on Drawings. End joints where adjacent length of metal flashing meet shall be made in accordance with jointing method specified hereinafter.
- 2.4.2 Brakeform miscellaneous metal flashings and accessories on roof.
- 2.4.3 Use competent tradesmen and work accurately to details indicated and as herein specified.
- 2.4.4 Hem exposed edges at least 12 mm for appearance and stiffness. Mitre and seal corners with sealant. Provide 25 mm upstand joint at corners.

Flashing and Sheet Metal

- 2.4.5 Sealant Boxes and Sealant Fill: Form sealant boxes as open topped boxes with topped edges stiffened by seaming. Make boxes not less than 50 mm larger than the object being flashed, 100 mm depth, and with minimum 100 mm flanges for stripping-in.
- 2.4.6 Downspouts and Overflow Scuppers
- 2.4.6.1 Fabricate scupper drains, gutters and downspouts in shapes and sizes indicated, with mitered and welded corners. Include steel straps formed from galvanized sheet of thickness indicated. Include hangers and other attachment devices, end plates, trim, and other accessories required for complete installation.
- 2.4.6.2 Gutters, scupper drains and downspouts: Form from galvanized steel sheet not less than 1.5 mm thick before galvanizing, and prepainted.
- 2.4.6.3 Profiles, size and profile as indicated: Gutter, 3-sided; Downspout, Rectangular, 4 sided; Scupper drains, 4-sided.
- 2.4.6.4 Additional Parts and Features:
 - 2.4.6.4.1 Rigid construction downspout hangers
 - 2.4.6.4.2 Downspout starters or fascia sump with downspout starter hole.
 - 2.4.6.4.3 Expansion joints: Loose-locked waterproof, at least one midway between outfall points.
 - 2.4.6.4.4 Transition for downspout to grade: Provide 45 degree section.

3 Execution

3.1 INSTALLATION

- 3.1.1 Install Work to details shown on Drawings.
- 3.1.2 Exposed fastenings will not be permitted on horizontal Work exposed to view from the building exterior.
- 3.1.3 Install starter strips where indicated or required to present a true, non-waving, leading edge. Anchor to back-up to provide rigid, secure installation. Secure starter strips with screws only, in accordance with FM 1-49 requirements.
- 3.1.4 End joints where adjacent lengths of metal flashing meet shall be made using an "S-lock" joint. Execute by inserting the end of one coping length in a 25 mm deep "S" lock formed in the end of adjacent length. Extend concealed portion of the "S" lock 25 mm outwards and nail to substrate prior to installation of subsequent sheets. Face nailing of joints will not be permitted.
- 3.1.5 Install sealant boxes at locations and to details indicated. Fill boxes with insulation and sealer and slope top away from object being flashed. Coordinate with ACCU manufacturer for number of conduits, wires, etc.
- 3.1.6 Prepare and touch up scratches on prepainted material with air drying formulation of the coil coating paint. Replace material at no cost to Owner, if touching up is unacceptable to the Consultant.

3.2 SEALANT

- 3.2.1 Apply sealant where required to form weathertight seal between flashing and adjoining surface and between flashing and other Work of this section. Sealant Work consists of bedding between members where possible and with neatly formed sealant bead where exposed.

END OF SECTION

Firestopping and Smoke Seals

07 84 00 – Firestopping and Smoke Seals

1 General

1.1 SUMMARY

- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.1.3 Ensure firestopping system provides fire-resistance rating (flame and temperature) not less than fire resistance rating of surrounding floor, wall or assembly, in accordance with requirements of the applicable Building Code.
- 1.1.4 Firestop system rating: Comply with F, FH, FT, or FTH ratings as required by authorities having jurisdiction.

1.2 REFERENCES

- 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
 - 1.2.2 **American Society for Testing and Materials (ASTM):**
 - 1.2.2.1 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 1.2.3 **Underwriters Laboratories - Canada (ULC):**
 - 1.2.3.1 CAN/ULC-S115 - Standard Method of Fire Tests of Firestop Systems

1.3 QUALITIFCATION

- 1.3.1 Subcontractor qualifications: Accredited firm with not less than 5 years satisfactory experience as recommended by firestopping/smoke seal manufacturer.

1.4 QUALITY ASSURANCE

- 1.4.1 Job mock-up: Provide sample application at each type of penetration at the Site, in the presence of Consultant. After approval, such mock-up to constitute standard of acceptance for remainder of Work.
- 1.4.2 Firestopping assemblies through fire rated structures are to comply with ULC or Warnock Hersey approved assemblies.
- 1.4.3 Manufacturer's Field Review
 - 1.4.3.1 Manufacturer's representative shall review the relevant parts of the work at the Place of the Project, or wherever such affected work is in progress, to ensure that work is being executed in accordance with manufacturer's written recommendations.
 - 1.4.3.2 Manufacturer's field review is to ensure that the Products specified are being used in the Work and are being applied on surfaces prepared in accordance with their recommendations and the requirements of the Contract Documents.
 - 1.4.3.3 Unless otherwise indicated, manufacturer's representative shall undertake a minimum of two field reviews, with additional reviews as deemed necessary by the manufacturer, to determine that the work of such sections is in accordance with the manufacturer's written recommendations. Cooperate and schedule field reviews with the Manufacturer's representative.
 - 1.4.3.4 Manufacturer's representative shall submit a type written report on manufacturer's letterhead within 2 Working Days after each field review. Report shall document manufacturer's representative's field observations and recommendations.

Firestopping and Smoke Seals

- 1.4.3.5 Manufacturer's field review reports shall be prepared and distributed following the procedures specified for preparation and submittal of inspection and testing reports given above.

1.5 SUBMITTALS

- 1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.5.2 Submit manufacturer's Product data for each material to be used, fire test certifications for assemblies as applicable to the Work, and Manufacturer's Field Review Reports for work of this Section.
- 1.5.3 Submit details of each type of penetration and materials to be incorporated as smoke stop and/or firestopping assembly.

1.6 SYSTEM DESCRIPTION

- 1.6.1 Provide firestop and smoke seal systems consisting of a material, or combination of materials installed to retain the integrity of fire-rated construction by effectively impeding the spread of flame, smoke, and/or hot gasses through penetrations, blank openings or gaps, membrane penetrations, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers.
- 1.6.2 Provide smoke sealants applied over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.
- 1.6.3 Fire-resistance rating to be equivalent in ratings of the adjacent floor, wall or other fire separation assembly.
- 1.6.4 Provide firestopping, at fire rated assemblies with assembly STC rating requirements, with STC rating equal or better to STC rating of fire rated assembly.
- 1.6.5 Provide firestopping and smoke sealant system assemblies as practical and as required to coordinate with the schedule and sequencing of the Work.
- 1.6.6 Confirm locations of exposed/non-exposed firestopping/smoke seal surfaces with Consultant prior to application.
- 1.6.7 Provide movement capability at movement joints in accordance with design requirements for movement joint.

1.7 DELIVERY, STORAGE AND HANDLING

- 1.7.1 Deliver materials in original unopened containers or unopened packages, with manufacturer's labels attached, installation instructions, and lot numbers intact and legible.
- 1.7.2 Store materials under cover and protect from weather and damage in accordance with manufacturer's requirements, including temperature restrictions.

1.8 JOBSITE CONDITIONS

- 1.8.1 Unmixed liquid components of foam are to rest in their original, unopened containers at a temperature between 18°C and 27°C (65°F and 80°F) for 12 hours before use.
- 1.8.2 Sealant may be applied at temperatures ranging from -38°C to +71°C (-35°F to +160°F).
- 1.8.3 Do not apply materials when temperature of substrate or ambient air exceeds manufacturer's stated limits.

Firestopping and Smoke Seals

- 2 Products
- 2.1 GENERAL**
- 2.1.1 Firestopping and smoke seal systems shall conform to the following:
- 2.1.1.1 VOC content not to exceed 250 grams per litre minus water
- 2.1.1.2 Asbestos-free systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with CAN/ULC-S115, and suitable to actual Project application and installation conditions.
- 2.1.1.3 For services that penetrate a fire separation or a membrane forming part of an assembly required to have a fire-resistance rating, provide firestop system with "F" rating as required by building code.
- 2.1.1.4 For combustible pipe penetrations through a fire separation required to have a fire-resistance rating, provide firestop system with "F" rating as required by building code.
- 2.1.1.5 For services that penetrate a fire wall or a horizontal fire separation that is required to have a fire-resistance rating, provide firestop system with "FT" rating as required by building code.
- 2.1.1.6 Products to be compatible with abutting dissimilar membranes, architectural coatings, finishes at floors, walls and ceilings. Check with requirements of Contract Documents and manufacturer of selected materials being installed.
- 2.1.2 Smoke sealants for overhead and vertical joints shall be non-sagging; sealants for floors shall be self-levelling.
- 2.1.3 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems).
- 2.2 MATERIALS**
- 2.2.1 Acceptable manufacturers of rated systems:
- 2.2.1.1 3M
- 2.2.1.2 A/D Fire Protection Systems
- 2.2.1.3 Hilti
- 2.2.1.4 Tremco
- 2.2.1.5 GE Canada
- 2.2.1.6 Dow Corning
- 2.2.1.7 Or Consultant approved alternate.
- 2.2.2 Firestop fibre: Mineral fibre (complete with galvanized steel insulation clips and) bearing ULC or Warnock Hersey label, in width 25% - 33% larger than the space to be filled. Use one of the following:
- 2.2.2.1 Firebarrier Firestopping" by A/D Fire Protection Systems
- 2.2.2.2 "Roxul Safe" by Rockwool
- 2.2.2.3 "Fire-Bloc 1" by M.W. McGill and Associates Limited
- 2.2.3 Damming materials, supports and anchorages: To firestopping/smoke and seal manufacturer's recommendations, as required by assembly.
- 2.2.4 Sheet metal closures: Galvanized sheet metal closures and fasteners appropriate to adjacent structures to be secured to. Sheet metal to be in accordance with ASTM A653/A653M with ZF75 zinc coating designation.
- 3 Execution
- 3.1 PREPARATION**
- 3.1.1 Remove combustible materials and loose impediment from penetration opening and involved surfaces.

Firestopping and Smoke Seals

3.1.2 Remove oil and other free liquids from penetration opening. Clean metal substrates with non-alcohol solvent

3.2 INSTALLATION

3.2.1 Install firestopping and smoke seal systems in accordance with manufacturer's instructions and fire rated assembly requirements to establish continuity and integrity of fire separations.

3.2.2 Install primers as recommended by firestop Product manufacturers.

3.2.3 Install temporary forming, damming and back-up as required. Remove after firestopping and smoke seal materials have achieve initial cure and able to resist displacement.

3.2.4 Use resilient, elastomeric firestopping systems in the following locations:

3.2.4.1 Openings and sleeves for future use.

3.2.4.2 Penetration systems subject to vibration or thermal movement.

3.2.4.3 Penetration systems in acoustical containment enclosures

3.2.5 Trowel and tool exposed firestop Product surfaces to uniform, smooth finish.

3.2.6 Repair damaged firestopped surfaces to acceptance of Consultant.

3.3 FIBRE FIRESTOPPING INSTALLATION

3.3.1 Install fibre firestopping with minimum 25% to 33% compression in accordance with Product manufacturer's recommendations.

3.3.2 Butt succeeding sections of firestopping tightly against preceding piece. Do not leave any void.

3.4 FOAM INSTALLATION

3.4.1 Follow manufacturer's installation instructions for damming penetration.

3.4.2 Seal gaps or cracks left after damming materials are in place.

3.4.3 Immediately after mixing, dispense liquid foam into penetration opening in accordance with manufacturer's installation instructions.

3.4.4 Do not overfill penetration openings with liquid foam. Foam expands approximately three times its original volume during cure. Comply with the following:

3.4.4.1 When dispensing liquid foam continuously, be sure the thickness of liquid foam does not exceed 25 mm at any given spot.

3.4.4.2 If opening is not filled when cured foam has completed its expansion, repeat injection and cure procedure until opening is filled to desired level.

3.4.5 Leave temporary damming in place for 24 hours to allow foam to fully cure.

3.5 SEALANT INSTALLATION

3.5.1 Apply sealant from cartridge or with trowel or putty knife from pail as applicable to detail or condition. Ensure sealant contacts with substrates of opening.

3.6 FIELD QUALITY CONTROL

3.6.1 Perform manufacturer's in-line quality control check at least once daily, and upon changing to new lot of material, to ensure performance of both dispensing equipment and foam Product prior to installing penetration seals.

3.6.2 Inspect cured penetration seal after 24-hour cure by removing temporary damming materials to examine seal.

Firestopping and Smoke Seals

3.6.3 Cured foam should completely fill penetration. Fill remaining gaps with freshly mixed foam or fire stop sealant. Reinspect after added material has cured 24 hours.

3.6.4 Damming materials required to achieve a specific fire rating must remain in penetration. Sheet metal closures which are shown on Drawings are to be reinstalled after inspections.

3.6.5 Coordinate and allow for Manufacturer's representative field review.

3.7 IDENTIFICATION

3.7.1 Identify each firestop penetration assembly with permanent label listing following:

3.7.1.1 Assembly and rating in hours

3.7.1.2 Date of installation

3.7.1.3 Installing company's name and telephone number

3.8 ADJUSTMENT AND CLEANING

3.8.1 Clean up foam or sealant spills following manufacturer's instructions on container label.

3.8.2 Trim excess cured foam with a sharp knife or blade if required for finished appearances.

3.8.3 Remove equipment, materials and debris, leaving area in undamaged, clean condition.

END OF SECTION

Joint Sealants

- 1 General
- 1.1 SUMMARY**
- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.1.3 **Type "A" conditions:** All exposed joints on the exterior and interior of wall envelope and all joints throughout that are subject to movement. The principal locations are as follows:
- 1.1.3.1 Perimeter of exterior hollow metal frames and steel channel frames at junctions with adjacent construction.
- 1.1.3.2 Control joints in exterior masonry and concrete walls.
- 1.1.3.3 Joint between truck dock shelter or door seals and adjacent construction.
- 1.1.3.4 Other locations indicated on the Drawings
- 1.1.4 **Type "B" conditions:** All joints on the building interior that are not subject to movement and that require filling for appearance or sanitary reasons. The principal locations are as follows:
- 1.1.4.1 Masonry control joints.
- 1.1.4.2 Joints between metal frames of all kinds and adjacent construction, in interior partitions.
- 1.1.4.3 Masonry wall inside corners in exposed locations; masonry-to-column junctures where masonry is anchored to steel.
- 1.1.4.4 Other locations indicated on the Drawings
- 1.1.5 **Type "C" conditions:** Exposed areas on the building interior which require a mildew resistant sealant. The principal locations are as follows:
- 1.1.5.1 Joints around washroom accessories, water closets, urinals, lavatories, vanities and shelves.
- 1.1.5.2 Joints around counters at walls.
- 1.1.5.3 Joints around shower accessories.
- 1.1.5.4 Other locations indicated on the Drawings.
- 1.2 REFERENCES**
- 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
- 1.2.2 **American Society for Testing and Materials (ASTM):**
- 1.2.2.1 ASTM C920 - Standard Specification for Elastomeric Joint Sealants
- 1.3 SUBMITTALS**
- 1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.3.2 Submit as Shop Drawings, printed literature of each sealant Product specified describing composition, together with recommendations or directions for surface preparation, material preparation and material installation.
- 1.3.3 Product data submitted to show validation by the Sealant Weatherproofing Restoration Institute (SWRI) for exterior sealants.
- 1.3.4 In addition, submit colour charts for each sealant material for colour selection.

Joint Sealants

1.4 QUALITY ASSURANCE

- 1.4.1 Installer qualifications: The Work of this section shall be carried out by an installer having specialized in this Work as its primary business for at least 5 years, and having performed satisfactorily Work of this type, size and scope. Employ craftsmen who are thoroughly skilled and completely familiar with the specified requirements. Provide the services of a competent foreman or supervisor who shall be available at all times during the progress of the Work of this section.
- 1.4.2 Single source: Provide sealants of each joint type from one manufacturer.

1.5 DELIVERY, HANDLING AND STORAGE

- 1.5.1 Deliver materials in manufacturers' original unopened containers with manufacturers' labels and seals intact. Labels to identify manufacturer's name, brand name, date of manufacture, grade and type, application directions, and expiry date or shelf life.
- 1.5.2 Handle and store materials in accordance with manufacturers' printed directions. Arrange for suitable storage areas. Store flammable materials in safe, approved containers to eliminate fire hazards.

1.6 JOBSITE CONDITIONS

- 1.6.1 Protect adjacent Work from damage resulting from Work of this section. Replace damaged Work at no increase in Contract Price.
- 1.6.2 Do not install sealants when ambient air temperature is less than 4°C (40°F) (-28°C (-20°F) for silicones) or when recesses are wet or damp; Provide temporary heated enclosures to comply with this requirement.
- 1.6.3 Protect adjacent exposed finished surfaces from damage, by masking or other approved means, prior to performing Work. Remove protection when no longer required and clean adjacent, exposed surfaces of any sealant deposited upon such surfaces.

1.7 WARRANTY

- 1.7.1 Warrant the Work for 3 years. Repair leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion or staining adjacent surfaces, occurring during the Warranty Period.

2 Products

2.1 SEALANT

2.1.1 General:

- 2.1.1.1 Low VOC: Use sealants with low volatile organic content to comply with SCAQMD Rule 1168.
- 2.1.1.2 Validation: Sealants are to have the validation of Sealants and Weatherproofing Restoration Institute (SWRI).
- 2.1.1.3 Provide joint sealants that are compatible with backing material, accessories, substrates and adjacent sealants for the intended uses based on the testing, recommendations, experience and written instructions of the sealant manufacturer..

- 2.1.2 Colours for exposed joint sealants caulking: Provide joint sealant colours as selected by the Consultant from the manufacturer's full range of colours.

- 2.1.3 **Sealant - type "A" conditions:** One-component polyurethane or one-component silicone sealant to ASTM C920, Type S, Grade NS, Class 25, Use NT, M and A in standard colours as selected by the Consultant.

2.1.3.1 Dow Corning Corp. "CWS or CCS"

2.1.3.2 Tremco "Dymonic"

Joint Sealants

- 2.1.3.3 Euclid Chemical, "Eucolastic 1 NS or SL"
- 2.1.3.4 Or Consultant approved equivalent.
- 2.1.4 **Sealant - type "B" conditions:** Non-sag, one part, acrylic polymer caulk, in standard colours as selected by the Consultant.
- 2.1.4.1 Tremco "Mono 555"
- 2.1.4.2 DAP Inc. "Acrylic Polymeric Sealant"
- 2.1.4.3 Or Consultant approved equivalent.
- 2.1.5 **Sealant - type "C" conditions:** Mildew resistant silicone sealant to ASTM C920, Type S, Grade NS, Class 25, and meeting the requirements of FDA Regulation 21 CFR 177.2600, in standard colours as selected by the Consultant.
- 2.1.5.1 Dow Corning "786 Mildew Resistant Silicone Sealant" or "Tub Tile and Ceramic"
- 2.1.5.2 GE Silicones "Sanitary 1700"
- 2.1.5.3 Sonneborn "Sonolastic Omniplus"
- 2.1.5.4 Bondaflex "SIL 100 WF"
- 2.1.5.5 Or Consultant approved equivalent.
- 2.1.6 **Sealant type "D":** Low dirt-pick-up, non-staining silicone sealant to ASTM C920, Type S, Grade Ns, Class 50, Use T, NT and M in standard colours as selected by the Consultant.
- 2.1.6.1 Dow Corning "756 SMS Silicone Building Sealant"
- 2.1.6.2 Bondaflex "SIL 295"
- 2.1.6.3 Or Consultant approved equivalent.
- 2.2 ACCESSORIES**
- 2.2.1 Primers: As recommended by sealant manufacturers for various substrates, to allow proper adhesion and to prevent staining of adjacent surfaces.
- 2.2.2 Joint backing: Round, solid section, skinned surfaced, soft polyethylene foam gasket stock, to be under compression and to suit joint width and anticipated movement. Skin shall be of proper consistency to prevent bonding to sealant.
- 2.2.3 Bond breaker: Recommended by sealant manufacturers to prevent bonding of sealant to backing surface of recess.
- 2.2.4 Cleaning agents: As recommended by sealant manufacturer.
- 3 Execution
- 3.1 PREPARATION**
- 3.1.1 Prepare joints to receive sealant and verify suitability. Failure of sealant in the future, due to claimed unsuitability of joint, will not be valid. Installation of sealant is considered as evidence that joint is suitable to receive sealant.
- 3.1.2 Clean recesses to receive sealant, free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance. Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents.
- 3.1.3 Apply masking tape to metal surfaces adjacent to recesses to prevent smearing or staining of such metal surfaces.
- 3.1.4 Depth of recess to receive sealants are not to exceed 1/2 the joint width up to a maximum of 12 mm and not less than 6 mm at centre of joint.
- 3.1.4.1 Where depth of recess is in excess of specified depth, place back-up material in recess, forced into place under compression, to provide specified recess depth.
- 3.1.4.2 Where recess is less than specified depth, cut the back surface of recess to specified recess depth.

Joint Sealants

- 3.1.5 Recess to be dry when sealants are installed. Where recess for sealants is at proper depth, apply bond-preventative material to back surface of recess. Prime sides in accordance with sealant manufacturer's recommendations, to develop proper mechanical adhesion to negate latent moisture.

3.2 INSTALLATION

- 3.2.1 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.
- 3.2.2 Fill joints completely, regardless of variation of joint widths, and to proper depth as specified. Install sealants under pressure, without smearing adjacent surfaces.
- 3.2.2.1 Type "A" sealant must have full and uniform contact with, and adhesion to, side surfaces of recess.
- 3.2.2.2 Type "B" and Type "C" sealants must have full and uniform contact with, and adhesion to, all surfaces of recess.
- 3.2.3 Finish face of sealant smooth and even. At recesses in angular surfaces, finish sealant with a flat face, flush with face of material at each side. At recesses in flush surfaces, finish sealant with a concave face, flush with face of material at each side.
- 3.2.4 Sealant may be tooled, provided that such tooling does not damage seal nor tear sealant. Surface of sealants to be free from dirt, stain or other defacements and be uniform in colour.

3.3 ADJUSTING AND CLEANING

- 3.3.1 Remove any sealants not complying with requirements specified herein. Re-prepare recesses and install new sealants to provide finish Work complying with requirements specified, at no increase in Contract Price.
- 3.3.2 Clean surfaces adjacent to filled joints and remove sealant smears. At metal surfaces, remove masking tape and other residue. Exercise care in cleaning and removal operations, so as not to mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials, at no increase in Contract Price.

END OF SECTION

Hollow Metal Doors and Frames

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **American Society for Testing and Materials (ASTM):**

1.2.2.1 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

1.2.3 **Canadian General Standards Board (CGSB):**

1.2.3.1 CGSB 41-GP - Rigid Vinyl Extrusions for Windows and Doors

1.2.4 **Canadian Standards Association (CSA):**

1.2.4.1 CSA C22.2 - Modular wiring systems for office furniture

1.2.4.2 CSA W47.1 - Certification of Companies for Fusion Welding of Steel

1.2.4.3 CSA W59-M - Welded Steel Construction (Metal Arc Welding)

1.2.5 **National Fire Protection Association (NFPA):**

1.2.5.1 NFPA 80 - Standard for Fire Doors, Fire Windows and Smoke Control Assemblies

1.2.6 **Underwriters Laboratories of Canada (CAN/ULC):**

1.2.6.1 CAN/ULC-S104-M - Standard Method for Fire Tests of Door Assemblies

1.2.6.2 CAN/ULC-S105-M - Standard Specification for Fire Door Frames Meeting

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 Submit as Shop Drawings, Clearly show in detail, gauges of metal Work, assemblies, large screen frame sections and assembly details, fastenings, hardware cutouts and reinforcing, anchorage and finish. Indicate doors and frames which are fire rated.

1.3.3 Submit manufacturer's Product data brochure as part of Shop Drawing submittal.

1.4 COORDINATION

1.4.1 Coordinate with finish hardware Supplier to ensure proper preparation of hollow metal doors and frames for finish hardware.

1.4.2 Coordinate with electrical division for doors requiring conduits.

1.5 PERFORMANCE REQUIREMENTS

1.5.1 Exterior insulated metal doors shall be tested to meet an operable U-value of minimum 0.400.

Hollow Metal Doors and Frames

1.6 FIRE RATING REQUIREMENTS

- 1.6.1 Fire rated labelled doors and frames: tested to ULC CAN/ULC-S104-M and listed by a nationally recognized agency having a factory inspection service and shall be constructed as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- 1.6.2 Install fire labelled steel door and frame products in accordance with NFPA 80, except where indicated otherwise

1.7 DELIVERY, HANDLING AND STORAGE

- 1.7.1 Protect Work against rust and damage during manufacture and delivery. Handle carefully to prevent distortion and wracking.
- 1.7.2 Protect hollow metal Work from damage. Replace damaged Work which cannot be satisfactorily repaired, restored or cleaned. Store materials on site in a manner to prevent damage.

2 Products

2.1 DESCRIPTION AND SOURCE

- 2.1.1 Doors are of the insulated/sound deadened, steel-stiffened type using the spot welding or adhesive method to attach face sheets to the rib stiffeners.
- 2.1.2 Frames are of the welded type. Knockdown frames are not permitted.
- 2.1.3 Source doors and frames from one of the following:
 - 2.1.3.1 Baron Steel Doors & Frames
 - 2.1.3.2 Fleming Door Products Limited
 - 2.1.3.3 Artek Door
 - 2.1.3.4 Daybar Industries Limited
 - 2.1.3.5 Gensteel Doors
 - 2.1.3.6 Or Consultant approved alternative

2.2 MATERIALS

- 2.2.1 **Sheet steel:** Commercial grade sheet steel conforming to ASTM A653/A653M, with ZF75 zinc-iron alloy coating designation. Sheet steel thicknesses specified are base metal thicknesses prior to galvanizing.
- 2.2.2 **Hollow Metal Doors (and Transom Panels)**
 - 2.2.2.1 Facings, rails, stiles: 1.5 mm thick (16 ga) steel.
 - 2.2.2.2 Interior stiffeners: 0.91 mm thick (20 ga) steel.
 - 2.2.2.3 Sound deadening and insulating material, to fill core space:
 - 2.2.2.3.1 Structural cell kraft paper honeycomb, 25 mm cells, density 16.5 kg/m³ minimum density
 - 2.2.2.4 Top caps: Rigid PVC extrusions conforming to CGSB 41-GP-19Ma
 - 2.2.2.5 Glazing stops: 1.5 mm thick (16 ga) steel, formed, drilled and countersunk for fastenings.
- 2.2.3 **Hollow Metal Door Frames**
 - 2.2.3.1 Steel: 1.5 mm thick (16 ga) steel.
 - 2.2.3.2 Hardware reinforcement: 3.4 mm thick (10 ga) steel.
 - 2.2.3.3 Channel door spreaders: 1.2 mm thick (18 ga) steel.
- 2.2.4 **Glazed Screen and Borrowed Light Frames and Mullions**
 - 2.2.4.1 Steel: 1.5 mm thick (16 ga) steel
 - 2.2.4.2 Glazing stops: 1.5 mm thick (16 ga), formed, drilled and countersunk for fasteners
- 2.2.5 **Frame Anchors**
 - 2.2.5.1 Frames in masonry: Adjustable "T-strap" anchors and base anchor.

Hollow Metal Doors and Frames

- 2.2.5.2 Frames in precast (concrete): Countersunk galvanized expansion bolts complete with base anchors, and spacers behind hollow metal frame.
- 2.2.5.3 Frames in steel channel sub-frames: Countersunk fluorocarbon coated self drilling screws complete with spacers behind hollow metal frame.
- 2.2.5.4 Labeled frames: To conform to ULC or Warnock Hersey requirements.
- 2.2.5.5 Frames in gypsum board partitions: Steel anchor clips and adjustable base anchors of suitable design securely welded inside each jamb.
- 2.2.5.6 **Floor anchors:** Minimum 3.5 mm thick adjustable hot dipped galvanized base anchors with two holes for bolting to floor.
- 2.2.6 **Rubber bumpers:** Glynn-Johnson GJ64.
- 2.2.7 **Conduit in hollow metal frames:** To CSA C22.2 No. 83-M. EMT galvanized cold rolled steel tubing.
- 2.3 FABRICATION**
- 2.3.1 Arc weld joints in accordance with CSA W59-M to produce a finished unit, square, true and free of distortion. Continuous weld joints unless specified otherwise. Execute welding by a firm fully approved by Canadian Welding Bureau to requirements of CSA W47.1.
- 2.3.2 Accurately form profiles.
- 2.3.3 Perform all cutting in door fabricator's shop.
- 2.3.4 Ream and remove burrs from cutouts and from drilled and punched holes.
- 2.3.5 Finish Work free from warp, open seams, buckles, weld and grind marks and other surface defects detrimental to attainment of a good paint finish in field.
- 2.3.6 Doors that do not require labels shall have label holes properly filled at the factory prior to shipping to Site.
- 2.3.7 Hollow Metal Doors**
- 2.3.7.1 Flush welded type, seamless, of sizes to conform to details and schedules, and reinforced to receive hardware fastenings.
- 2.3.7.2 Provide cutouts for glass and door louvres.
- 2.3.7.3 Vertically stiffen doors with galvanized metal stiffeners at 150 mm o.c. For bonded face sheets, apply continuous mastic adhesive to stiffeners into which, bond face sheets. For spot welded face sheets, apply welding at 150 mm o.c. Fill voids with fibreglass insulation. Fill and grind smooth weld marks.
- 2.3.7.4 Weld doors on the hinge side with a minimum of ten points of 13 mm welds in the following locations: Top and bottom, on either side of the hinge, and at the intermediate points between the hinges.
- 2.3.7.5 Weld doors on the strike side with a minimum of eight 13 mm welds in the following locations: Top and bottom, on either side of the hinge, and two welds above and below the strike, spread equally between the top and bottom welds.
- 2.3.7.6 After welding, dress and fill door joints. Clean, sand, flood coat with air drying paste filler and again sand to eliminate unevenness or irregularities.
- 2.3.7.7 Using premoulded PVC, cap top of exterior doors, and interior doors on which the tops can be seen from stair landings or other high elevations.
- 2.3.7.8 Blank, drill, reinforce and tap doors to receive hardware.
- 2.3.7.9 Accurately fit and mitre glazing stops and loosely screw in position with cadmium plated countersunk tamperproof oval head screws, spaced 150 mm o.c. maximum.
- 2.3.8 Hollow Metal Door Frames**
- 2.3.8.1 Assemble using welded construction only.

Hollow Metal Doors and Frames

- 2.3.8.2 Provide thermally broken frames for exterior doors, with polyvinylchloride thermal breaks separating exterior and interior portions of frame.
- 2.3.8.3 Weld vertical centre mullion where indicated at double door openings.
- 2.3.8.4 Cut frame mitres accurately and weld continuously on inside of frame profile.
- 2.3.8.5 Grind welded frame corners to smooth finish, fill with metallic paste filler, sand smooth, and prime paint.
- 2.3.8.6 Make cutouts to suit hardware. Blank, drill, tap and reinforce frames to receive template hardware. Protect mortised butts and strike cutouts with metal mortar guard boxes welded on inside of frames. Reinforce frames for installation of hardware.
- 2.3.8.7 Weld, grind smooth and seal a continuous integral steel weather drip at head of exterior door frames.
- 2.3.8.8 Provide three door bumpers per single door frame, two per double door frame without centre mullion, six per double door frame with centre door mullion.
- 2.3.8.9 Tack weld two channel or angle spreaders on door jambs at bottom of door opening to prevent bending of frame and to maintain alignment when setting.
- 2.3.8.10 If frame requires anchorage by mechanical fastening through exposed face of frame, determine spacing of fasteners and prepare frame for countersunk fasteners.
- 2.3.9 Hollow Metal Frames for Glazed Screens and Borrowed Lights**
- 2.3.9.1 Assemble using welded construction. Construct large screens in sections with provision for on-site assembly to suit site conditions.
- 2.3.9.2 Form perimeter frames, tubular mullions and transoms with 50 mm face members. Accurately cope and mitre sections to fit together, carefully align and weld on inside of frame.
- 2.3.9.3 Accurately cut, mitre and fit steel glazing stops. Loosely screw in position with cadmium plated countersunk tamperproof oval head screws spaced at maximum 450 mm o.c. and 50 mm from each end.
- 2.3.9.4 Prepare frames by grinding, sanding and filling same as specified for door frames.
- 2.3.10 Fire Rated Doors and Frames**
- 2.3.10.1 Fabricate doors and frames for hourly rating noted on door schedules in conformance with CAN/ULC S104-M and CAN/ULC S105-M. Furnish door and frames with the appropriate label of a testing organization accredited by Standard Council of Canada in conformance with the foregoing standards.
- 2.3.10.2 Label the entire assembly of fire rated screens containing doors.
- 2.3.10.3 Locate fire rating label on doors on hinged edge midway between top hinge and head of door. Locate fire rating label on frames in door rebate.
- 2.3.10.4 Mortise, reinforce, drill and tap doors to receive template hardware and reinforce for surface mounted hardware, all as per requirements of foregoing standards.
- 2.3.11 Temperature Rise Limit**
- 2.3.11.1 Where located in a firewall, fabricate doors to achieve the Temperature Rise Limit (TRL) indicated in the Ontario Building Code.
- 2.3.11.2 Provide such doors with a combined fire rating/temperature rise limit label. Locate as previously specified.
- 2.3.12 Insulated hollow metal transom panels:** Same as for hollow metal door construction complete with drip flashings on exterior panels.
- 2.3.13 Preparation for security system:** Hollow metal doors will be monitored to a central security system. Prepare frames and doors to accommodate concealed rotary switch hinge (C.R.S.) at the centre hinge point. Provide frame with metal mortar guard at back side of hinge and with a 19 mm diameter rigid galvanized steel conduit from top of mortar guard to 300 mm above door head.

Hollow Metal Doors and Frames

- 2.3.14 **Masonry anchors:** Fit specified anchors into frames. Furnish number of anchors on each jamb as follows:
- 2.3.14.1 Frames up to 2285 mm height: 3 "T" anchors.
- 2.3.14.2 Frames 2285 mm to 2440 mm height: 4 "T" anchors.
- 2.3.14.3 Frames over 2440 mm height: 1 "T" anchor for each 600 mm or fraction thereof of height.
- 2.3.15 **Stud wall anchors:** Fit specified anchors into frames. Furnish number of anchors for each jamb as follows:
- 2.3.15.1 Frames up to 2285 mm height: 4 anchors.
- 2.3.15.2 Frames 2285 mm to 2440 mm height: 5 anchors.
- 2.3.15.3 Frames over 2440 mm height: 5 anchors plus one additional for each 600 mm or fraction thereof over 2440 mm.

3 Execution

3.1 INSTALLATION

- 3.1.1 Building-in of hollow metal frames in masonry is specified in Section 04 20 00 - Unit Masonry.
- 3.1.2 Setting of hollow metal frames is specified in Section 06 10 00 - Rough Carpentry.
- 3.1.3 Installation of doors and finish hardware is specified in Section 08 71 05 - Installation of Doors and Finish Hardware.

END OF SECTION

Sectional Doors

- 1 General
- 1.1 SUMMARY**
- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.1.3 Be responsible for supplying and installing a door system that is complete in all respects and smoothly operating. Provide all components and accessories as specified or as required to meet this requirement.
- 1.2 RELATED SECTIONS**
- 1.2.1 Section 11 13 00: Loading Dock Equipment
- 1.2.2 Mechanical Divisions: Door heaters, and wiring from door heater to the limit switch installed on the door to operate when the door is open 305 mm¹²"
- 1.2.3 Electrical Divisions: Wiring from power source to the line side of the disconnect switch in the door control panels, ad underslab conduit and pull wire.
- 1.3 DEFINITIONS**
- 1.3.1 **Operation cycle:** One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.
- 1.3.2 **NEMA ICS:** National Electrical Manufacturers Association Industrial Control and Systems standard.
- 1.4 DESIGN CRITERIA**
- 1.4.1 Design exterior doors to withstand the following specified unfactored wind loads in the closed position, with a maximum deflection under full design load of L/240 of the span:
 - 1.4.1.1 1.54 kN/m² positive (inward, toward the interior of the building)
 - 1.4.1.2 1.68 kn/m² negative (outward, toward the exterior)
- 1.4.2 Design operators to function against loading consequential to the foregoing.
- 1.4.3 Use the same design criteria where interior doors can be subjected to wind forces due to building arrangement.
- 1.4.4 Design system to be shock-mounted to minimize noise transmission and to isolate system vibrations during operations.
- 1.5 CODES AND REGULATIONS**
- 1.5.1 For electrical equipment and installation thereof, comply with all local and provincial laws, and with all other mandatory requirements. Be responsible to ensure an installation which is in compliance with all such laws and regulations, and all changes or alterations required by the authorized inspector of the authority having jurisdiction made without charge to the Owner.
- 1.5.2 It is the door manufacturer's responsibility to ensure that specified colour coding is acceptable to local jurisdiction.
- 1.6 SUBMITTALS**
- 1.6.1 All submittals as required by this Section, are shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

Sectional Doors

- 1.6.2 **Shop Drawings**
- 1.6.2.1.1 Complete electrical schematics and wiring diagrams and sequence of door operation.
- 1.6.2.2 Prepare Shop Drawings on one standard size drawing sheet. Standard "cuts" or stock drawings will not be acceptable.
- 1.6.2.3 Confirm with a note that exterior doors meet the design requirements specified.
- 1.6.2.4 Show and describe in detail
 - 1.6.2.4.1 Detailed door assemblies
 - 1.6.2.4.2 Door elevations, sections and details, tracks, hardware and operating components, dimensions, gauges, finishes.
 - 1.6.2.4.3 Door operators, make, and horsepower rating.
 - 1.6.2.4.4 The relationship of the foregoing components to adjacent construction.
- 1.6.3 **Operation and Maintenance Data:** indicating the following
 - 1.6.3.1 "As built" straight line wiring diagrams showing electrical connections and control circuitry.
 - 1.6.3.2 Instructions explaining operation.
 - 1.6.3.3 Lubrication chart indicating lubrication points and type of lubricant recommended for equipment.
- 1.7 QUALITY ASSURANCE**
- 1.7.1 Installer: Retain door manufacturer or an installation specialist company licensed or franchised by door manufacturer.
- 1.8 HANDLING, STORAGE AND PROTECTION**
- 1.8.1 Handle components with care. Protect against damage, dirt, disfigurement and weather.
- 1.8.2 Store on site off the ground, and in a covered location.
- 1.9 WARRANTY**
- 1.9.1 Warrant Work of this section against defects and deficiencies for a period of 3 years from date Work is certified as substantially performed in accordance with the general conditions of the Contract.
- 1.9.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.
- 2 Products
- 2.1 GENERAL**
- 2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.
- 2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.
- 2.2 OVERHEAD DOORS**
- 2.2.1 Sectional, steel faced, foam-in-place insulated, having a thermal value of minimum RSI 2.818 (R16), torsion spring counterbalanced, electrically operated complete with pull chain for manual operations, and as follows:
 - 2.2.2 **Acceptable Products**
 - 2.2.2.1 Upwardor "Thermalax 2000" Series TX 450 (44 mm 1-1/8" thick), Sectional 592 series
 - 2.2.2.2 or Approved equal.

Sectional Doors

- 2.2.2.3 Vertical Lift , manual, prefinished white c/w chain pull on right side.
- 2.2.2.4 Install Xcluder Sill & Jamb seals, to be obtained from Xcluder National Vendor.
- 2.2.3 Component Minimum Requirements**
- 2.2.3.1 Facing panels: Embossed prepainted galvanized sheet steel complying with ASTM A653/A653M, core insulated with polyurethane foam, non-corrosive end caps and thermal break.
- 2.2.4 Hardware**
- 2.2.4.1 Track: 84 mm3-3/8" overall outside dimension, 3 mm1/8" thick steel with track hangers and brackets to suit, all in Z275 zinc coating.
- 2.2.4.2 Track angle: Continuous 3 mm1/8" thick steel with Z275 zinc coating.
- 2.2.4.3 Rollers: 75 mm3" diameter, ball bearing, with 12 mm1/2" diameter case hardened axles.
- 2.2.4.4 Roller bracket hinges and intermediate hinges: Heavy duty 3 mm1/8" thick steel with Z275 zinc coating.
- 2.2.4.5 Counterbalance: Job rated torsion springs helically wound from oil tempered steel wire for a minimum 100,000 cycle quality. Provide a cycle counter in the control panel.
- 2.2.4.6 Jack shaft: 25 mm1" diameter solid steel with die cast aluminum cable drums.
- 2.2.4.7 Cables: Galvanized aircraft type with minimum 4 mm diameter and safety factor of 8:1.
- 2.2.4.8 Locking device: Self locking through electric brake.
- 2.2.4.9 Hand chain: "Endless", heavy chrome plated steel.
- 2.2.4.10 Safety bottom bar: "Featheredge" by the Cookson Company, reversing safety bottom bar, electric type complete with neoprene weatherstripping combination able to withstand severe weather conditions. Use a heavy duty coil cord power cable.
- 2.2.4.11 Weatherstripping to head, jambs and meeting rails: Factory applied, of type to ensure a weathertight seal. Design weatherstripping assembly for easy replacement when weatherstrip is worn.
- 2.2.4.12 Astragal: Tubular PVC, on manually operated doors.
- 2.2.4.13 Track guards: 1500 mm59" high formed from Z275 zinc coated steel.
- 2.2.4.14 Hoisting mechanism: Power operator and controls as specified and emergency hand chain hoist with clutch release cable of design to operate doors to meet speed and cycle frequency specified herein.
- 2.2.4.15 Supplementary steel supports: New material conforming to CAN/CSA-G40.20/ G40.21-M, cleaned to SSPC-SP6 and primed with primer conforming to CISC/CPMA 2.75. Colour as selected by Consultant from manufacturer's standard range.
- 2.3 DOOR FABRICATION**
- 2.3.1 Provide framing required to support doors, tracks and operators from structure.
- 2.3.2 Fabricate section panels as follows, with:
- 2.3.2.1 Exterior and interior ribbed steel facing.
- 2.3.2.2 Space between facings solidly filled with foamed-in-place insulation, fully face bonded to steel.
- 2.3.2.3 All ends closed and sealed.
- 2.3.2.4 Top and bottom edges rebated to fit tightly together, and to provide weathering.
- 2.3.2.5 Top panel sufficiently stiffened to carry load of panels below.
- 2.3.3 There shall be no visible welds, bolts, screws.
- 2.3.4 Fabricate the Work true to dimensions and square. Accurately fit joints and intersecting members with adequate fastenings.
- 2.4 MISCELLANEOUS ACCESSORIES**
- 2.4.1 Steel supports: Conforming to Section 05 50 00 Metal Fabrications.

Sectional Doors

2.4.2 System Isolation: frame isolation mounts, pads, and grommets as recommended by Door manufacturer.

2.5 FABRICATION

2.5.1 Fabricate Work with materials and with component dimensions and gauges, reinforcing, attached anchors and fastenings of adequate strength to prevent warping, buckling, opening of joints and seams, loosening of hardware, distortion and displacement within limits of intended and specified use.

2.5.2 Conceal and weld connections wherever possible.

2.5.3 Fit joints and junctions between components tightly and in true planes.

2.5.4 Isolate from each other dissimilar metals, and metal from concrete or masonry to prevent electrolysis.

2.6 SHOP FINISHING OF DOOR SYSTEM

2.6.1 Phosphatize all galvanized metal surfaces to provide for adhesion of finish paint. Clean ferrous metal surfaces except working parts of machinery and faying surfaces and prime with a rust inhibitive primer. Clean supplementary steel supports and likewise, prime with a rust inhibitive primer.

2.6.2 Apply in the shop, specified paint system to a minimum dry film thickness of 100 microns (4 mils) in accordance with paint finisher's standards. For baked system, bake components prior to foam insulation application.

3 Execution

3.1 EXAMINATION

3.1.1 Examine existing or completed work surfaces to receive the work or work that may be affected by the work of this Section and ensure that work done as part of the work of other Sections is complete and that there are no conditions which will adversely affect the performance of this work. Notify the Consultant immediately, in writing of any unsatisfactory conditions. Do not proceed with this work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of surfaces and existing conditions.

3.2 INSTALLATION

3.2.1 Supply information and templates required for installation Work. Assist and/or supervise setting of anchorage built into Work of other sections.

3.2.2 Drill, tap and cut frames and other Work as required to install doors, tracks, operators, hardware, fittings, etc., and Provide necessary bolts, anchors, inserts, and supplementary framing and supports required to complete the Work.

3.2.3 Supply and install material required to suspend tracks from walls or roof steel including members between joists.

3.2.4 Do not use fasteners which penetrate through walls.

3.2.5 Furnish inserts and anchoring devices which must be set in concrete or built in masonry for the installation of doors. Provide setting drawings, templates and printed instructions for the installation of the anchorage devices.

3.2.6 Install units to fit tight at edges of jambs and heads of frames and ensure smooth and free operation under all conditions of operation. Leave in proper condition in all respects.

Sectional Doors

3.3 ELECTRICAL WORK

- 3.3.1 Provide wiring, conduit and fittings, and interconnect all electrical components of door system, back to master control panel provided in Section 11 13 00 Loading Dock Equipment. Terminate wiring in master control panel and tag.
- 3.3.2 Provide equipment or contacts necessary for interlocking doors and levellers in a manner such that door does not close if leveller is not in down position or such that leveller cannot be raised if door is closed.
- 3.3.3 Where conduit is installed in slab, coordinate with Section 03 35 00 Concrete Floors and Finishing .
- 3.3.4 Identify control and indicating devices on front panel of door control cabinets with lamacoid nameplates.
- 3.3.5 Nameplates shall be laminated phenolic plastic, white front with black core, with lettering etched through the outer covering. Letters to be black.
- 3.3.6 Tag motors, limit switches, etc, with brass tags indicating component number or function.
- 3.3.7 Identify conductors at all points of connection with Wieland Type Z wire markers. The identification shall correspond to the shop drawings.
- 3.3.8 Identify components, including inside of control cabinet.
- 3.3.9 Colour coding: Utilize the following throughout:
- 3.3.9.1 Red - Phase A
 - 3.3.9.2 Black - Phase B
 - 3.3.9.3 Blue - Phase C
 - 3.3.9.4 Green - Ground
 - White - Neutral
 - 3.3.9.5 Orange - Control
 - 3.3.9.6 Yellow - Interlock

3.4 FIELD TOUCH-UP

- 3.4.1 Touch up prepainted finishes disturbed during transport and installation using a spray formulation of the baked enamel paint.

3.5 LUBRICATION

- 3.5.1 Upon completion of erection of units and operating equipment, lubricate moving parts before operation.
- 3.5.2 Grease all sprockets, bearings, cables, link chains and guides. Lubricant shall be as recommended by the manufacturer.

3.6 NOISE AND VIBRATION CONTROL

- 3.6.1 Refer to design notes on Architectural and Mechanical Drawings, and recommendations as provide in "**ACOUSTICAL REVIEW REPORT TITLE**" as prepared by **CONSULTANT**, dated **Month Day, Year**. Unless otherwise noted in the Report noted, provide noise and vibration controls to minimize noise transmittance to minimum STC 45.

3.7 ADJUSTMENT AND DEMONSTRATION

- 3.7.1 Test-operate doors and demonstrate the operation of same at the time of acceptance of the completed Work.
- 3.7.2 Adjust Work to provide free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist, or other distortion.

Sectional Doors

3.7.3 Clean Work on completion of installation.

END OF SECTION

Aluminum Entrances and Store Fronts

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Systems provided as part of the Work of this section shall all be Ontario Building Code SB-10 compliant.

1.1.3 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **American Architectural Manufacturer's Association (AAMA):**

1.2.2.1 AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum

1.2.2.2 AAMA CW-10 - Care & Handling of Architectural Aluminum From Shop To Site

1.2.3 **American National Standards Institute (ANSI):**

1.2.3.1 ANSI H35.1 - Alloy and Temper Designation Systems for Aluminum

1.2.4 **American Society for Testing and Materials (ASTM):**

1.2.4.1 ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire

1.2.4.2 ASTM E283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

1.2.4.3 ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

1.2.5 **Canadian General Standards Board (CAN/CGSB):**

1.2.5.1 CAN/CGSB-12.20-M - Structural Design of Glass for Buildings

1.2.6 **Canadian Standards Association (CSA):**

1.2.6.1 CSA-A440-M - Windows

1.2.6.2 CSA W47.2-M - Fusion Welding Of Aluminum Company Certification

1.2.6.3 CSA W59-M - Welded Steel Construction (Metal Arc Welding)

1.2.7 **Underwriters Laboratories of Canada (CAN/ULC):**

1.2.7.1 CAN/ULC-S710.1 - Standard For Thermal Insulation – Bead-Applied One Component Polyurethane Air Sealant Foam

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 **Samples:** submit sample sections of all component parts of entrances, store fronts, glass and spandrel panels, finished in specified colours. Sizes of samples as follows:

1.3.2.1 Extruded shapes: 300 mm

1.3.2.2 Each type of glass: 300 mm square

1.3.3 **Shop Drawings:** Show fabrication and erection details of all components and accessories.

Aluminum Entrances and Store Fronts

- 1.3.3.1 The engineering design calculations and Drawings for Work of this Section shall be prepared by a Professional Engineer registered to practice in Ontario. The said Engineer shall affix his seal and signature to the design calculations and Drawings.
- 1.3.3.2 Show the following on the Shop Drawings:
 - 1.3.3.2.1 Interface conditions with adjoining works.
 - 1.3.3.2.2 Sealant locations and joint detail including joint back-up.
 - 1.3.3.2.3 Interior structure and/or reinforcements.
 - 1.3.3.2.4 Extruded framing system for all members (plans and sections, in half full size, if not of the manufacture specified and drawn). Show thermal breaks and what material.
 - 1.3.3.2.5 Glazing and glass stop details, vinyl or neoprene mouldings (in half full size), and all anchorage and assembly fixings.
 - 1.3.3.2.6 Ventilator details showing hardware locations and a note confirming that operating hardware is accessible for unobstructed hand operation.
 - 1.3.3.2.7 List of materials used for every component.
- 1.3.3.3 Indicate how thermal expansion and contraction are to be accommodated and to what degree. Show connections to adjacent construction and provision made for structural deflections, contractions, expansion and other normal movement.

1.4 DESIGN REQUIREMENTS

- 1.4.1 Design aluminum entrances and curtain wall system in accordance with following Climatic Design Data for Toronto contained in the Ontario Building Code:
 - 1.4.1.1 Design temperature: January 1%, July 2-1/2%
 - 1.4.1.2 Hourly wind pressures: 1 in 30 year occurrence
- 1.4.2 Design aluminum entrances and store front system to accommodate following without producing detrimental effect:
 - 1.4.2.1 Cyclic 40 degrees C daily thermal swing of components.
 - 1.4.2.2 Cyclic, dynamic loading and release of loads such as wind loads.
 - 1.4.2.3 13 mm vertical deflection in supporting structure and movement of supporting structure due to live, dead load, and creep or deflections, seismic load, sway displacement and similar items.
- 1.4.3 Design to prevent accumulation of condensate on interior side of aluminum entrance framing under the following service conditions:
 - 1.4.3.1 Interior temperature: 21°C
 - 1.4.3.2 Exterior temperature: -25°C
 - 1.4.3.3 Interior RH: 30%.
- 1.4.4 Restrict air infiltration/exfiltration, through curtainwall assembly to 0.25 m³/h/m-1 and doors to 2.79 m³/h/m-1 at reference pressure differential of 75 Pa, when measured in accordance with ASTM E283.
- 1.4.5 No water infiltration when tested to ASTM E331 with pressure differential of 720 Pa (15.0 p.s.f.)
- 1.4.6 Design store fronts, and ventilators system in accordance with following CSA-A440-M classification ratings:
 - 1.4.6.1 Air tightness: Fixed
 - 1.4.6.2 Water tightness: B3
 - 1.4.6.3 Wind load resistance: C5
 - 1.4.6.4 Condensation resistance: Temperature Index: Minimum 60.6
- 1.4.7 Design glass in accordance with CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

Aluminum Entrances and Store Fronts

- 1.4.8 Design and detail controlled drainage path to actively discharge water, which enters into or forms within curtain wall entrances, to exterior; prevent accumulation or storage of water within curtain wall system. Prevent water from entering interior when tested in accordance with ASTM E331.
- 1.4.9 Design and detail air barrier, vapour retarder, insulation and rainscreen Products and assemblies into continuous and integrated curtain wall envelope. Optimize curtain wall design to align envelope layers and to minimize thermal bridges.
- 1.4.10 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical deflection to less than L/175 (under uniformly distributed positive design wind load), and 10 mm maximum regardless of span.
- 1.4.11 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.
- 1.4.12 Where used in combination with three-panel pocket sliding doors, the frame thickness of entrance glazing frames are to match the sliding door frame. (Generally 150mm±)

1.5 DELIVERY, HANDLING AND STORAGE

- 1.5.1 Handle aluminum work in accordance with AAMA CW-10.
- 1.5.2 Protect aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.6 QUALITY ASSURANCE

- 1.6.1 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in the installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance. Submit proof of experience upon Consultant's request.
- 1.6.2 Welder Qualifications: Perform welding of structural components only by fabricators certified by Canadian Welding Bureau to CSA welding qualification codes, CSA W47.2-M for welding of aluminum.

1.7 WARRANTY

- 1.7.1 Warrant Work of this section against defects and deficiencies for the periods specified below from date Work is certified as substantially performed in accordance with the general conditions of the Contract.
- 1.7.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.
- 1.7.3 Warrant the Work as follows:
 - 1.7.3.1 Work in general: Five-year warranty against defects and failure of system, and to remain completely weathertight and air and water leakproof within the tolerances and limits specified.
 - 1.7.3.2 Insulating units: ten-year warranty against breakage due to faulty workmanship or materials, loss of air seal and condensation.
 - 1.7.3.3 Tinted or reflective, or colour coated units: Ten-year warranty against peeling or becoming defective due to normal weather conditions.
 - 1.7.3.4 Anodized finish: Five-year warranty against fading, coating conversion and coating separation from metal.

Aluminum Entrances and Store Fronts

- 1.7.3.5 Fluoropolymer finish: Five-year warranty against peeling, checking, blistering or cracking, and be nonconvertible; fading shall be within ± 5 NBS
- 1.7.4 Defects in the fabrication and installation of units specified in this Section shall include, but shall not be restricted to: leaking, loosening of whole or of parts of units, breakage or deformation of unit metalwork, glass breakage from excessive stresses developed within the glazed unit or the glass (other than by accidental cause exterior to the glass and unit frame), and fading or discolouration of factory applied finishes.
- 2 Products
- 2.1 ACCEPTABLE MANUFACTURERS**
- 2.1.1 Storefront Systems**
- 2.1.1.1 Provide one of the following systems. Submit Engineer stamped shop drawings verifying structural requirements for Curtain Wall systems.
- 2.1.1.2 Vistawall FG3000
- 2.1.2 Doors**
- 2.1.2.1 **Exterior, manufacturers standard narrow/medium stile doors:**
- 2.1.2.1.1 Doors to suit Vista FG3000 glazing system
- 2.1.2.1.2 Refer to drawings.
- 2.2 MATERIALS**
- 2.2.1 Aluminum**
- 2.2.1.1 Extrusions: ASTM B211 and ANSI H35.1 AA6063-T5, alloy and temper for framing, and otherwise where not exposed to suit specified and fabricator's requirements
- 2.2.1.2 Exposed anodized sheet and plate: AA5005-H14, alloy and temper, or AA1100-H14, anodizing quality. Also for metal back pans in spandrel glazing. All back pans to be secured directly to aluminium framing system as recommended by framing manufacture.
- 2.2.1.3 Exposed surfaces of aluminum shall be free of die marks, scratches, blisters, "leave-off" marks, or other blemishes which are visible
- 2.2.2 **Glass:** To meet specified requirements of Section 08 80 00 and as specified for installation.
- 2.2.3 **Glazing Materials:** Neoprene bulb type glazing gaskets with setting blocks to meet specified requirements of Section 08 80 00.
- 2.2.4 **Finish hardware:** Provide hardware in accordance with Section 08 71 00.
- 2.2.5 **Caulking:** To meet specified requirements of Section 07 92 00.
- 2.2.6 **Fastenings:** 300 Series stainless steel, austenitic.
- 2.2.7 Anchors:**
- 2.2.7.1 Exposed: Aluminum or stainless steel with aluminum materials, and otherwise to match metal anchored.
- 2.2.7.2 Non-Exposed: As for exposed or may be galvanized steel.
- 2.2.8 **Bituminous Paint:** Bitumastic coating, acid and alkali resistant material.
- 2.2.9 **Weatherstripping:** Durable, non-absorbing material resistant to deterioration by aging and weathering.
- 2.2.10 Thermal Break Material: Polyvinylchloride, of semi-rigid durometer hardness of 80, plus or minus 5, located on the external side of the glass pane.

Aluminum Entrances and Store Fronts

2.3 SPANDREL PANEL BACK-UP (VAPOUR BARRIER)

- 2.3.1 Material: Minimum 0.76 mm thick (22 ga) galvanized steel face sheet with rigid fibreglass insulation core of thickness shown bonded to same, supplemented by mechanical fasteners as applicable.
- 2.3.2 Form panels with offset edge flange to provide flush surface at edge of pan. Bond insulation to panel back-up with daubs of mastic adhesive.
- 2.3.3 Provide integral reinforcing and stiffeners as required.
- 2.3.4 Weld corners of panels and grind smooth or butter corner joints with butyl sealant.

2.4 FABRICATION

- 2.4.1 Ensure that glazing rebate is provided with depth and width to accommodate specified glass in accordance with glass manufacturer's recommendations. Install glazing gaskets anchored to aluminium extrusions.
- 2.4.2 Fabricate aluminium entrances to dimensions and profiles indicated on Drawings and to meet specified requirements. Maintain sight lines indicated and clearances to other construction components. Provide all reinforcing as required for attachment of hardware.
- 2.4.3 Provide assemblies with weep holes to drain off pocketed water. Baffle to prevent entry of driven water to conform to specified performance.
- 2.4.4 Join members by welding where practicable, using materials recommended by manufacturers of metals being welded. Remove flux completely following welding, and grind and polish joints smooth and clean.
- 2.4.5 Join members where welding is impracticable by mechanical methods. Reinforcement or fasteners visible on exposed faces of members will not be acceptable.
- 2.4.6 Join members to fit flush with hairline joints.
- 2.4.7 Except where shipping makes impossible, fabricate units in shop and ship completely assembled with operating hardware attached.
- 2.4.8 Protect material from electrolytic action when dissimilar metals are in contact with one another.
- 2.4.9 Protect aluminium in contact with masonry or concrete with a heavy coating of bituminous paint.
- 2.4.10 Incorporate anchorage to structure for units at sills, heads and jambs on minimum 450 mm centres and to suit, and to support units adequately when subjected to specified loads.
- 2.4.11 Allow for complete adjustment in anchorage for levelling and positioning of units during installation.
- 2.4.12 Fabricate filler and closure pieces as necessary for a complete and weather tight installation.
- 2.4.13 Thermal Break: Incorporate a thermal break in the frame and sash of double glazed units.
- 2.4.14 Fastenings:
 - 2.4.14.1 Where fastenings are exposed to dampness or moisture, use cadmium plated steel for steel-to-steel, aluminium for aluminium to aluminium, and stainless steel otherwise or alternatively for all above.
 - 2.4.14.2 Where fastenings are not exposed to dampness or moisture, cadmium plated steel may additionally be used for all combinations of metals noted in preceding subparagraph.

Aluminum Entrances and Store Fronts

2.5 ACCESSORIES

- 2.5.1 **Perimeter Sealant:** One part silicone neutral cure low modulus sealant, GE Silicones "Silpruf SCS 2000" or Dow Corning "DC-795". Colour as selected by the Consultant from standard colour selection.
- 2.5.2 **Airseal Transition Membrane:** Soprema "Soprasolin" or W.R. Grace "Permabarrier", in width sufficient to properly bridge and seal joints around windows. Provide stainless fasteners and bars necessary to keep membrane in place.
- 2.5.3 **Foamed-In-Place Air Seals:** Foamed-In-Place Air Seals: Class 1, single component polyurethane foam conforming to CAN/ULC-S710.1, with flame spread rating of 20 or less and smoke developed of 25 or less. Density of 20.8 to 28.8 kg/m³ 1.3 to 1.8 lbs./cu.ft., "Zerodraft Foam Sealant" by Canam Building Envelope Specialists Inc., or "Great Stuff Pro" by Dow Chemical Company, or "LEF" by Tremco, or approved alternative.
- 2.5.4 **Backpan Insulation:** Semi-rigid glass fibre thermal insulation as follows:
- 2.5.4.1 Owens Corning "AF530"
- 2.5.4.2 Rockwool "Rockboard 40"
- 2.5.4.3 Fibrex Insulation, Inc. "Curtain Wall Type 4"
- 2.5.4.4 Ottawa Fibre "OFI 48"
- 2.5.4.5 Or approved alternate
- 2.5.5 **Temporary Strips:** 25 mm wide, light reflecting, easily removable, pressure sensitive tape applied over all glass. Doors shall have two cross stripes at eye level, windows and curtain wall shall have corner to corner cross stripes from aluminum frames.
- 2.5.6 **Safety Decals:** 25 mm wide pressure sensitive tape applied at eye level on the No. 4 surface of all glass lites in curtain wall at ground floor level. Design as selected by the Consultant.

2.6 ALUMINUM DOORS

- 2.6.1 Fabricate doors of welded construction.
- 2.6.2 Glazing: Insulating glazed units in curtainwall framing and single glazing at vestibule framing.
- 2.6.3 Glazing stop: Square, snap-on type, designed for neoprene glazing system.
- 2.6.4 Equip doors with full weatherstripping at perimeter. Install weatherstripping throughout the full length and width of doors at jambs and heads.
- 2.6.5 Aluminum door hardware: Supplied by finish hardware supplier for installation by door manufacturer.

2.7 ANODIZED FINISHES

- 2.7.1 Treat all visible aluminum surfaces with a clear anodic oxide finish or Coloured anodized finish, noted on drawings, as follows:
- 2.7.2 **Clear anodic oxide treatment:** AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A41.

2.8 PROTECTION OF METALS

- 2.8.1 Provide protection against galvanic action wherever dissimilar metals are in contact, either by painting the contact surfaces with a heavy coat of zinc chromate primer, or by the application of an appropriate sealant or tape.

Aluminum Entrances and Store Fronts

2.8.2 Protect aluminum which is to be in contact with cured concrete with zinc chromate primer or bituminous paint, and wherever crevices between the contact surfaces may entrap moisture or other corrosive elements

3 Execution

3.1 EXAMINATION

3.1.1 Take critical site dimensions to ensure that adjustments in fabrication or installation are provided for, that allowance is made for possible deflection of structure at heads, and that clearances to other constructions have been maintained.

3.1.2 Ensure that anchors and inserts, installed by others, are adequate to meet specified requirements, and make adaptations before installation

3.2 INSTALLATION

3.2.1 Store Front

3.2.1.1 Set units in their correct location, level, square and plumb and at proper elevations, with the nominal face of the framing aligned in a single vertical plane. Fasten and anchor framing in place.

3.2.1.2 Accurately measure glass openings and calculate glass size based on manufacturer's installation tables allowing for proper edge engagement, rabbet width, rabbet depth and expansion.

3.2.2 Assembly and Anchorage

3.2.2.1 Anchor component parts securely in place by bolting, welding or other permanent mechanical attachment system, which will comply with performance requirements and permit movement as intended or necessary. Install slip-joint linings where required to ensure movement as per design.

3.2.2.2 Allow for complete adjustment in anchorage for levelling and positioning of units during installation.

3.2.2.3 Where welding is unavoidable for exposed non-ferrous work during erection of curtain wall assembly, comply with CSA W59-M and recommendations of fully certified firm to CSA W47.1 for the particular metals and alloys being welded. Use methods and welding rods which will not distort members and will result in closest possible colour match. Grind exposed surfaces smooth, using wheels and compounds which are free of iron and other substances which would result in stains or discoloration of surfaces. Restore finishes after welding and grinding.

3.2.3 Erection Tolerances

3.2.3.1 Limit variations from plumb, level or dimensioned angle to the following:

3.2.3.1.1 3 mm (maximum deviation in storey height, or in 3000 mm (vertical run, or in 6000 mm (horizontal run.

3.2.3.1.2 6 mm maximum deviation in 12000 mm (in any direction.

3.2.3.2 Limit variations from location (theoretical calculated positions in plan or evaluation based on established floor lines and column lines), including variations from plumb and level, to the following:

3.2.3.2.1 9 mm (total maximum deviation for member at any location.

3.2.3.2.2 3 mm (maximum change in deviation for member for 3000 mm (run, any direction.

3.2.3.3 Limit offsets in end-to-end and edge-to-edge alignment of adjoining and consecutive members, which form planes, continuous runs and profiles, to the following:

3.2.3.3.1 1.5 mm (maximum offset in flush alignment, including those which are to be 12 mm (or less out-of-flush, and including those which are separated 50 mm (or less by a reveal or protrusion in plane of wall.

3.2.4 Doors

Aluminum Entrances and Store Fronts

- 3.2.4.1 Install doors plumb, square, level, free from warp, twist and superimposed loads.
- 3.2.4.2 Secure work adequately and accurately to structure in the required position, in a manner not to restrict thermal movement.
- 3.2.4.3 Provide compressible filler over aluminum work at locations shown on Drawings.
- 3.2.4.4 Use aluminum or stainless steel screws, nuts, bolts, washers, rivets and all other fastening devices, colour to match doors and frames where exposed to view.

3.3 GLAZING

- 3.3.1 Use extruded gaskets for door and sidelight glazing.
- 3.3.2 Thoroughly wipe all surfaces receiving glazing materials with a cloth dampened in xylol to assure a clean surface.
- 3.3.3 Use glazing tape for glass and aluminum spandrel panels.
- 3.3.4 At horizontal mullions and frames secure lites with screw applied pressure plates into the main grid members. Mitre glazing tape at all end joints, corners and at junctions. Screw fasteners shall be 1/4-20 machine screws. Contain glazing tape on pressure plates with a rigid polyvinyl chloride spacer. Internal seal shall be bulb type silicone extrusions.
- 3.3.5 Place setting blocks at quarter points from each corner of glass. Centre glass in opening and press firmly against tape Provide isolation tape at edges of laminated glass to prevent staining of interply plastic from glazing materials. Roll-in inside resilient extrusion.

3.4 JOINT SEALANT AND SEALS

- 3.4.1 **Pre-Application Conference:** Arrange with the sealant manufacturer(s) for a visit to the job site by one of its technical representatives before beginning the sealing installation to discuss with the Contractor and the Consultant the procedures to be adopted, to analyze site conditions and inspect the surfaces and joints to be sealed, in order that recommendations may be made, should adverse conditions exist. Discuss the following item:
 - 3.4.1.1 Weather conditions under which work will be done
 - 3.4.1.2 Anticipated frequency and extent of joint movement
 - 3.4.1.3 Joint design
 - 3.4.1.4 Number of beads to be used in the sealing operation
 - 3.4.1.5 Have manufacturer(s) send report to the Consultant.
- 3.4.2 **Joint Sealant**
 - 3.4.2.1 At interior and exterior joints between aluminum framing and adjacent work of others execute the following work:
 - 3.4.2.1.1 Install backer rod as required to provide sealant joints of proper form, thickness-to-width ratios, and to provide bond break at back side of sealant. Where backer rod cannot be used, use bond breaker tape to back side of sealant joint substrate.
 - 3.4.2.1.2 Clean substrate surfaces to which sealant is to bond and apply sealant primers as recommended by sealant manufacturer.
 - 3.4.2.1.3 Seal joints continuous to produce weatherproof and visually acceptable joint installation.
 - 3.4.2.2 Install backer rod between butt glazed insulating and spandrel glass units, and between units to adjacent structures as shown. Seal joints continuous to produce weatherproof and visually acceptable joint installation.
 - 3.4.2.3 Seal all joints required for a weatherproof installation and against air/vapour leakage. Use materials in strict accordance with the manufacturer's printed instructions, and applied only by tradesmen specially trained or experienced in their use. Before applying sealants, completely remove all mortar, dirt, dust, moisture and other foreign matter from surfaces it will contact. Mask adjoining surfaces when required, to maintain a clean and neat appearance. Total sealing compounds to fill the joint and provide a smooth finished surface.

Aluminum Entrances and Store Fronts

- 3.4.2.4 Refer to and comply with workmanship requirements of Section 07 92 00.
- 3.4.3 Foamed-In-Place Air Seals
- 3.4.3.1 Prior to application, remove mortar, dirt, dust, moisture and other foreign matter from joints to be sealed.
- 3.4.3.2 Apply seal in accordance with manufacturer's directions. Fill all joints. Trim off excess seal.
- 3.4.4 Airseal Transition Membrane
- 3.4.4.1 Apply primer and airseal transition membrane in accordance with membrane manufacturer's instructions. Use primer in conjunction with adhesive if part of system.
- 3.4.4.2 Re-prime surfaces not covered with transition membrane during the same working day.
- 3.4.4.3 Overlap airseal transition membrane 75 mm (minimum. Lap in the direction of waterflow.
- 3.4.4.4 Coordinate the airseal transition with adjacent parts of the Work.

3.5 ADJUSTMENT AND CLEANING

- 3.5.1 Adjust doors and motor operator to operate smoothly and fit tightly when closed and locked.
- 3.5.2 Adjust hardware to operate smoothly, with proper tension, and lubricate.
- 3.5.3 Remove protective material and glass presence markers from prefinished surfaces.
- 3.5.4 Clean interior and exterior surfaces by washing with clear water; or with water and soap or detergent; followed by a clear water rinse.
- 3.5.5 Clean and restore stained surfaces in accordance with manufacturer's recommendations. Replace if cleaning is impossible.

3.6 PROTECTION

- 3.6.1 Protect prefinished surfaces of metal with protective coatings or wrappings to remain in place until construction completion. Use materials recommended by finishers or manufacturers of metals to ensure that method is sufficiently protective, easily removed, and harmless to finish.
- 3.6.2 Maintain protection from time of installation to final cleanup.

END OF SECTION

Sliding Automatic Entrances

- 1 General
- 1.1 **SUMMARY**
- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.2 **RELATED SECTIONS**
- 1.2.1 Electrical Divisions: provision of power to line side of door control panels; installation of empty conduit between control panels and doors.
- 1.3 **REFERENCES**
- 1.3.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
- 1.3.2 **Architectural Metal Products (AMP):**
- 1.3.2.1 AMP-501 - Architectural Metal Products, Finishes for Aluminum
- 1.3.3 **Canadian General Standards Board (CGSB):**
- 1.3.3.1 CAN/CGSB-12.1-M - Tempered or Laminated Safety Glass
- 1.3.3.2 CAN/CGSB-12.3-M - Glass, Polished Plate or Float, Flat, Clear
- 1.4 **REQUIREMENTS OF REGULATORY AGENCIES**
- 1.4.1 Comply with the requirements of the Canadian Standards Association, all local code inspection requirements of the Hydro Electric Power Commission, and ANSI Standard A156.10.
- 1.4.2 Be responsible for, and abide by all the requirements and regulations of the Ontario Building Code. Conduct tests and inspections required, and pay all charges incidental thereto.
- 1.5 **SUBMITTALS**
- 1.5.1 All submittals as required by this Section, are shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.5.2 **Shop Drawings:** Submit engineered shop drawings clearly indicate each type of frame and screen, extrusion profiles, method of assembly, section and hardware reinforcement and mounting plates, locations of exposed fasteners, finishes, glazing systems, glass type, accessories, line of air barrier and drainage path, and as required to completely represent the proposed door system. Indicate fastening system for anchorage of door frame to opening, and structural design for each door type and size.
- 1.5.3 **Samples:** Submit samples of colour and finish prepared as specified on respective metal components. Identify samples as to treatment, thickness, alloy, framing composition, colour, manufacture, performance standard and portion of the work to which they apply. Fabrication shall not proceed without written acceptance of samples from Consultant.
- 1.5.4 **Maintenance Data and Operating Instructions:** Submit Operating and Maintenance Instructions required for mechanical and electrical connection purposes, for incorporation in Maintenance Manual. Identify every item of equipment with catalogue data, Operating and Maintenance Instructions, model and serial number.
- 1.5.4.1 Submit complete electrical wiring diagram including electrical schematics and sequence of operation for doors.

Sliding Automatic Entrances

1.5.4.2 Submit lubrication chart indicating lubrication points and type of lubricant recommended for equipment.

1.5.5 **Test report:** Submit certified test reports showing compliance with specified performance characteristics and physical properties. Test reports shall be recent and produced within 5 years of project's start date.

1.6 DESIGN REQUIREMENTS

1.6.1 Reinforce units to withstand handling stresses, temperature changes, the effect of shrinkage forces, wind loads, dead and live loads, and related elements.

1.6.2 Design components to achieve sufficient freedom of movement of members to allow for thermal expansion and contraction within the range of air and surface temperatures as applicable to the location of the components without causing harmful buckling, opening of joints, distortion, undue stress on fasteners, breakage of sealants, or other detrimental effects.

1.6.3 Entrapment Force Requirements:

1.6.3.1 Power Operated Sliding Doors: Not more than 30 lbf (133 N) required to prevent stopped door from closing.

1.6.3.2 Sliding doors provided with a breakaway device shall require no more than 50 lbf (222N) applied 1 inch (25 mm) from the leading edge of the lock stile for the breakout panel to open.

1.6.4 Operator Equipment: CSA approved.

1.6.5 Design light gauge aluminum Products to CSA CAN3-S157-M.

1.6.6 Design and anchor work so that there will be no objectionable distortion or seriously stressed fastenings as the metal expands and contracts. Design and fabricate expansion joints to ensure that they will be, and remain, permanently watertight. Locate joints as shown on reviewed shop drawings. Provide necessary wind bracing as required.

1.6.6.1 Design system to prevent initiation of close cycle when failure of threshold presence detectors occurs.

1.6.6.2 Maximum force required to prevent closing 124.5 N. Adjustable reversing circuit will open door if the path is obstructed.

1.6.7 Design mullions for maximum deflection of 1/175.

1.6.8 Design to drain to exterior face of the door assembly, any water entering at joints and any condensation occurring within the door assembly.

1.7 WARRANTY

1.7.1 For Work of this Section, 12 month warranty period is extended to 24 months. Insulating glass 10 years on date of complete performance of work.

1.7.2 Warrant that automatic sliding doors will function as specified for 24 months.

1.7.3 Include coverage of repair or replacement of components or entire units which fail in material workmanship. Failures include but are not necessarily limited to, structural failures including excessive deflection, faulty operation of operators and hardware, deterioration of metals, and metal finishes.

1.7.4 During the warranty period a factory-trained technician shall perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

1.7.5 During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.

Sliding Automatic Entrances

1.7.6 Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

1.8 PROTECTION

1.8.1 Protect all Work with suitable heavy wrappings in transit and in storage. Maintain protection until final clean-up.

1.9 DIMENSIONS

1.9.1 Verify all dimensions at the site before fabrication commences, and report to Consultant in writing all discrepancies.

2 Products

2.1 SYSTEM DESCRIPTION

2.1.1 General: All equipment to operate under climatic conditions at the temperature ranges prevailing in the building locale.

2.1.2 Sliding doors shall be completely self-contained single slide or bi-parting entrance systems, as shown on drawings, consisting of:

2.1.2.1 Operator housing, guide rollers, door carriers, locks and breakaway latches.

2.1.2.2 Aluminum frames and doors, including top and bottom pivots for swing type breakaway operation.

2.1.2.3 Power operator complete with electronic control by means of "Stan-ray" overhead ("Omni-Scan" thin profile) motion detectors for 2-way traffic, and switches as specified.

2.2 ACCEPTABLE PRODUCTS

2.2.1 Work of this section shall be done using one of the following manufacturers:

2.2.1.1 Assa Abloy SL500

2.2.1.2 Refer to 08 42 31 Reference Sliding Automatic Door for model type and Xcluder sweep on the exterior. Refer to drawings for size and finish.

2.3 BASIC MATERIALS

2.3.1 Generally: Use new materials, free from defects impairing strength, durability or appearance, and of best commercial quality for the purpose specified.

2.3.2 Aluminum: AA 6065 T5 alloy for framing and doors and AA 6061 T6 for guide tracks and structural members.

2.3.3 Glass: 6 mm clear tempered glass conforming to CAN/CGSB-12.1 Class B, Category II. For transoms use 6 mm clear float glass conforming to CAN/CGSB-12.3.

2.4 GENERAL FABRICATION REQUIREMENTS

2.4.1 Do all fitting and assembly as far as practicable in the factory.

2.4.2 Trial fit units in the shop, if permanent shop assembly is not practical.

2.4.3 Install and fix all components and accessories, and supply complete with all necessary anchors, clips, bolts, screws, and other appurtenances. Drill, tap, weld hole or slot metal sections as may be required to properly fix Work in place.

2.4.4 Fabricate door and framing members with sharply-defined profiles, straight, square and true, with surfaces in proper planes and exposed finished surfaces and edges smooth and free from all defects.

2.4.5 Provide framing, bracing, reinforcing, and anchors with structural properties adequate to safely sustain and withstand all strains and stresses to which they will be subjected.

Sliding Automatic Entrances

- 2.4.6 Join and fit corners of doors to flush hairline joints, and weld along the concealed lines of contact.
- 2.4.7 Weld to thoroughly penetrate the materials and to produce complete fusion of metal between the stiles and rails. Superficial welding or mechanically jointed corners will not be permitted.
- 2.4.8 Use interlocking-type glazing beads with no exposed screws.
- 2.4.9 Fabricate major sections of minimum 3.2 mm wall thickness aluminum.
- 2.5 COMPONENT MINIMUM REQUIREMENTS**
- 2.5.1 Doors and frames: Aluminum construction. Sidelight base frame section for supporting bottom door rollers shall allow for frame setting adjustment. Door tracks shall be removable without removing frame.
- 2.5.2 Tracks, guide rollers, door carriers, and miscellaneous hardware: The door tracks and anti-riser guides shall be an integral part of the structural member. Incorporate rollers with sealed bearings, with each door having minimum of two support rollers and one anti-rise roller for smooth fast operation. Provide each roller with vertical adjustment with positive mechanical locks. Each door shall include two rollers with self-lubricating sleeve bearings attached with 5 mm thick formed steel guide brackets. All steel brackets and fittings shall be corrosion resistant.
- 2.5.3 Door Power Operator
- 2.5.3.1 Type: Electro-mechanical power operator system made up of three basic components: mechanical gear transmission, electric moto, and electronic control.
- 2.5.3.2 By means of the electric motor and mechanical gear transmission, the power operator shall pull the door from "Close" to "Open" position when activated.
- 2.5.3.3 When deactivated, the mechanical transmission shall return the door to the close position. Doors shall operate manually in the event of power failure, maintaining closing and latching speeds.
- 2.5.3.4 Power operator shall be easily replaced without removing the door.
- 2.5.3.5 A timing belt in the operator shall convert rotating motion into horizontal movement to open and close the door. Include a spring loaded idler pulley for maintaining proper belt tension. With the timing belt system the electronic control shall be a self-contained unit including transformers, relays, rectifiers and other electronic components for proper operation, switching of the automatic power equipment and door speed adjustments.
- 2.5.3.6 Plug-in type relays in the control shall allow individual replacement. Voltage shall be 115 volts AC with a maximum of 7 amps per power operator.
- 2.5.4 Controls
- 2.5.4.1 Electronic, key-operated switch installed in a panel in the header. The key switch shall have 5 position, controlling both sets of doors as noted below (key shall be removable in any position):
- 2.5.4.1.1 Locked: Door remains closed with the outer doors mechanically locked
- 2.5.4.1.2 Closed: Doors are closed and remain closed, but not locked, with scanners deactivated
- 2.5.4.1.3 Auto 1: Automatic operation, with interior scanners of both units activated, but exterior scanners deactivated
- 2.5.4.1.4 Auto 2: Automatic operation, with all scanners activated
- 2.5.4.1.5 Open: Door is open and remains open
- 2.5.4.2 Equip control with a summer/winter switch in the panel, to adjust the opening speed and limit of the doors, for winter use.
- 2.5.4.3 Mount panel in the header assembly. Coordinate installation of panels with Electrical Divisions, who shall install empty conduit between the panels and the door systems.

Sliding Automatic Entrances

- 2.5.4.4 Provide a proximity sensor across each opening, so that the closing cycle will reverse if the sensor is activated.
- 2.5.5 Soft start: Include with each slider a "soft start" component as standard equipment for smooth recycle and start.
- 2.5.6 Swing breakaway: Provide automatic slide entrance system with swing-type door leaves attached to door carriers by means of top and bottom pivots and a breakaway latch release for holding the door in closed position for normal operation. Breakaway shall be re-settable by applying pressure to re-engage the door.
- 2.5.7 Concealed door closer: One LCN door closer per door, to provide manual swing door operation in the event of power failure or swing breakaway.
- 2.6 CART GUARD**
- 2.6.1 Supply & Install Prefinished aluminum cart guards to match door (Interior & Exterior)
- 2.7 FINISH**
- 2.7.1 To match finishes as specified in Section [08 40 00 Aluminum Entrances, Windows, and Curtain Wall] [08 40 05 Aluminum Entrances and Storefronts] [08 40 10 Aluminum Framed Window Wall].
- 3 Execution
- 3.1 PREPARATION**
- 3.1.1 Take critical site dimensions to ensure that adjustments in fabrication of installation are provided for, and that clearances to other construction have been maintained.
- 3.1.2 Concealed surfaces of aluminum which would otherwise come in direct contact with other building surfaces, shall be given a heavy protective coating of bituminous paint, prior to installation.
- 3.1.3 Accurately measure sash openings and calculate light size based on manufacturer's installation tables, allowing for proper minimum edge engagement, rabbet width, rabbet depth, and expansion
- 3.2 INSTALLATION**
- 3.2.1 Set frames plumb and true in openings, held in alignment during construction and provided with suitable and adequate anchorage to adjoining Work. Install all hardware.
- 3.2.2 After installation of frames and screens, prior to glazing, adjust doors to provide continuous contact with adjoining members.
- 3.2.3 Completed installation shall be of adequate strength to support operating doors and normal loading, without glass shaking or vibrating when doors are in use.
- 3.2.4 Interconnect all electrical/electronic components and wire back to control panel.
- 3.3 GLAZING**
- 3.3.1 Glaze doors and screens using flexible gaskets.
- 3.4 ADJUSTMENT AND CLEANING**
- 3.4.1 Immediately prior to the final cleaning of the glass, and before takeover of the building by the Owner, make good all damage and disfigurement to this Work, remove all protective coatings, stains and foreign matter from all exposed exterior and interior surfaces of aluminum Work supplied under this section, and leave all in a uniform colour and in first-class condition to the Consultant's satisfaction.

Sliding Automatic Entrances

- 3.4.2 Clean using soap and water, or water and approved solvents not injurious to aluminum, glass, glazing and caulking compounds. Do not use abrasives.

END OF SECTION

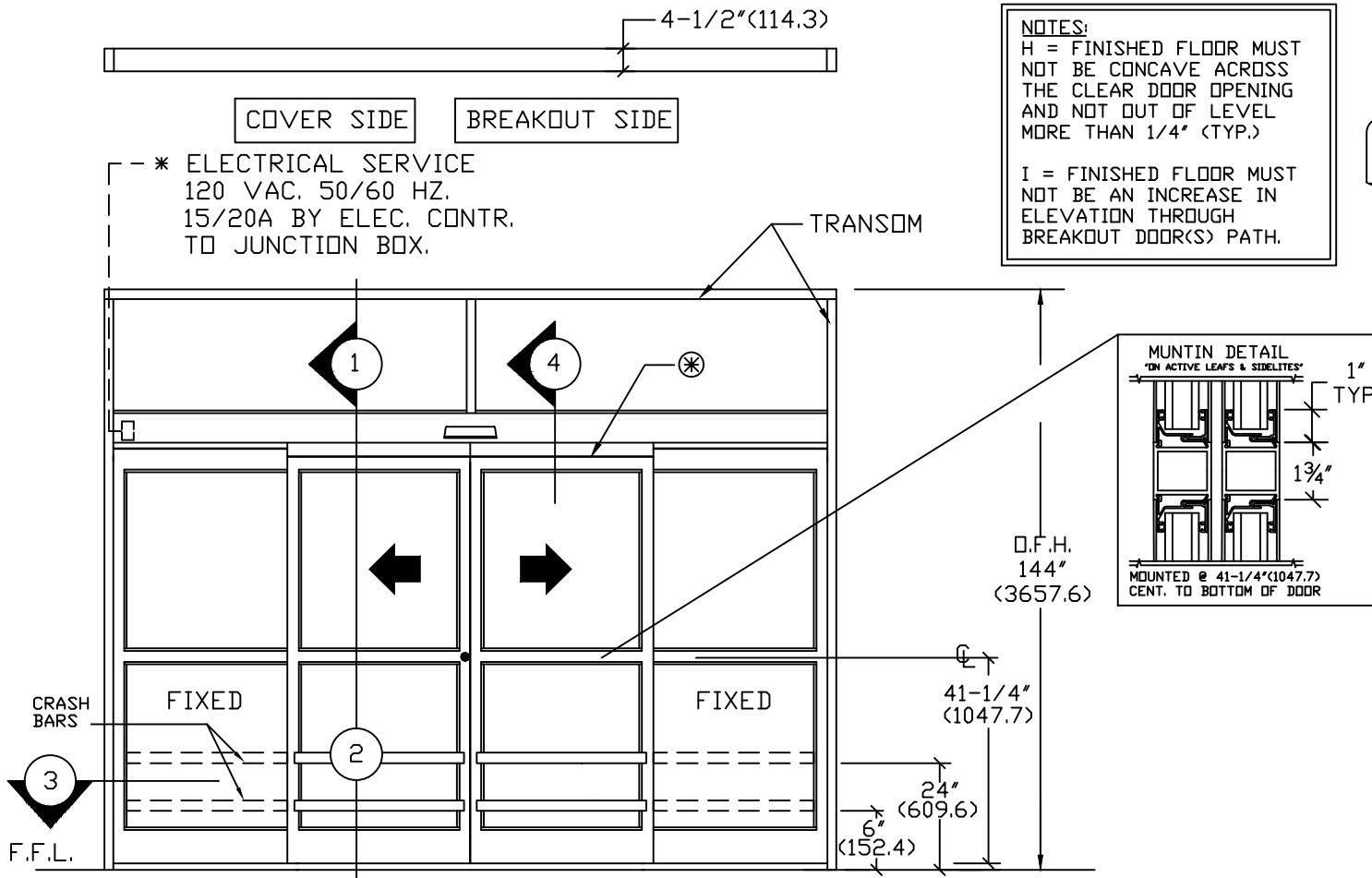
BESAM SL500
OVERHEAD CONCEALED FIXED SIDELITE
NARROW STILE BI-PART SLIDING DOOR SYSTEM

PRELIMINARY RELEASE
FOR APPROVAL

SHOP DRAWING APPROVAL
SIGNATURE: _____
DATE: _____

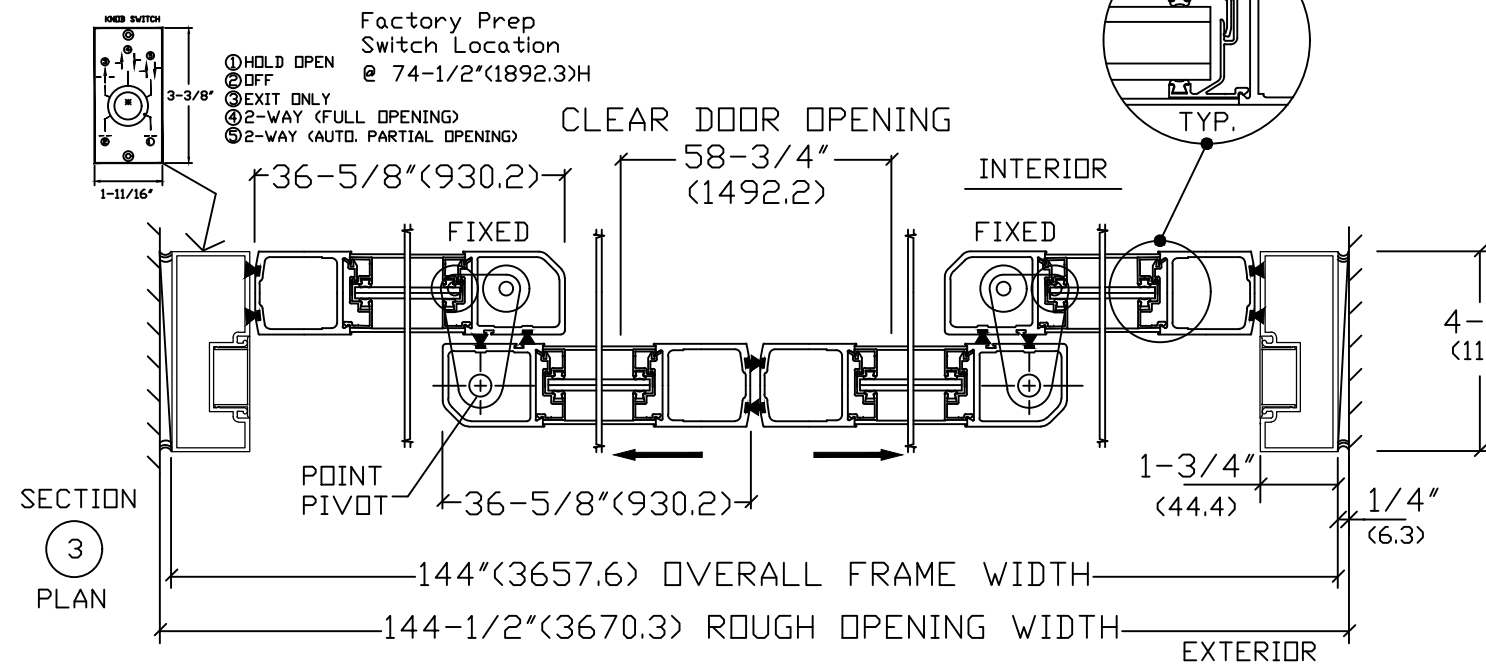
NOTE: BY SIGNING THIS SHOP DRAWING, THE CUSTOMER IS APPROVING THE CUSTOM DOOR CONFIGURATION FOR FABRICATION AS DRAWN.

NOTES:
H = FINISHED FLOOR MUST NOT BE CONCAVE ACROSS THE CLEAR DOOR OPENING AND NOT OUT OF LEVEL MORE THAN 1/4" (TYP.)
I = FINISHED FLOOR MUST NOT BE AN INCREASE IN ELEVATION THROUGH BREAKOUT DOOR(S) PATH.

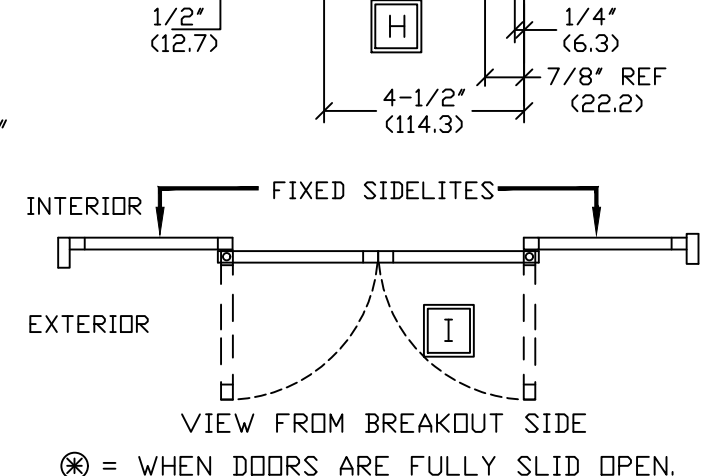
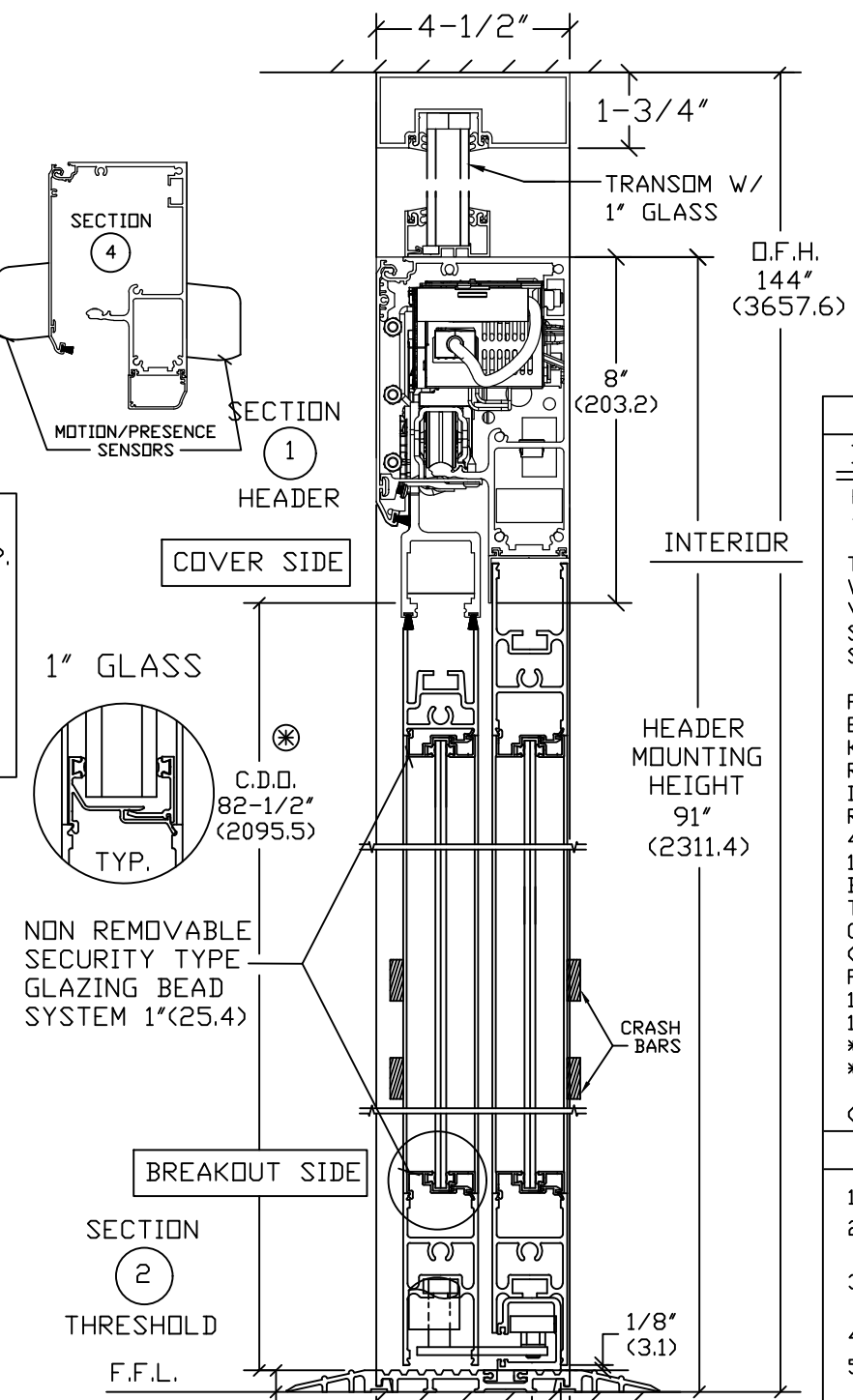


EXTERIOR ELEVATION
FSL-BI-PART SLIDING DOOR -NS

F.F.L. = FINISHED FLOOR LINE



SECTION 3
PLAN



⊗ = WHEN DOORS ARE FULLY SLID OPEN.

UNIT DESCRIPTION

BESAM SL500 DHC NS (1-REQ'D)
FIXED SIDELITE BI-PARTING SLIDING DOOR SYSTEM
"PETSMART EXTERIOR DOOR #100A"

THE PACKAGE CONSISTS OF: AUTOMATIC OPERATOR & WEATHERSTRIPPING, FRAMES, DOORS & SIDELITES WITH VERTICAL WEATHERSTRIPPING, EMERGENCY BREAKAWAY, STANDARD 2-POINT LOCK, MOTION & PRESENCE SENSORS SC53, VERTICAL JAMB TUBES AND 5-POSITION SWITCH-KNOB.

PACKAGE SHALL ALSO INCLUDE:
ECDDOOR SEALS (SEE SHEET 2 OF 2),
KEY CYLINDER (EXTERIOR) / THUMBTURN (INTERIOR),
REPLACEABLE CORE CYLINDER, LOCK INDICATOR,
DOOR POSITION SWITCH, SECURITY SWITCH,
ROLLER GUIDE & G-CHANNEL,
4"(101.6) BOTTOM RAIL, HD CARRIER WHEELS, BALL CATCH,
1-3/4"(44.4) MUNTIN BARS @ 41-1/4"(1047.7) CENT. TO BOTTOM OF DOOR, 1/2"(12.7) THRESHOLD W/ LEAD-UPS,
TRANSOM TO 144"(3657.6) HEIGHT W/ 1-VERTICAL CENT.,
CONCEALED SWEEPS A/L ONLY, SPECIAL SWEEP EXTERIOR,
(2) CRASH BARS A/L & S/L @ 6"(152.4) & 24"(609.6) - HGT. FROM BOTTOM OF CRASH BAR TO F.F.L.,
1"(25.4) GLASS STOP ON DOORS AND TRANSOM,
1"(25.4) INSULATED LOW E CLEAR TEMP. GLASS & GLAZING.
*SENSOR WEATHER HOOD DK12 & CPSS.
*SPECIAL XCLUDER SWEEP (EXTERIOR ONLY)

(1) ONE-YEAR WARRANTY ON PARTS AND LABOR.

NOTES

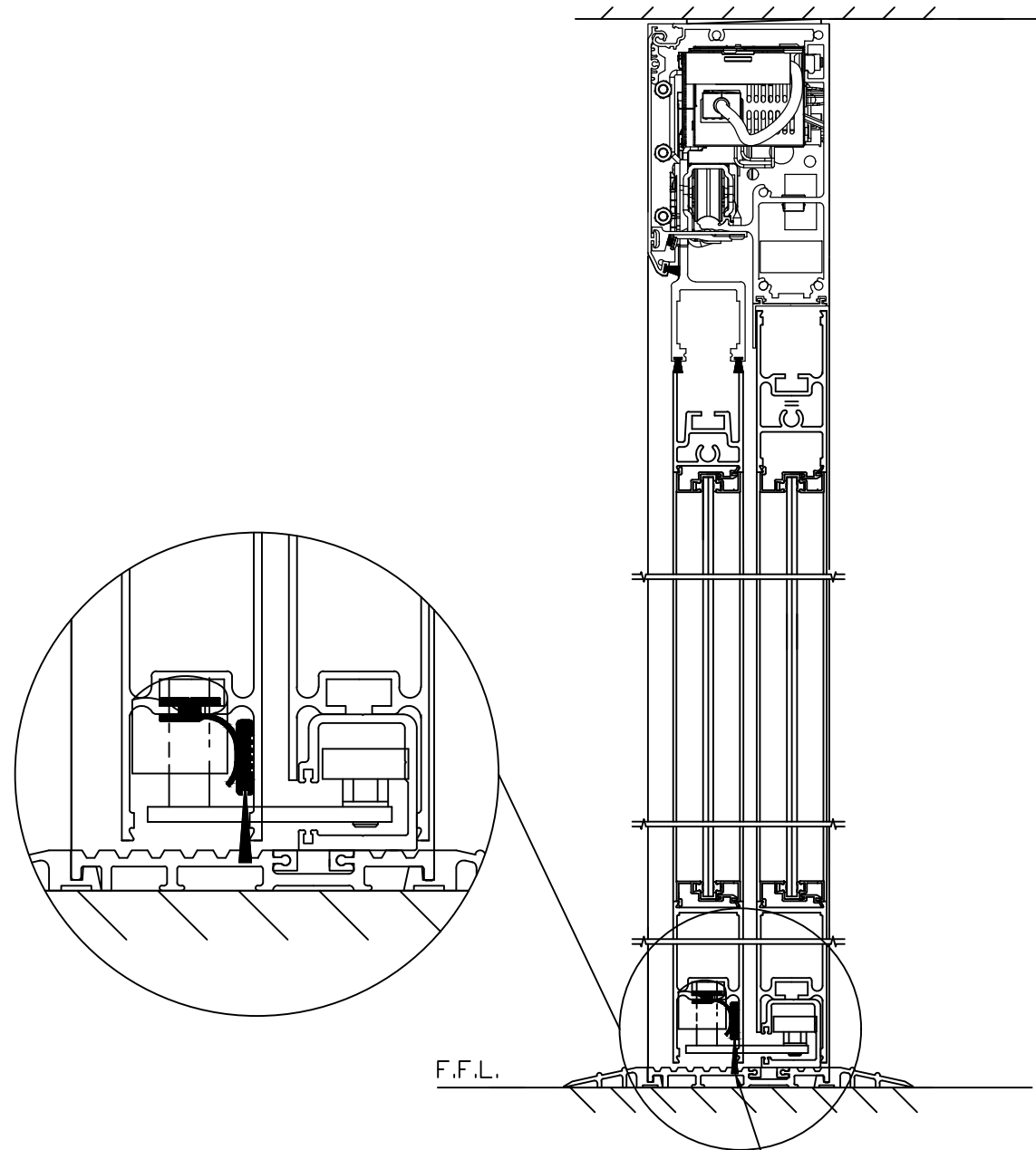
- ALUMINUM FINISH TO BE CLASS 1 CLEAR ANODIZED.
- ELECTRICAL SERVICE AND ALL HARD WIRING TO BE SUPPLIED BY ELECTRICAL CONTRACTOR.
- PREPARATION OF OPENINGS TO ACCEPT PACKAGES SHALL BE BY OTHERS.
- CAULKING BY OTHERS.
- THESE PACKAGES WILL BE ORDERED AND BUILT IN ACCORDANCE TO THESE APPROVED SHOP DRAWINGS.
- WITH THE APPROVAL OF THESE SHOP DRAWINGS, THE G.C. IS GUARANTEEING TO HOLD REQUIRED FIELD DIMENSIONS.
- ALL WRITTEN DIMENSIONS SHALL TAKE PREFERENCE OVER SCALED DIMENSIONS.
- SUPPORT AT HEADER FOR OPERATOR IS BY OTHERS.

CUSTOMER: _____ FILE NAME: PETSMART1A

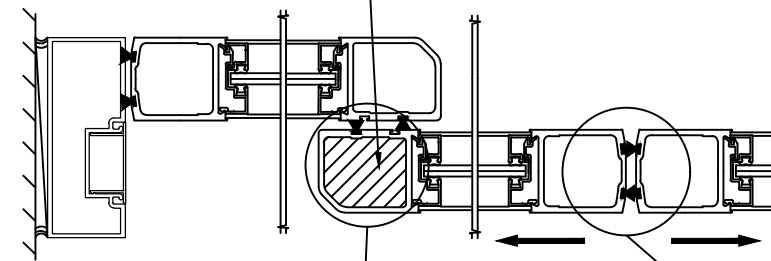
DO NOT SCALE THIS DRAWING DWG. BY: DDD
DRAWING DATE: 05/13/24, 05/15/24

NOTE: THE STANDARD PACKAGE CONSISTS OF:
THE AUTOMATIC OPERATOR & WEATHERSTRIP, FRAMES, DOORS &
SIDELITES WITH VERTICAL WEATHERSTRIP, EMERGENCY BREAKAWAY
& 2-POINT LOCK, 5 POSITION SWITCH;
(OFF-EXIT ONLY-AUTO-REDUCED OPENING-HOLD OPEN)
AND MOTION/PRESENCE SENSORS,
STD CLASS 1 ANODIZED FINISH: CLEAR- AA-M12C22A31, .010 MM.

ECD SEALS EXCEED ASTM E283 REQUIREMENTS BY REDUCING AIR
FLOW BY APPROXIMATELY 40%.



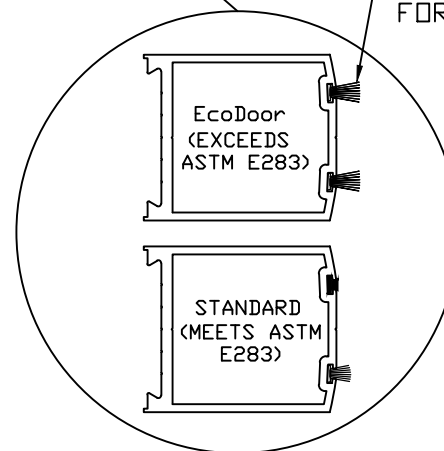
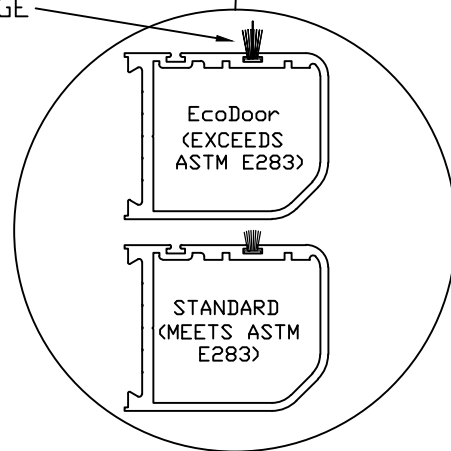
ECD FOAM INSERT
FOR AIR BLOCKAGE,
EXCEEDS ASTM E283



BREAKOUT SIDE

FIN SEAL FOR
AIR BLOCKAGE

TALL ECD SEALS
FOR AIR BLOCKAGE



F.F.L.

SWEEPS REQUIRED FOR ASTM E283
AND ECD PACKAGE

PRELIMINARY RELEASE
FOR APPROVAL

SHOP DRAWING APPROVAL
SIGNATURE: _____
DATE: _____

NOTE: BY SIGNING THIS SHOP DRAWING, THE
CUSTOMER IS APPROVING THE CUSTOM DOOR
CONFIGURATION FOR FABRICATION AS DRAWN.

CUSTOMER: _____ FILE NAME: PETSMA2
DO NOT SCALE THIS DRAWING DWG. BY: DDD
DRAWING DATE: 05/13/2024

" FIXED SIDELITE "

ASSA ABLOY PETSMA2
SHEET 2 OF 2

Finish Hardware

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 SECTION INCLUDES

1.2.1 Supply and off-load to place in a clean, dry, and secure room at the Place of the Project, which has been designated for storage of all finish hardware specified including necessary fastening devices.

1.2.2 Supply all finish hardware required and not supplied under other Sections.

1.2.3 Check and verify hardware information on door and frame shop drawings, prior to fabrication.

1.2.4 Packaging, labelling, provision of installation instructions, templates, fixings and similar items, and delivery to the Work site.

1.2.5 Give assistance at the Place of the Project to organize hardware storeroom and supply qualified staff to correctly categorize, mark, and arrange each item in groups to enable efficient dispensing in specified hardware groups for each door to installation trades.

1.2.6 Provide qualified staff at the Place of the Project promptly to assist installation trades subsequent to being requested and to ensure that hardware is being correctly installed.

1.2.7 Upon completion of installation of hardware, hardware Supplier shall arrange and conduct, in company of Consultant and Construction Manager, inspections to verify that all hardware is installed and functioning satisfactorily, and where necessary shall recommend adjustments of such items as closer arms, valves, door holders and latch and locksets. Report comments in writing to Consultant and Construction Manager.

1.2.8 Supply temporary locking cylinders and keys for construction purposes. Locks used for Construction Manager security shall be keyed as required to conform to building operations' security requirements.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

1.3.1 Use ULC listed and/or Warnock Hersey International labelled hardware for doors in fire separations and exit doors.

1.4 QUALITY ASSURANCE

1.4.1 Standards: Comply with standards specified in this section.

1.4.2 Qualifications of manufacturers: Products supplied under this section shall be from manufacturers regularly engaged in manufacture of similar items and with history of successful production acceptable to the Consultant.

1.5 SUBMITTALS

1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

Finish Hardware

- 1.5.2 Three copies of a detailed finish hardware list reviewed by a qualified AHC member of American Society of Hardware Consultants. List all items proposed to be furnished and delivered under this section.
- 1.5.2.1 Manufacturer's Specifications, catalogue cuts and other data required to demonstrate compliance with specified requirements.
- 1.5.3 Following review, the Consultant will return two copies to the Contractor. If copies are marked "Revised as Noted - Do Not Resubmit" or "Reviewed as Submitted", make photocopies and distribute.
- 1.5.4 Identify each hardware item by manufacturer, manufacturer's catalogue number, material, function, finish and location of item in Work.
- 1.5.5 Review of hardware list by Consultant shall not relieve Contractor from responsibility for furnishing all required finish hardware.
- 1.5.6 Samples
- 1.5.6.1 Within 15 Calendar Days deliver physical samples of approved finish hardware items to Consultant.
- 1.5.6.2 Identify each sample by label indicating applicable Specification paragraph or line number, brand name and number, finish and hardware package number.
- 1.5.6.3 Substitute new samples for those rejected by Consultant.
- 1.5.6.4 Consultant will retain samples until completion of Project, at which time, samples will be returned to Supplier.
- 1.5.6.5 Do not deliver any hardware to Site until all samples have been approved.
- 1.6 PRODUCT HANDLING**
- 1.6.1 Packaging and marking: Individually package each unit of finish hardware, complete with proper fastenings and appurtenances, clearly marked on outside to indicate contents and specific locations in the Work.
- 1.6.2 Replacements: In the event of damage, immediately make all repairs and replacements necessary to approval of Consultant and at no additional cost to Owner.
- 1.7 MAINTENANCE**
- 1.7.1 Maintenance data: Submit maintenance data, parts list and manufacturer's instructions for each type of door closer, lockset, latchset, door holders and fire exit hardware for incorporation into maintenance manual specified in Section 01 33 00.
- 1.7.2 Brief maintenance staff regarding proper care, cleaning and general maintenance.
- 1.7.3 Supply four sets of wrenches for door closers, locksets and fire exit hardware.
- 1.8 DELIVERY AND STORAGE**
- 1.8.1 Store finish hardware in locked, clean and dry area on site.
- 1.8.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- 1.8.3 Maintain inventory list with hardware schedule.
- 1.9 HARDWARE LIST**
- 1.9.1 The Supplier shall thoroughly check the hardware list forming part of this section and shall bring to the attention of the Consultant any errors or omissions therein.
- 1.9.2 Confirm degrees of swing for door holders and closers.

Finish Hardware

1.10 DOOR SCHEDULES

- 1.10.1 The Supplier shall thoroughly check the door schedules and Working Drawings to ensure that hardware listed can be used as specified in accordance with building codes and function. Bring to attention of the Consultant any errors or omissions therein.
- 1.10.2 Doors shown on Drawings and omitted from the schedules shall be included on the detailed finish hardware list.

1.11 WARRANTY

- 1.11.1 Warrant all exit devices for three years and door closers for ten years
- 2 Products

2.1 GENERAL

- 2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.
- 2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 HARDWARE

- 2.2.1 **Manufacturers:** unless otherwise shown in hardware schedule or shown on drawings, provide products from manufacturers as listed, or manufacturer equivalents as reviewed and approved by the Consultant.
- 2.2.2 **Hinges:**
- 2.2.2.1 Hager Hinge Canada- ECBB 11004 1/2x 41/2 NRP,
- 2.2.2.2 Hinges: SL40 Wide throw geared continuous hinge, heavy duty, to suit door function, door location, wall assembly and 180 degree swing.
- 2.2.2.3 Exterior door locations: Black finish
- 2.2.3 **Door closers: Hager 5100 26 5105 x Black finish**
- 2.2.4 **Cylinders: Best**
- 2.2.5 **Locksets/latchsets/deadlocks: Schlage L9000 Series or L400 as required, Black finish**
- 2.2.6 **Exit devices: Black finish**
- 2.2.6.1 Von Duprin 98 Series
- 2.2.6.2 Hager Exit Device
- 2.2.7 **Overhead door stops/stays: Glynn-Johnson**
- 2.2.8 **Flatware: Gallery Specialty Hardware**
- 2.2.9 **Weatherstrip Hager 891S N**
- 2.2.10 **Threshold: Hager 410S.**
- 2.2.11 **Sweep: Hager 750S N**
- 2.2.12 **Drip Cap: Hager 810S**
- 2.2.13 **Door Holder: Rockwood 460 x ALM**
- 2.2.14 **Electric Strike: HESS 8300 X 801E**

Finish Hardware

- 2.2.15 **Dust proof Strike: Hager 280X**
- 2.2.16 **Angle Latch Protector: Don Jo Angle latch protector ALP-206SL**
- 2.2.17 **Door Spy: Rudolph Door Spy DS100**
- 2.2.18 **Auto Flush bolt : Hager Auto flushbolt c/w 24" top rod**
- 2.2.19 **Fasteners:** Furnish all finish hardware with all screws, bolts and other fasteners of suitable size and type necessary to anchor hardware in position for trouble-free service under heavy duty usage.
- 2.2.19.1 Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors acceptable to Consultant, depending on material to which hardware is to be applied and recommendations of hardware manufacturer.
- 2.2.19.2 Fastenings shall harmonize with hardware as to material and finish.
- 2.2.19.3 Exposed screws for installing hardware shall have Phillips or Robertson heads.
- 2.2.19.4 Finishes: Hardware shall match finish of locksets. Take special care to coordinate all various manufactured items furnished under this section, to ensure an acceptable uniform finish.
- 2.3 MATERIALS**
- 2.3.1 Full Mortise Hinges: Non-removable pins at outswinging exterior doors, Ball bearing type "BB"
- 2.3.2 Exit Devices/Mullions: Exterior doors equipped with exit devices must have security deadlatching and cylindrical dogging. All doors equipped with exit devices to have lever trim to match lock/latchsets.
- 2.3.3 Locksets/Latchsets/Strikes: All mortise sets to come complete with three point anti-friction latchbolt, thru-bolted trim. All mortise levers to be solid stainless steel or forged brass as specified.
- 2.3.4 Door Closers
- 2.3.4.1 Use full through bolt fastening, "CTB". With "Top Jamb" application, supply arm through bolt fastening.
- 2.3.4.2 Spring power is to be of proper size to operate door efficiently. All door closers to be supplied as multi-sized. For exterior doors, supply closers multi-sized but pre-adjusted to size 4 for "Top Jamb" application, or size 5 for "Parallel Arm" application. For interior doors, supply closers multi-sized but pre-adjusted to size 3 for "Regular Mount" or "Top Jamb" application or size 4 for "Parallel Arm" application. It is the responsibility of Section 08 71 05 to make final adjustment on the door closers. This final adjustment is to include closing speed, latching speed and backcheck.
- 2.3.4.3 All door closers are to be supplied with full cover and are to be of a complementary design from one model type to the next. Door closers are to be of the same manufacturer throughout the Project.
- 2.3.4.4 Finish door closers supplied for all exterior door locations and for wet or damp interior door locations are to be with special rust inhibitor paint protection, "SRI".
- 2.3.4.5 Where specified for labelled wood fire doors, supply through bolts "CTB" for installing closers.
- 2.3.4.6 Supply screws for door closer arms/brackets of sufficient length to penetrate jamb head seals and still provide adequate securement to the frame surface.
- 2.3.4.7 Protect all door closers, except those having a built-in stop system such as "DS (Door Saver) or "CUSH" (Cushion Stop) models, with an auxiliary door stop. Such auxiliary stops shall be as specified, and may include either overhead, floor or wall mounted types.
- 2.3.5 Automatic Entrance System: Complete Stanley system supplied by this section.

Finish Hardware

- 2.3.6 Overhead Door Stops/Stays
- 2.3.6.1 Where an overhead door holder is to be used in conjunction with a door closer, provide stop only, or stop with hold open as specified. Where a door closer is not required, use a friction type, non-friction type, or non-friction with hold open type device as specified.
- 2.3.6.2 Supply screws for the jamb brackets for overhead door holders/stays of sufficient length to penetrate jamb head seals and still provide adequate securement to the frame surface.
- 2.3.6.3 All surface mounted overhead door holders/stays are to be supplied with through bolts for the door attachment.
- 2.3.7 Kickplates/Armour Plates: 1.2 mm minimum thickness stainless steel, Type 304, #4 finish, rounded corners, free of rough or sharp edges; drill for countersunk fixing with stainless steel flat head screws flush with finished surface. Supply with 3M tape only where specified.
- 2.3.7.1 Where door pulls are scheduled on one side of door and push plates on other side issue installation instructions so that the pull is secured through door from reverse side and countersunk flush with door prior to installation of push plate.
- 2.3.8 Wall Stops: Furnish wall stops of height to engage doors. Where wall stops cannot be used, use overhead door stops and/or floor stops as specified. Adjust to proper degree of stop.
- 2.4 KEYING**
- 2.4.1 All locksets, panic hardware and key switches will be supplied complete with Medeco high security, removable core cylinders, master keyed to a grand master key system. Supply cylinders less cores. Supply 50 temporary cores as required for use during the construction period which shall be master keyed and keyed differently.
- 2.4.2 Supply as directed by Consultant.
- 2.4.3 Regulatory requirements:
- 2.4.3.1 Ensure hardware for fire-rated openings complies with requirements of authorities having jurisdiction with door and frame manufacturer's ULC tested assemblies, and that hardware items bear ULC labels.
- 2.4.3.2 Doors to dwelling units shall be installed in accordance with the Building Code having Jurisdiction in regard to "resistance to forced entry".
- 2.4.3.3 Where barrier free access is indicated on the drawings and is required by the Building Code having Jurisdiction, provide barrier free hardware meeting OBC and authorities having jurisdiction requirements.
- 3 Execution
- 3.1 DELIVERY**
- 3.1.1 Stockpile all items sufficiently in advance to ensure their delivery to the site in a timely manner to ensure orderly progress of Work.
- 3.2 INSTALLATION INSTRUCTIONS**
- 3.2.1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their Work to receive hardware.
- 3.2.2 Furnish manufacturer's instructions for proper installation of each hardware component.
- 3.2.3 Fully adjust all non-sized or universal door closers in strict accordance with the manufacturer's printed instructions for spring power closing speed, latching speed and backcheck at the time of installation.

Finish Hardware

3.3 EXAMINATION

- 3.3.1 Confirm kickplate and threshold sizes before ordering.
- 3.3.2 Do not use wall stops on drywall, demountable or moveable partitions.

3.4 KEY SECURITY

- 3.4.1 Deliver to, and install all cylinders at the jobsite.
- 3.4.2 Key all doors to receive locks according to an approved key schedule

3.5 INSTALLATION

- 3.5.1 Hardware installation is specified in Section 08 71 05 – Installation of Doors and Finish Hardware.

3.6 ADJUSTMENT

- 3.6.1 Coordinate with hardware installer and adjust all items of hardware to operate smoothly. If a manufacturer's representative has done this Work, forward written confirmation of same.
- 3.6.2 Prepare or replace any hardware found defective.

END OF SECTION

Installation of Doors and Finish Hardware

08 71 05 – Installation of Doors and Finish Hardware

1 General

1.1 SUMMARY

- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
 - 1.1.2.1 Receive and install hollow metal doors and plastic laminate doors.
 - 1.1.2.2 Receive and install finish hardware in all doors listed in finish hardware schedule appended to Section 08 71 00. Receive templates from finish hardware Supplier.
 - 1.1.2.3 Final adjustment on door closers including closing speed, latching speed and backcheck.
- 1.1.3 Obtain up-to-date finish hardware schedule and keep a copy in a 3-ring binder at the jobsite. Make schedule available to the Consultant upon request. Record any changes made to hardware schedule at the site.
- 1.1.4 Keep a copy of all reviewed catalogue cuts and samples, if any, and have same readily available to the Consultant upon request.

1.2 QUALITY ASSURANCE

- 1.2.1 The Subcontractor performing the Work of this section shall be a firm specializing in the installation of commercial doors and high quality building finish hardware, both electrified and non-electrified.
- 1.2.2 Give assistance at the place of the Works to organize hardware storeroom and supply qualified staff to correctly categorize, mark, and arrange each item in groups to enable efficient dispensing in specified hardware groups for each door to installation trades.
- 1.2.3 Provide qualified staff at the place of the Works promptly to assist installation trades subsequent to being requested and to ensure that hardware is being correctly installed.

1.3 DELIVERY, STORAGE AND HANDLING

- 1.3.1 Receive and store doors and finish hardware. It must be noted that hollow metal doors are in two types, namely standard hollow metal with stiffened/insulated core, and fire rated hollow metal. Likewise, solid core wood doors come in both standard and fire rated assemblies. Ensure that such units are identified accordingly to ensure installation at their intended points of usage.
- 1.3.2 Jointly make an inventory of finish hardware with the hardware Supplier.
- 1.3.3 Handle, store and protect doors and finish hardware.

1.4 WARRANTY AND MAINTENANCE DOCUMENTS

- 1.4.1 Collect warranty and maintenance documents from finish hardware Supplier as specified in Section 08 71 00. Submit the foregoing documents upon Substantial Performance in accordance with Section 01 33 00.

Installation of Doors and Finish Hardware

- 2 Products
- 2.1 NOT USED**
- 3 Execution
- 3.1 DOORS**
- 3.1.1 Install doors to swing shut with minimum clearances of 1.6 mm at heads, 2 mm at jambs and 6 mm over finished floor surfaces. Check with door schedule for conditions requiring greater clearance from floor for air movement.
- 3.1.2 Install doors to swing freely but not loosely on their hinges, to close tightly and evenly on their frames without binding or rattling in the latched position.
- 3.1.3 Do not install warped, twisted or other defective doors.
- 3.1.4 Field trimming or cutting of wood doors is not permitted. All cutouts for mortise hardware, grilles and glass, and all bevelling and prefitting shall have been done in the door manufacturer's plant.
- 3.1.5 Secure plastic laminate transoms with concealed pins at head and clips at bottom corners.
- 3.2 FINISH HARDWARE**
- 3.2.1 Install building finish hardware in accordance with finish hardware schedule appended to Section 08 71 00. Carefully examine Section 08 71 00 for installation requirements specific to Section 08 71 05.
- 3.2.2 Install building finish hardware in accordance with finish hardware schedule appended to Section 08 71 00. Carefully examine Section 08 71 00 for installation requirements specific to Section 08 71 05.
- 3.2.3 Hardware Location:
- 3.2.3.1 Hardware location dimension shall be as follows; measured from finish floor to centre line of hardware unless indicated otherwise:
 - 3.2.3.1.1 Locksets/latchsets centre line of strike: 1034 mm
 - 3.2.3.1.2 Deadlocks/mortise night latch: 1524 mm
 - 3.2.3.1.3 Exit devices (centre line of strike): 1000 mm
 - 3.2.3.1.4 Push plates: 1000 mm
 - 3.2.3.1.5 Door pulls: 1000 mm
- 3.2.3.2 Hardware locations are to pre-determined standard industry recommendations. On custom doors, mount hardware across intermediate rail to meet architectural design considerations.
- 3.2.4 Protect installed hardware from damage.
- 3.2.5 Install kickplates on four sides with continuous pressure-sensitive 2-sided adhesive tape supplied with hardware.
- 3.2.6 Thresholds: Site measure openings before cutting. Set thresholds on two continuous beads of sealant conforming to Section 07 92 00.
- 3.2.7 Door closers and holders: Install door closers in such a manner that door opening is unaffected and that maximum swing is permitted. Prior to installing closer to the door, it is the responsibility of the installer to:
 - 3.2.7.1 Index the arm attachment so as to properly position the arm to the closer.
 - 3.2.7.2 Adjust the back check positioning valve in order to maintain an effective backcheck range.

Installation of Doors and Finish Hardware

3.2.8 Weatherstripping of Doors

3.2.8.1 Install weatherstripping effectively to tightly seal entire perimeter of doors. Secure in place with non-ferrous "Tec" screws, in accurate alignment.

3.2.8.2 Maintain integrity of weatherseal at head of doors fitted with closers. Adapt weatherstripping as required to achieve specified performance and provide any necessary accessories.

3.3 INSPECTION

3.3.1 Coordinate with finish hardware Supplier who provides inspection service during hardware installation and upon completion.

3.3.2 Adjust or rectify finish hardware items found to be improperly installed. Remove defective materials and replace with new materials supplied by the finish hardware Supplier at no cost to the Owner.

3.4 CLEANING

3.4.1 Wipe clean doors and frames of dust created from the door and hardware installation process.

3.4.2 Clean and polish all items of hardware and leave free from disfigurement.

END OF SECTION

Power Door Operators

- 08 71 13 Power Door Operators
- 1 General
- 1.1 SUMMARY**
- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.2 REFERENCES**
- 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
- 1.2.2 **American National Standards Institute (ANSI):**
- 1.2.2.1 ANSI A117.1 - Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People
- 1.2.2.2 ANSI/BHMA A156.10 - Pedestrian Doors, Power Operated
- 1.3 SUBMITTALS**
- 1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.3.2 **Shop Drawings:** Submit for review, detailing doors, operators, and control panel to be provided under this section.
- 1.3.2.1 Indicate materials and work to be supplied and/or installed under other sections.
- 1.3.2.2 Show exact dimensions, operator details and wiring.
- 1.4 WARRANTY**
- 1.4.1 Provide written warranty covering power door operators, against defects of materials and workmanship.
- 1.4.2 Operators shall be warranted for a period of one (1) year from date of installation. Warranty shall cover any failure due to material defects or workmanship.
- 2 Products
- 2.1 EQUIPMENT**
- 2.1.1 Door operators shall be completely self-contained.
- 2.1.2 Power operated entrance equipment shall comply with ANSI/BHMA A156.10 and ANSI A117.1.
- 2.1.3 Major aluminum extrusions shall be minimum 3 mm wall thickness, except operator housing, which shall be 4 mm wall thickness.
- 2.1.4 Air infiltration due to leakage shall not exceed 4 cfm per lineal foot of door crack as defined by ASHRAE #90. Substantiate amount of air infiltration by test data.
- 2.2 POWER OPERATED DOORS**
- 2.2.1 Furnish and install power operated sliding and swinging door operators as shown on Drawings, Door Schedule and as specified herein. Door operators shall be self-contained, electric-mechanical by Stanley Magic Door, by Besam Automated Entrance Systems Inc., Entrematic Canada, or other approved manufacture. Self-contained door operator shall consist of the following.
- 2.2.1.1 Operator housing
- 2.2.1.2 AC electric motor

Power Door Operators

- 2.2.1.3 Operator assembly
- 2.2.1.4 Electric control
- 2.2.2 Operator housing: Completely contained in a 150 mm x 150 mm extruded aluminum housing. All aluminum sections 6063-T5 alloy and shall be a minimum wall thickness of 4 mm. All exposed surfaces finished in clear anodized or coloured anodized finish to match door frames. Operator housing shall provide a seal against dust, dirt and moisture.
- 2.2.3 Electric motor: Equipped with standard built-in thermal overload protection and shall not exceed 5 amps current draw.
- 2.2.4 Operator assembly: Power transmission servo shall have only one moving part, ensuring superior reliability and low maintenance. Operator shall be non-handed to ensure maximum.
- 2.2.5 Power operated entrance systems shall be completely engineered, manufactured and assembled. Each unit shall undergo vigorous testing prior to shipment. The operator complete with electronic controller shall be factory assembled in the header, adjusted and tested. No field wiring or operator adjustment shall be required other than connection to job site power.
- 2.2.6 Control box shall be factory set to provide operating speeds and forces as prescribed by ANSI 156.10. Control box in conjunction with the position sensor shall automatically set the opening and closing speeds, the opening and closing check position, the full open and close position of the doors.
- 2.3 ELECTRICAL CONTROL**
- 2.3.1 Solid state completely enclosed electronic control with quick connect plugs shall incorporate the following features:
- 2.3.1.1 A 2-1/2 ampere current limiting circuit which limits the opening force of the operator to a maximum of 24 lb. force at the lock stile.
- 2.3.1.2 A "soft-start" motor driving circuit to smooth normal opening and recycle to minimize loosening of doors, pivots and frames.
- 2.3.1.3 An "energy saver" circuit that reduces power to the motor after 7 seconds of maintained opening signal.
- 2.4 OPERATION**
- 2.4.1 Power opening: The operator shall be powered open by force transmitted by the electric motor to operate and through adjustable arm linkage to the door. At all times a constant opening pressure shall be maintained. Both opening and closing speed shall be individually adjustable.
- 2.4.2 Power operated door system shall be a self-contained design requiring no remote pumps or compressors.
- 2.4.3 Spring Closing: The operator shall close the door by spring energy. The spring shall be non-handed and designed to counteract wind conditions and return the door to full close.
- 2.4.4 The operator shall function as a manual door closer in the normal direction of swing with or without electrical power.
- 2.4.5 The forces and speeds of power opening, manual opening, and spring closing shall conform to the requirements of ANSI A156.10.
- 2.4.6 Access to operator and electronic control box shall be provided by a full length removable cover, edge rabbeted to the header to ensure flush fit. The aluminum header, including structurally integrated end caps, shall have an anodized finish to match aluminum doors and frames.

Power Door Operators

2.5 ACTIVATING DEVICES

- 2.5.1 Controls shall cause door to open instantly when device located beside door is actuated, hold door open, and cause door to close - unless safety device or re-actuation of opening impulse overrides such operation.
- 2.5.2 Actuation devices shall be "Sure Wave" touchless switches with required accessories for a complete installation. Provide finish to match mullions.
- 2.5.3 Where indicated provide sensor control in control box which shall automatically set the opening and closing speeds, opening and closing check position, full open and close position of doors.
- 2.5.4 Two doorway holding beams (DHB) shall be factory installed in the sliding door package to provide safety by causing a door-open signal if the path of the sliding doors is interrupted by an object. DHB shall consist of separate transmitter and receiver.

2.6 FINISHES

- 2.6.1 All exposed aluminum surfaces shall be finished in clear anodized finish AA-M12C22A41 or coloured anodized finish AA-M12C22A44, Class I, 0.178 mm thick (0.7 mils), to match aluminum doors.
- 3 Execution

3.1 INSTALLATION

- 3.1.1 Install power door operators in accordance with manufacturer's instructions and reviewed shop drawings.

3.2 ADJUSTMENT

- 3.2.1 Upon completion of project and just prior to handing over of the building to the Owner or at a time as directed by the Consultant, inspect, test and adjust installation to ensure smooth and easy operation.
- 3.2.2 After repeated operation of completed installation, re adjust door operators and controls for optimum operating condition and safety.

END OF SECTION

Glazing

08 80 00 – Glazing

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American National Standards Institute (ANSI)

1.2.2.1 ANSI Z97.1 - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

1.2.3 American Society for Testing and Materials (ASTM):

1.2.3.1 ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass

1.2.3.2 ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting

1.2.3.3 ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting

1.2.3.4 ASTM D2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting

1.2.3.5 ASTM E2190 - Insulating Glass Unit Performance and Evaluation

1.2.4 Canadian General Standards Board (CGSB):

1.2.4.1 CAN/CGSB-12.1-M - Tempered or Laminated Safety Glass

1.2.4.2 CAN/CGSB-12.3-M - Flat, Clear Float Glass

1.2.4.3 CAN/CGSB-12.8-M - Insulating Glass Units

1.2.4.4 CAN/CGSB-12.9-M - Glass, Spandrel

1.2.4.5 CAN/CGSB 12.20-M - Structural Design of Glass for Buildings

1.2.5 National Fire Protection Association (NFPA):

1.2.5.1 NFPA 80 - Standard for fire doors and other opening protectives

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 **Product Data:** Submit manufacturer's Product data sheets for Products proposed for use in the work of this section.

1.3.3 Shop Drawings:

1.3.3.1 Show details of each type of glazing system in conjunction with the framing system indicating type of glass, sizes, shapes, glazing material and quantity. Show details indicating glazing material, glazing thickness, bite on the glass and glass edge clearance.

1.3.3.2 Indicate analysis of glass including maximum deflection and allowable stresses from imposed dead/live loads and thermal loads.

1.3.4 **Samples:** Submit 305 mm (12 inch) square samples of each type of glass indicated except for clear monolithic glass products, and 305 mm (12 inches) long samples of each colour required, except black, for each type of sealant or gasket exposed to view

Glazing

- 1.3.5 **Test and evaluation reports:**
- 1.3.5.1 Obtain compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealant as well as other glazing materials including insulating units.
- 1.3.5.2 Submit letter from IGMAC or IGMA/IGCC, or a test report prepared by independent testing company confirming insulating glass units of the types required have been successfully tested in accordance with CAN/CGSB 12.8 or ASTM E2190 and will withstand design loads specified in the Contract Documents. Test report must be produced recently and within 5 years period.
- 1.4 PERFORMANCE REQUIREMENTS**
- 1.4.1 **Glazing strength**
- 1.4.1.1 Design system so that edges of inner pane of insulating glass units do not fall more than 8°C below the temperature of the center of the inner pane.
- 1.4.1.2 Glass system shall be capable of withstanding normal thermal movements, wind loads without failure, including loss due to defective manufacture, fabrication and installation, deterioration of glazing materials, and other defects in construction.
- 1.4.1.3 Provide glass products of uniform appearance, reflectivity, hue, shade, visible light transmittance, and color when viewed from distance of 3 m (120 inches) to 30 m (1200 inches) perpendicular to the glass or from 45 degree angle to the glass. Reference ASTM C 1048 section 11.4.5-6.
- 1.4.1.4 Protect laminated glass interlayer from damage or discoloration resulting from contact with deleterious and incomplete sealants, substances, and materials. Comply with manufacturer's recommended installation instructions.
- 1.4.1.5 Provide glass products in the thickness and strengths required to meet or exceed the following criteria based on project loads and in-service conditions.
- 1.4.1.5.1 Analysis shall comply with CAN/CGSB 12.20-M.
- 1.4.1.5.2 Minimum thickness of heat-treated glass products to be selected so the worst case probability of failure does not exceed the following:
- 1.4.1.5.2.1 8 breaks per 1000 for glass installed vertically less than 15 degrees from the vertical plane and under wind action.
- 1.4.1.5.2.2 1 breaks per 500 for heat soaked tempered glass as a result of verifiable NiS inclusion.
- 1.4.1.5.2.3 1 break per 1000 for glass installed 15 degrees or more from the vertical plane and under action of wind and/or snow.
- 1.4.1.5.3 Maximum lateral deflection; insulating glass units:
- 1.4.1.5.3.1 For insulating glass units supported on four edges, limit centre-of-glass deflection at design wind pressure to not more than 1/175 times the longside length or 19 mm (3/4 inch) maximum.
- 1.4.1.5.3.2 For structural insulating glass units not supported on four edges, limit centre-of-glass deflection at design wind pressure to not more than 1/240 times the long-side length or 19 mm (3/4 inch) maximum.
- 1.4.2 **Thermal and optical performance:** Provide glass products with performance properties specified or published by glass manufacturer where not specified. Performance properties to be manufacturer's published data as determined according to the following procedures:
- 1.4.2.1 Center of glass U-value: National Fenestration Rating Council (NFRC) 100 methodology using LBNL WINDOW 7.6 computer program.
- 1.4.2.2 Center of glass Solar Heat Gain National Fenestration Rating Council (NFRC) 200 methodology using LBNL WINDOW 7.6 computer program.
- 1.4.2.3 Visible light transmittance. (NFRC) 200 methodology
- 1.4.2.4 Solar optical properties; (NFRC) 300 methodology or LBNL Optics.

Glazing

- 1.4.3 **Thermal movements:** Glazing systems shall be capable of withstanding normal thermal movements, wind loads indicated in wind study report, to maximum allowable deflection without permanent deformation and impact loads, without failure, including loss due to defective manufacture, fabrication and installation; deterioration of glazing materials; and other defects in construction.
- 1.4.4 **Protection:** Protect laminated glass interlayer from damage or discolouration resulting from contact with deleterious and incompatible sealants, substances, and materials. Comply with manufacturer's recommended installation instructions.
- 1.4.5 **Acoustical performance:** Provide glass products that meet the requirements of the Acoustic Report.
- 1.5 DELIVERY, STORAGE AND HANDLING**
- 1.5.1 Deliver materials to the site in original crates and containers with the maker's name and brand distinctly marked thereon and with glass labeled as to types. Do not remove labels on glass until after Work is accepted by the Consultant.
- 1.5.2 Store materials within the building, in a clean, dry location. Fully protect materials from damage until ready for use.
- 2 Products
- 2.1 MANUFACTURERS**
- 2.1.1 Products of the following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:
- 2.1.1.1 AGC Flat Glass North America Ltd.
- 2.1.1.2 Dow Corning
- 2.1.1.3 Guardian Industries Corp.
- 2.1.1.4 Momentive Performance Materials
- 2.1.1.5 PPG Canada Inc.
- 2.1.1.6 Pilkington Special Glass Limited
- 2.1.1.7 Tremco Canada
- 2.2 STANDARD GLAZING**
- 2.2.1 **Float glass:** 6 mm thick, conforming to CAN/CGSB-12.3-M, glazing quality, polished.
- 2.2.2 **Tempered safety glass:** 6 mm thick, clear, conforming to CAN/CGSB-12.1-M, Type 2, Class B, free from roller and tong marks
- 2.2.2.1 Tempered Glass Panels to be cut tempered glass to final size and shape before heat treatment; provide for proper edge clearance and bit on glass. Provide thickness indicated, but not less than that required to support structural loads.
- 2.2.3 **Laminated safety glass:** 6 mm thick, conforming to CAN/CGSB-12.1-M, Type 1, Class B, with optically clear polyvinyl butyral interlayer (PVB). PVB layer to be not less
- 2.2.4 **Insulating units:** Conforming to CAN/CGSB-12.8-M., with a Low "E" coating, Solarban 60 as manufactured by PPG Canada Inc., or Consultant approved alternative, and composed of minimum 6 mm thick, inner and outboard lites, complete with minimum 12 mm (1/2 inch) air space, 90% argon/10% air filled. Glass colour and surface coatings in locations as shown on drawings and as noted in glazing schedule below. Performance values as follows:
- 2.2.4.1 Visible light transmittance: 70%
- 2.2.4.2 U-Values: Winter nighttime - 0.29, Summer daytime - 0.27
- 2.2.4.3 Shading coefficient: 0.45
- 2.2.4.4 Solar heat gain coefficient: 0.39

Glazing

- 2.2.5 **Spandrel glass: CAN/CGSB-12.9-M, 6 mm thick unless otherwise indicated, with water-based silicone emulsion coating applied to backside, 'Opaci-Coat 300' by Oldcastle Glass or approved alternative. Colour: as selected by Consultant from manufacturer's standard colours. Insulation and metal back pan are as noted under glazing accessories.**
- 2.3 GLAZING ACCESSORIES**
- 2.3.1 **Glazing tape:** 440 polyisobutylene-butyl tape by Tremco Ltd.
- 2.3.2 **Structure glazing tape:** recommend acceptable:
- 2.3.2.1 SGT 900 by Tremco
- 2.3.2.2 Spacer tape by Dow Corning
- 2.3.2.3 Norton Thermal bond by St. Gobain
- 2.3.3 **Spacer shims and setting blocks:** Neoprene, Shore "A" Durometer hardness 70-90, 100 mm long, wide enough to extend from fixed stop to opposite face of glass and of height suitable to provide adequate glazing "bite" for setting blocks. Neoprene, Shore "A" 40 to 50 Durometer hardness, of adequate thickness to provide correct glass to face clearance of at least 3 mm for spacer shims. For glass in fire rated doors (screens) use ULC approved fire resistant setting blocks and spacer shims.
- 2.3.4 **Glazing channel (for interior glazing):** Black extruded neoprene or PVC channel gaskets, of size to suit glazing.
- 2.3.5 **Glazing compound:** 1-part clear silicone. GE Canada "Silpruf SCS 2000", Dow Corning "795" or Tremco "Spectrum 2".
- 2.3.6 **Security Film:**
- 2.3.6.1 Optically clear 6mil polyester film, abrasion resistant coating and release liner, interior grade. Provide 3M "Ultra S600" or Consultant approved alternative meeting the following minimum requirements:
- 2.3.6.1.1 Tested and compliant in accordance with ANSI Z97.1
- 2.3.6.1.2 Nominal Tensile Strength (ASTM D882-95a in PSI) = 30,000 PSI (2.07 x 10⁸ Pa)
- 2.3.6.1.3 Nominal Break Strength (ASTM D882-95a in lbs/inch width) = 180 lbs (32.1 kg/cm)
- 2.3.6.1.4 Min. Graves Area Tear (ASTM D1004-94a in lbs.%) = >1150 lbs.% (>523 kg %)
- 2.3.6.1.5 Min. Puncture Propagation Tear (ASTM D2582-93 in lbs) = 18.5 lbs. (8.4 kg)
- 3 Execution
- 3.1 INSPECTION OF JOB CONDITIONS**
- 3.1.1 Inspect openings and frames prepared by other trades into which glass is to be installed. Notify the Consultant in writing, of any conditions which will preclude proper installation. Do not glaze unsatisfactory locations until such conditions have been made good. Commencement of Work implies acceptance of existing conditions.
- 3.1.2 Obtain glass dimensions on the job site. Glass shall be 4 mm less than the rebate size in either dimension, with allowance for edge spacers, shims and setting blocks.
- 3.1.3 Free rabbets, stops and glass edges of dirt, moisture, oil and other foreign matter detrimental to or obstructing glazing material.
- 3.2 GLASS INSTALLATION**
- 3.2.1 Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- 3.2.2 Check that all openings and stops to be painted are primed before commencing Work.

Glazing

3.2.3 At completion of the Work, replace at own expense, glass provided under this section which is broken due to loose setting, binding in the frame, pinched by glazing clips, inadequate or improper use of setting blocks, improper workmanship or other causes.

3.3 INTERIOR GLAZING

3.3.1 Standard hollow metal doors: Install glass with continuous glazing channels on glass edges. Set glass and secure in place with stops butted tight to glazing channels. Screw stops to door with countersunk fluorocarbon coated oval head screws.

3.3.2 Standard wood doors: Install glass with continuous glazing channels on glass edges. Set glass and secure in place with stops butted tight to glazing channels. Secure stops to door with screws provided, with heads slightly below glass stop surface.

3.3.3 Standard hollow metal frames for screens and borrowed lights: Place setting blocks and spacers as required to support glass. Use a minimum of two setting blocks, locate at $\frac{1}{4}$ points. Locate spacers at jamb edges of glass, uniformly spaced at 600 mm o.c. maximum, and 300 mm maximum from top and bottom.

3.3.4 Fire rated hollow metal doors: Set glass on continuous setting block with 6 mm gap between glazing stops and embed in putty in accordance with NFPA 80 requirements. All exposed joints between the metal and glass shall be struck and pointed.

3.4 EXTERIOR GLAZING

3.4.1 Apply setting blocks at quarter points on all four sides of openings.

3.4.2 Cut glazing tape to proper length and set against permanent stops when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but necessarily in one continuous length do not stretch tapes to make them fit the opening. Install horizontal strips first, extend over entire width of opening before applying vertical strips. Weld corners together by butting tape and dabbling with sealant.

3.4.3 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

3.4.4 Remove backing paper from tape prior to setting glass.

3.4.5 Apply continuous heel bead between glass and sash.

3.4.6 Place glass in opening, press tightly and evenly against glazing tape.

3.4.7 Apply continuous glazing tape on removable stop. Place and screw stop in place with fluorocarbon coated oval head screws. Apply elastomeric sealant cap bead over top between glass and removable stop.

3.5 IDENTIFICATION OF GLAZING

3.5.1 Provide on one side of all glass lites, temporary, easily removable, large safety decals, immediately after glass installation. Maintain safety markings until final clean-up. Remove all markings at time of final clean-up.

Glazing

3.6 SECURITY FILM

3.6.1 Install security laminate on inside surface of glazing as recommended by manufacturer.

3.6.2 Sealant: Interior edges of film to be sealed to window frame as recommended by Film manufacturer.

END OF SECTION

Gypsum Board

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1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American National Standards Institute (ANSI):

1.2.2.1 ANSI B 212.15 - Cutting Tools - Carbide-Tipped Masonry Drills
And Blanks For Carbide-Tipped Masonry Drills

1.2.3 American Society for Testing and Materials (ASTM):

1.2.3.1 ASTM A653/653M - Standard Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

1.2.3.2 ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

1.2.3.3 ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

1.2.3.4 ASTM C630 - Standard Specification for Water-Resistant Gypsum Backing Board

1.2.3.5 ASTM C645 - Standard Specification for Nonstructural Steel Framing Members

1.2.3.6 ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board

1.2.3.7 ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

1.2.3.8 ASTM C1396/C1396M - Standard Specification for Gypsum Board

1.2.3.9 ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber

1.2.3.10 ASTM D2056 - Method of Test for Resistance of Finish of Zippers to Dry Abrasion

1.2.3.11 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

1.2.4 Canadian Standards Association (CSA):

1.2.4.1 CSA A82.30-M - Interior Furring, Lathing and Gypsum Plastering

1.3 QUALITY ASSURANCE

1.3.1 Retain workmen skilled in gypsum board work to perform Work of this section in accordance with this Specification and the latest printed directions of the manufacturer.

Gypsum Board

1.4 DELIVERY, STORAGE AND HANDLING

- 1.4.1 Deliver materials in original packages, containers and bundles bearing brand and manufacturer's name. Handle materials with care to prevent damage thereto. Store in a covered area off the ground, on flat, smooth, dry surfaces.
- 1.4.2 Protect this Work against damage at all times. Protect from moisture until ready for use.

1.5 PROJECT/SITE CONDITIONS

- 1.5.1 In cold weather and during period of gypsum board application and joint finishing, maintain temperatures within the building uniformly within the range of 13°C to 21°C (55°F to 70°F). Also provide adequate ventilation to eliminate excessive moisture within the building during this same period.

2 Products

2.1 MATERIALS

- 2.1.1 **Manufacturer:** Canadian Gypsum Co. Limited (CGC), Georgia-Pacific Corp. (GP), or Certain Teed Gypsum Canada Inc., unless specifically stated otherwise. Gypsum board shall conform to the flame spread rating requirements of the Ontario Building Code.
- 2.1.2 **Main runner channels:** 38 mm x 19 mm, cold rolled galvanized steel channels, weighing not less than 0.8 kg/m conforming to ASTM A568/568M and ASTM A653/653M.
- 2.1.3 **Metal furring channels:** 22 mm winged flange type, cold rolled galvanized steel channels conforming to ASTM A568/568M and ASTM A653/653M.
- 2.1.4 **Hangers:** 5 mm diameter pencil rods or 32 mm x 3 mm galvanized steel flat bars to CSA A82.30-M.
- 2.1.5 **Tie wire:** Not less than No. 18 gauge galvanized wire.
- 2.1.6 **Metal studs:** Standard gypsum board screw-on stud system complete with floor and ceiling runners conforming to ASTM A568/568M, ASTM C645 and ASTM A653/653M. Size: 32 mm wide x depths shown on Drawings. Use 20 gauge for abuse resistant board.
- 2.1.7 **Shaftwall framing:** "C-H" studs complete with "J" runners and "E" studs as required, all hot dipped galvanized.
- 2.1.8 **Gypsum board:** 13 mm, with tapered and rounded edge for joint filling, and in 1200 mm wide sheets of maximum practical lengths to minimize end joints:
- 2.1.8.1 For general use: GP "ToughRock", CGC "Sheetrock" or CertainTeed "Regular Gypsum Board" conforming to ASTM C1396.
- 2.1.8.2 For exterior soffit application: CGC "Exterior Ceiling Panel", GP "ToughRock Soffit Board" or Certain Teed "Exterior Soffit Board", conforming to ASTM C1396.
- 2.1.8.3 For fire rated assemblies: Minimum 16 mm thick Type "X" core conforming to ASTM C1396.
- 2.1.8.4 For exterior wall sheathing: Refer to Section 06 16 00, Sheathing.
- 2.1.8.5 Liner for shaftwall: CGC "Shaftwall Linerpanel" or GP "Toughwall Fireguard Shaftliner" or Certain Teed "GlasRoc Shaftliner", double bevelled edge, 25.4 mm thick, conforming to ASTM C1396.
- 2.1.9 **Backer board for tiled area:** 13 mm thick, in any of the following types:
- 2.1.9.1 Walls: Cementitious board, "PermaBase" by National Gypsum, "Util-A-Crete" distributed by Olympia Tile International Inc., "Durock" distributed by Canadian Gypsum Company, or "Wonder Board" by Canwel.
- 2.1.9.2 Ceilings: Composite board, "Dens-Shield" by Georgia Pacific or Certain Teed "Diamondback Tiler Backer Board".

Gypsum Board

- 2.1.10 **Security mesh:** Provide galvanized, expanded steel mesh with minimum weight of 4.9 kg/sq.m. (1.0 lb/sq.ft.):
- 2.1.10.1 DRAMEX Security Mesh -10F 1.5" by Dramex Expanded Metals
- 2.1.10.2 AMICO – ISG Security Mesh ASM 1.5-9F by AMICO Canada
- 2.1.10.3 Or Consultant approved alternative
- 2.1.11 **Column covers:** Non-combustible glass fibre-reinforced high density gypsum (GRG) conforming to ASTM E-84, fabricated in two vertically divided sections attached with screws and with field finished joint. All fasteners are to be concealed. Provide all support structures. Acceptable manufacturers: Formglas Inc. or DecoForm Inc.
- 2.1.12 **Backer board screws:** "Hi-Lo" bugle head Type S point concrete backer board screws, corrosion resistant.
- 2.1.13 **Gypsum board screws:** 5 mm x 25 mm (No. 6 gauge) x 1" long for metal furring application and 5 mm x 32 mm (No. 6 gauge) x 1-1/4" long for metal stud application. Screws shall be self-drilling, self-tapping, case hardened, with socket countersunk heads to ASTM C1002, Type S.
- 2.1.14 **Screws for gypsum board on wood studs:** 5 mm (No. 6 gauge) x length to penetrate minimum 16 mm into wood. Screws shall conform to ASTM C1002, Type W.
- 2.1.15 **Nails for exterior gypsum board sheathing on wood framing:** Roofing type, galvanized.
- 2.1.16 **Inserts for concrete slabs:** Tie wire anchors, Red Head TW-1614 by ITW Canada Inc., Parabol Wire Hanger distributed by Acrow-Richmond Ltd., T-14 Eyebolt by Ramset Ltd. or Tie Wire Drive TW-932 by Isometric Ltd.
- 2.2 ACCESSORIES**
- 2.2.1 Reinforcing**
- 2.2.1.1 External corner reinforcement: Domtar "Metal Corner Bead", CGC "Dur-A-Bead", Certainteed "AquaBead Corner Reinforcement" or GP equivalent.
- 2.2.1.2 Casing beads: 0.56 mm (25 gauge) galvanized steel designed to accept the specified thickness of gypsum board.
- 2.2.1.3 Joint reinforcement tape (gypsum board): Domtar "Joint Tape" CGC "Perf-A-Tape", Certainteed "FibaTape" or GP equivalent, conforming to ASTM C475.
- 2.2.1.4 Joint reinforcement tape (backer board): Glass mesh.
- 2.2.1.5 Joint filler, topping cement: For gypsum board, use manufacturer's high grade premixed compound. For composite and cementitious backer board, use board manufacturer's high grade premixed compound for waterproof exposure.
- 2.2.1.6 Control joint strip: Roll formed zinc coated metal with a tape protected void, 6 mm wide throat x 11 mm deep with flanges for embedding in joint compound.
- 2.2.2 **Adhesive for gypsum board on rigid insulation:** 3M No. 2166 or ICI Devoe D.W.24.
- 2.2.3 **Adhesive for gypsum board on masonry or concrete walls:** Joint filler mixed with water in accordance with manufacturer's directions.
- 2.2.4 **Acoustic insulation:** thickness as noted on drawings. If thickness is not noted, provide minimum 50 mm thick. QuietZone Acoustic Batt by Owens Corning, "Sustainable Insulation Noise Reducer" by Certainteed, "Thermafiber Sound Attenuation Fire Blanket" by Thermafiber Inc., Inc. or "AFB" by Rockwool.
- 2.2.5 **Acoustic sealant:** Tremco "Acoustical Sealant", PRC "PR181", U.S.E.-Hickson "Kop•R•100" or Wilrep "SilenSeal" (water based). Covering bead at exposed applications shall be a material compatible with acoustic sealant, suitable for painting, as supplied by acoustic sealant manufacturer.

Gypsum Board

- 2.2.6 **Supplementary steel supports:** Steel conforming to Section 05 50 00.
- 2.2.7 **Metal deck flute closure:** Moulded to deck profile; moulded cellular neoprene or rubber closure pieces at non-rated locations and fire rated closed cell neoprene conforming to ASTM D1056 or D2056 at fire rated locations.
- 2.2.8 **Access Panels:** to be provided by Division 23.
- 3 Execution
- 3.1 GENERAL**
- 3.1.1 Install fire rated gypsum board to provide the fire ratings shown. Conform to applicable ULC/Warnock-Hersey designs and to manufacturer's specifications. Provide corner beads on all external corners.
- 3.2 SUSPENSION SYSTEM**
- 3.2.1 Locate anchorage points in reinforced concrete floor slab underside 35 MPa compressive strength in accordance with gypsum board manufacturers' suspension requirements. Drill holes with carbide-tipped drill bits conforming to ANSI B212.15. Install anchors; minimum installation depth and method of expansion as recommended by anchor manufacturer.
- 3.2.2 Do not secure hangers to metal deck or mechanical ducts. Hang grillage for suspended gypsum board ceilings independent of walls, pipes, ducts. Securely anchor to the building structural framing (slab).
- 3.2.2.1 Space hangers at 1200 mm maximum centres along the carrying channels, and not more than 150 mm from ends.
- 3.2.2.2 Place supplementary steel supports as required to maintain hanger spacing and to keep metal deck and mechanical ducts free from hangers being secured to.
- 3.2.3 Space carrying channels at maximum 1200 mm centres and not less than 25 mm nor more than 150 mm from boundary walls.
- 3.2.3.1 Run the channels transverse to structural framing members.
- 3.2.3.2 Where splices are necessary, lap members at least 200 mm and wire each end with two loops.
- 3.2.3.3 Avoid clustering or lining up splices. Attach to rod hangers by bending hanger sharply under bottom flange of runner and securely wire in place with a saddle tie.
- 3.2.4 Note: All stems on precast concrete double tee deck have 13 mm diameter holes, at 1200 mm o.c. and are available to ALL trades for attachments and hangers. Not all holes will therefore be used for gypsum board suspension alone. Provide supplementary steel as required and attach to holes that are available.
- 3.2.5 Install furring channels transverse across carrying channels or other supports.
- 3.2.5.1 Space at 400 mm centres and not less than 25 mm nor more than 150 mm from boundary walls, openings, interruptions in ceiling continuity and change in direction.
- 3.2.5.2 Secure to each support with clips or equivalent attachment.
- 3.2.5.3 Splice joints by nesting and tying channels together or with custom splicers.
- 3.2.5.4 Level to a maximum tolerance of 3 mm over 3600 mm
- 3.2.5.5 Reinforce wherever necessary for the proper support of luminaires, access hatches, ceiling grilles, outlet boxes, ventilating outlets and all other openings.
- 3.2.5.6 Provide special furring as required at recessed lights.
- 3.2.6 Provide control joints in ceilings, furring and panelling where stresses are likely to develop, such as at the following locations.
- 3.2.6.1 At abutting structural elements
- 3.2.6.2 At dissimilar walls and ceilings

Gypsum Board

- 3.2.6.3 At dissimilar backup interface at structural expansion and control joints
- 3.2.6.4 At wings of "L", "U" and "T" shaped ceiling areas
- 3.2.6.5 At 9000 mm maximum spacing in continuous runs
- 3.2.7 Form control joints using continuous furring channels along each side of joint locations, and filling control joint space with specified joint strip, secured in place, making straight joints. Temporarily tape control joint "V" grooves in preparation for joint filling.
- 3.3 STEEL STUDS AND FURRING**
- 3.3.1 Install tracks at floors, ceilings and underside of deck over, align accurately and secure to structure at 600 mm centres maximum. Avoid piercing metal deck.
- 3.3.2 Close opening between top track and steel deck flutes on all full height partitions and bulkheads with specified deck flute closure. Install carefully and compress into place to close flute openings.
- 3.3.3 Close opening between track and concrete deck on all full height partitions. Where partitions are at right angles to stems on precast concrete double tee deck, extend studs above bottom of stems as required to support gypsum board. Cut and fit top track between stems.
- 3.3.4 On full height partitions at coffered ceilings, stop studs at ceiling level, install studs from top of ceilings to concrete deck. Cut and fit top track between stems as required.
- 3.3.5 Place studs vertically at 400 mm o.c. and not more than 50 mm from abutting walls, openings and each side of corners. Install studs and secure to tracks.
- 3.3.6 Arrange for mechanical and electrical horizontal runs within walls to be installed simultaneously with partitions.
- 3.3.7 Provide freedom for deflection under beams and deck to prevent transmission of structural loads to studs, or install 50 mm deep telescoping top tracks.
- 3.3.8 At openings, install horizontal track to accommodate intermediate studs. Cut out flanges at each end of track, turn up webs and screw to studs. Install intermediate studs above and below openings at same spacing as wall studs.
- 3.3.9 Provide double studs at all hollow metal door jambs. Secure at top and bottom and brace back to adjacent studs at mid-point.
- 3.3.10 Provide control joints in gypsum board partitions where stresses are likely to develop, such as at the following locations:
 - 3.3.10.1 At abutting structural elements
 - 3.3.10.2 At dissimilar backup interface
 - 3.3.10.3 At dissimilar walls and ceilings
 - 3.3.10.4 At structural expansion and control joints
 - 3.3.10.5 At door and other openings
 - 3.3.10.6 At 9000 mm maximum spacing in continuous runs
- 3.3.11 Form control joints using double studs back to back on each side of joint locations, and filling control joint space with specified joint strip secured in place, making straight joints. Temporarily tape control joint "V" grooves in preparation for joint filling.
- 3.3.12 Fixture and cabinet supports: Verify location of supports within gypsum board assemblies to support wall mounted fitments, cabinets, and other items. Cooperate and coordinate with carpentry trade and provide information in ample time to ensure supports are provided in the correct locations.

Gypsum Board

3.4 GYPSUM BOARD ON METAL SUSPENSION, STEEL STUDS AND FURRING

- 3.4.1 Erect gypsum boards vertically or horizontally, whichever results in fewer end joints. Locate edge or end joints over supporting members. Stagger vertical joints over different studs on opposite sides of partitions.
- 3.4.2 Locate vertical joints at least 300 mm from the jamb lines of openings.
- 3.4.3 Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1.6 mm open space between boards. Do not force into place.
- 3.4.4 Position boards so that both tapered edge joints abut, and mill-cut or field-cut where end joints abut. Do not place tapered edges against cut edges or ends.
- 3.4.5 Attach gypsum board to framing (and blocking) as required for additional support at openings and cutouts.
- 3.4.6 Do not locate joints within 200 mm of corners or openings, except where control joints are shown at jamb lines or where openings occur adjacent to corners in the partition/wall layout. Where necessary, place a single vertical joint over the centre of wide openings.
- 3.4.7 Where feasible, and where recommended by manufacturer, install gypsum board with "floating" corner construction, unless isolation of the intersecting boards is indicated or unless control or expansion joints are indicated.
- 3.4.8 Drive screws with a power screw-gun and set with the countersunk head slightly below the surface of the board.
- 3.4.9 In the case of double layers of gypsum board, screw first layer to studs and furring, laminate second layer to first using joint filler as an adhesive. Stagger joints between first and second layers. Brace face layer until adhesive has dried.
- 3.4.10 Receive access panels from mechanical division and install in gypsum board assemblies. Coordinate locations with mechanical division.

3.5 ACOUSTIC INSULATION

- 3.5.1 Install sound attenuation blankets to full height and full width of partitions where indicated. Fit carefully behind electrical outlets and other Work which penetrates partitions.

3.6 INSTALLATION OF SHAFTWALL

- 3.6.1 Install runners at floors and underside of deck over, align accurately and secure to structure at 600 mm centres maximum with short leg toward finish side of wall.
- 3.6.2 Close opening between top track and steel deck flutes on all full height partitions and bulkheads with specified deck flute closure. Install carefully and compress into place to close flute openings.
- 3.6.3 Cut liner panel 25 mm less than floor to ceiling height and erect vertically between J-runners. If wall exceeds maximum panel length, position panel and joints within upper and lower third points of wall. Stagger joints top and bottom in adjacent panels and reinforce joints with horizontal C-H studs. Screw-attach studs or runners on walls over 4800 mm high.
- 3.6.4 Install studs to within 10 mm of floor to ceiling height, between liner panel, with panel edge inserted into stud groove. Install full length steel E-studs or J-runners vertically at intersections, corners, and columns. Frame openings to maintain structural support for wall.

Gypsum Board

- 3.6.5 Install gypsum panels on finish side to studs with 25 mm type S screws at 300 mm maximum.
- 3.6.6 Provide freedom for deflection under deck to prevent transmission of structural loads to studs.
- 3.6.7 Install horizontal shaftwall using C-H studs at 600 mm o.c. unless shown otherwise. Use J-runner to connect system to wall studs. Screw fasten gypsum board to J-runners.
- 3.6.8 Provide control joints where stresses are likely to develop, such as at the following locations.
- 3.6.8.1 At abutting structural elements
 - 3.6.8.2 At dissimilar backup interface
 - 3.6.8.3 At dissimilar walls and ceilings
 - 3.6.8.4 At structural expansion and control joints
 - 3.6.8.5 At 9200 mm maximum spacing in continuous runs
- 3.6.9 Form control joints using J-runners or E-studs back to back on each side of joint locations, and filling control joint space with specified joint strip secured in place, making straight joints.
- 3.6.10 Install firestopping and sealant along perimeter edge, top and penetrations in fire rated assembly.
- 3.7 ACCESSORIES**
- 3.7.1 Erect plumb, or level, with minimum joints.
- 3.7.2 Corner reinforcing bead: Install along all external angles. Secure with screws at 225 mm o.c. Apply filler over flanges flush with nose of the bead and extending at least 75 mm onto surface of board each side of corner. When filler dries, apply a thin coat of topping cement and blend onto adjoining surfaces.
- 3.7.3 Casing beads: Install where wallboard butts against a surface having no trim concealing the juncture. Secure with screws at 300 mm o.c. Apply filler over flange flush with nose of the bead and extending at least 75 mm onto surface of board. When dry, apply a thin coat of topping cement and blend onto adjoining surfaces.
- 3.7.4 Recess channels and trim: Secure recess channels and special metal trim to substrate. Provide casing beads full height on wallboard edges at recess channels and metal trim.
- 3.8 JOINT TAPING, FINISHING**
- 3.8.1 Apply a coat of joint filler over board each side of joint and embed reinforcing tape. Cover edges of embedded tape with a thin coat of joint filler and complete joint with a final coat of topping cement feathered at least 200 mm each side of joint and cambered to a maximum thickness of 1.6 mm.
- 3.8.2 Fill any gaps between boards at internal corners with joint filler, allow to dry. Apply thin coat of joint filler over board 50 mm on each side of corner. Embed angularly creased reinforcing tape and cover edges of tape with a thin coat. Apply second coat over tape on one side of corner and allow to dry before covering tape on other side. Apply finish coat of topping cement.
- 3.8.3 Fill screw holes and depressions over each screw and nail head with joint filler/topping cement.
- 3.8.4 After topping cement has dried, sand surface lightly with No. 00 sandpaper and leave smooth, ready for painting. Apply second coat of filler if required.
- 3.8.5 Finish work smooth, seamless, plumb, true, flush and with square, plumb, neat corners.

Gypsum Board

3.8.6 Remove control joint "V" groove tape.

3.9 JOINT TREATMENT OF BACKER BOARD - TILED AREAS

3.9.1 Pre-fill joints of board with thin-set mortar and embed glassfibre tape. Press to a smooth finish. Allow to cure.

3.9.2 Provide control joint around ceiling perimeter, in addition to locations outlined earlier in this section.

3.10 JOINT TREATMENT AND FINISHING OF BACKER BOARD – UNTILED

3.10.1 Apply 50 mm glassfibre tape uniformly over joints and corners in a bed of joint compound. Cover fasteners with joint compound. Apply in accordance with manufacturer's directions.

3.10.2 Apply board manufacturer-recommended base coat uniformly on surface of board.

3.10.3 Apply 2.4 mm thick uniform water resistant skim coat as recommended by board manufacturer, finish smooth similar to that of gypsum board, ready to receive coating.

3.10.4 Provide control joint around ceiling perimeter, in addition to locations outlined earlier in this Section.

3.11 FINISHING

3.11.1 Finishing shall conform to the following ASTM C840 Finish Levels 0 through 5 as required.

3.11.1.1 Level 0: For temporary construction

3.11.1.1.1 No taping, finishing or corner beads required.

3.11.1.2 Level 1: Gypsum board in areas above ceilings, concealed spaces, service corridors and other areas not open to public view, and in areas where sound and smoke control is required.

3.11.1.2.1 All joints and angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

3.11.1.3 Level 2: Where water resistant gypsum backing board (ASTM C630) is used as tile substrate, in warehouse storage or similar areas where surface appearance is not a primary concern.

3.11.1.3.1 All joints and angles shall have tape embedded in joint compound and have one separate coat or joint compound wiped with joint knife and leaving a thin coating over the tape and fastener heads. Accessories shall be covered by one coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges shall be acceptable.

3.11.1.4 Level 3: Gypsum board in areas to receive heavy or medium texture finishes before final painting. Do not use where smooth painted surfaces are specified.

3.11.1.4.1 All joints and angles shall have tape embedded in joint compound and two separate applications of joint compound over all joints, angles and fastener heads. Accessories shall be covered with two separate coats of joint compound. Joint compounds shall be smooth and free of tool marks and ridges. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration.

3.11.1.5 Level 4: Gypsum board in areas where flat paints, light textures are to be applied.

3.11.1.5.1 All joints and angles shall have tape embedded in joint compound and have three separate coats of joint compound over all joints, angles and fastener heads. Accessories shall be covered with three separate coats of joint compound. All joint compounds shall be free of tool marks and ridges. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration, and repaired if required.

3.11.1.6 Level 5: Where gloss, semi-gloss or non-textured flat paints are specified.

3.11.1.6.1 Equal to level 4 and, in addition, a skim coat shall be applied. Excess material shall be immediately sheared off, leaving a film covering the paper. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration.

Gypsum Board

3.12 ACOUSTICAL CAULKING

- 3.12.1 Apply acoustic sealant as the installation of acoustically insulated partitions proceed to ensure concealment of sealant. Work includes sealing perimeter of partitions, and openings and penetrations through partitions to achieve STC rating (required) shown on Drawings, in accordance with sealant manufacturer's printed directions.
- 3.12.2 Seal as follows:
- 3.12.2.1 At partitions, provide continuous, two 6 mm concealed beads of acoustical sealant under tracks and runners, behind steel studs at perimeter, and wherever Work abuts dissimilar materials.
- 3.12.2.2 At ceilings, provide continuous, two 6 mm concealed beads of acoustical sealant wherever Work abuts dissimilar materials.
- 3.12.2.3 Provide double seal at laminated partition faces. Install face layer with 6 mm edge clearance at terminations of Work, and install continuous bead of acoustical sealant all around.
- 3.12.2.4 At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of acoustical sealant.
- 3.12.2.5 Seal sides and backs of electrical boxes to completely close up openings and joints with a bead of acoustical sealant.
- 3.12.2.6 Where sound-rated partitions intersect non-rated walls or partitions, extend sound-rated construction to completely close sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.
- 3.12.2.7 Ceiling plenums: Where sound-rated partitions extend through non-sound rated ceilings to structural substrates above, extend the same treatment to that portion of the partition above the ceiling as specified for portion below the ceiling.
- 3.12.2.8 For double-layer partition applications, install base layer only above ceilings.
- 3.12.3 Where acoustic sealant is applied at exposed joints, apply a covering bead of topping sealant finish to a smooth, shallow concave surface.
- 3.12.4 Remove any excess sealant and smears as Work progresses and leave the Work in a clean condition to Consultant's satisfaction.

3.13 CUTTING, DRILLING AND PATCHING

- 3.13.1 Cut, drill and patch gypsum board as may be necessary to accommodate the work of other trades.

3.14 PROTECTION BOARD

- 3.14.1 Neatly cut boards in straight line. Position in place and butt together in moderate contact with 3 mm gap between boards.
- 3.14.2 Predrill and screw in place keeping a fastener distance of 19 mm from edge of board, and in accordance with manufacturer's directions.

END OF SECTION

General Requirements for Floor Finishes

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.1.3 This section specifies testing of concrete floor slab on grade to guarantee a suitable substrate to receive the floor finishes specified in Division 9. Perform and pay for the following:

1.1.3.1 Moisture tests using calcium chloride quantitative test method

1.1.3.2 Humidity tests

1.1.3.3 Dew point tests

1.1.3.4 pH tests

1.1.3.5 Verify 28-day curing of concrete

1.1.3.6 Coordinate HVAC requirements for testing purposes

1.1.3.7 Notify all parties of test results

1.2 QUALITY ASSURANCE

1.2.1 Technicians: Individuals from a company engaged in the business of performing construction testing and inspection services of the type required by this section, for a minimum of two years within the past five years.

1.3 REFERENCES

1.3.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.3.2 American Society for Testing and Materials (ASTM):

1.3.2.1 ASTM D4262 - Standard Test Method for pH of Chemically Cleaned or Etched Concrete

1.3.2.2 ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.3.2.3 ASTM F1869 - Standard Test Method for Measuring Moisture Vapour Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.3.2.4 ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes

1.4 SUBMITTALS

1.4.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.4.2 Technicians' qualifications: Confirmation of technicians' qualifications as specified, and confirmation of test method to be used.

1.4.3 Test Reports: Submit to the Consultant, summary of tests leading to satisfactory results, prior to floor finish installation. Report to follow specified contents and format. No floor finish installation shall proceed without satisfactory test results reported to, and acknowledged by, the Consultant.

General Requirements for Floor Finishes

- 2 Products
- 2.1 **NOT USED**
- 3 Execution
- 3.1 **FLOOR FINISHES SCHEDULE COORDINATION**
- 3.1.1 Coordinate testing with the schedule of floor finishes operations. Installation of finishes is predicated upon a concrete substrate that is suitable for installation of finishes as proven by satisfactory test results.
- 3.2 **SITE MEETING**
- 3.2.1 Prior to start of Work, attend a site meeting with the Construction Manager and Consultant, Contractor and Floor Finishes Subcontractors. Purpose of the meeting is to ensure familiarity with the requirements of the Work, common understandings reached, methodologies, relationships and protection of work criteria are understood.
- 3.3 **TESTING**
- 3.3.1 An appropriate environment is required during testing. Coordinate provision of HVAC during test periods.
- 3.3.2 Remove curing compound and/or sealer at test locations using hand-held grinders.
- 3.3.3 Perform moisture testing in accordance with ASTM F1869 methods. No alternative test methods accepted.
- 3.3.4 Follow ASTM standards for number and frequency of tests. At any rate, satisfactory test results must be representative of the total floor.
- 3.3.5 Perform relative humidity tests in accordance with ASTM F2170.
- 3.3.6 Perform pH testing in accordance with ASTM D4262 and ASTM F710.
- 3.4 **REPORTING**
- 3.4.1 All reports shall be prepared by the technician conducting the test, who shall affix his/her signature to the reports. The reports shall confirm compliance of the Work with the Contract Documents and signed by the technician.
- 3.4.2 Report format shall be columnar, containing the information listed below, and, where applicable, contain notations of the specified standard or other reference covering the items to be tested.
- 3.4.3 Information required in the reports, as a minimum:
 - 3.4.3.1 Test location
 - 3.4.3.2 Test method used (indicate passing result)
 - 3.4.3.3 Confirm surface for testing has been prepared
 - 3.4.3.4 Start time and date of placing calcium chloride test
 - 3.4.3.5 Relative humidity (RH) at start time
 - 3.4.3.6 Ambient temperature (AT) at start time
 - 3.4.3.7 Results after test period
 - 3.4.3.8 Relative humidity (RH) at end of test
 - 3.4.3.9 Ambient temperature (AT) at end of test
 - 3.4.3.10 Satisfactory or unsatisfactory results. Repeat tests if results not satisfactory. Coordinate results with floor finishes trades
 - 3.4.3.11 Observations or comments
 - 3.4.3.12 Name and signature of technician; date report sent to Consultant.

General Requirements for Floor Finishes

END OF SECTION

Painting

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.1.3 Examine the Specifications and Drawings for the work of other Sections regarding the provisions for prime and finish coats.

1.1.4 Paint all exterior surfaces not prefinished or having a finish provided under other section.

1.1.5 Generally interior work shall be prime painted only, except for insulation on mechanical equipment, pipes and fittings, and other items requiring protection including electrical panels.

1.1.6 The following surfaces are not to be painted:

1.1.6.1 Exterior concrete surfaces

1.1.6.2 Concealed ceiling spaces and walls above gypsum wallboard ceilings and acoustic tile ceilings

1.1.6.3 Surfaces scheduled as having "No Finish" in Room Finish Schedules

1.1.6.4 Exposed concrete floors

1.1.6.5 Plywood backing panels in Electrical, Telephone and Communication Equipment Rooms

1.1.6.6 Stainless steel piping

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 Environmental Protection Agency (EPA):

1.2.2.1 Method 24 - EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products

1.2.3 Master Painters Institute (MPI):

1.2.3.1 - MPI Architectural Painting Specifications Manual

1.3 QUALITY ASSURANCE

1.3.1 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to a MPI Painting Specification) for all painting procedures including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

1.3.2 All paint manufacturers and Products used shall be as listed under the "Approved Products" section of the MPI Architectural Painting Specification Manual.

1.4 QUALIFICATIONS

1.4.1 Contractor: Minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.

1.4.2 Journeymen: Qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.

Painting

1.4.3 Apprentices: Working under direct supervision of qualified tradesperson in accordance with trade regulations.

1.5 SUBMITTALS

1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.5.2 **Product Data:** Submit Product data and instructions for each paint and coating Product to be used, along with paint thinner data and application methods.

1.5.3 **MSDS Sheets:** Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS). Indicate VOCs during application and curing.

1.5.4 **Samples:**

1.5.4.1 Submit full range colour sample chips to indicate where colour availability is restricted.

1.5.4.2 Submit duplicate 200 mm x 200 mm sample panels of each paint and stain with clear coating with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

1.5.4.2.1 3 mm plate steel for finishes over metal surfaces

1.5.4.2.2 50 mm concrete block for finishes over concrete or concrete masonry surfaces

1.5.4.2.3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces

1.5.4.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

1.5.4.4 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5.5 **Manufacturer's Instructions:** Submit manufacturer's installation and application instructions.

1.5.6 **Closeout submittals:** Submit maintenance data for incorporation into maintenance manual. Include following:

1.5.6.1 Product name, type and use

1.5.6.2 Itemized list complete with manufacturer, Product number, paint type and colour coding for all colours used for Owner's later use in maintenance.

1.5.6.3 MPI Environmentally Friendly classification system rating.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Pack, ship, handle and unload materials to jobsite with containers and labels intact.

1.6.2 Acceptance at Site

1.6.2.1 Identify Products and materials with labels indicating: manufacturer's name and address, type of paint or coating, compliance with applicable standard, colour number in accordance with established colour schedule.

1.6.3 Remove damaged, opened and rejected materials from site.

1.6.4 Storage and Protection

1.6.4.1 Provide and maintain dry, temperature controlled, secure storage

1.6.4.2 Store materials and supplies away from heat generating devices

1.6.4.3 Store materials and equipment in well ventilated area with temperature range 7°C to 30°C (45°C to 86°F)

1.6.5 Store temperature sensitive Products above minimum temperature as recommended by manufacturer.

Painting

- 1.6.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- 1.6.7 Remove paint materials from storage only in quantities required for same day use.
- 1.6.8 Fire Safety Requirements
 - 1.6.8.1 Provide one 9 kg fire extinguisher adjacent to storage area.
 - 1.6.8.2 Store oily rags, waste Products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - 1.6.8.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- 1.6.9 Waste Management and Disposal
 - 1.6.9.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - 1.6.9.2 Place materials defined as hazardous or toxic in designated containers.
 - 1.6.9.3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, regional and municipal regulations.
 - 1.6.9.4 Ensure emptied containers are sealed and stored safely.
 - 1.6.9.5 Unused paint and coating materials must be disposed of at legal hazardous material collections site.
 - 1.6.9.6 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous Products and are subject to regulations for disposal. Information on these controls can be obtained from provincial Ministries of Environment and regional levels of government.
 - 1.6.9.7 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - 1.6.9.8 Reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground.
 - 1.6.9.9 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- 1.7 SITE CONDITIONS**
 - 1.7.1 Heating, Ventilation and Lighting**
 - 1.7.1.1 Provide heating facilities to maintain ambient air and substrate temperatures above 10°C (50°F) for 24 hours before, during and after paint application until paint has cured sufficiently.
 - 1.7.1.2 Provide continuous ventilation for seven days after completion of application of paint.
 - 1.7.1.3 Coordinate use of existing ventilation system with Consultant and ensure its operation during and after application of paint as required.
 - 1.7.1.4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - 1.7.1.5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
 - 1.7.2 Temperature, Humidity and Substrate Moisture Content Levels.**
 - 1.7.2.1 Unless pre-approved written approval by Product manufacturer, do not perform painting when:
 - 1.7.2.1.1 Ambient air and substrate temperatures are below 10°C (50°F).
 - 1.7.2.1.2 Substrate temperature is above 32°C (90°F) unless paint is specifically formulated for application at high temperatures.
 - 1.7.2.1.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

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- 1.7.2.1.4 The relative humidity is under 85% or when the dew point is more than 3°C (38°F) variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3°C (38°F) below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint Work.
- 1.7.2.1.5 Rain or snow is forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
- 1.7.2.1.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand "normal" adverse environmental factors.
- 1.7.2.2 Perform painting Work when maximum moisture content of the substrate is below:
 - 1.7.2.2.1 Allow new concrete and masonry to cure minimum of 28 days.
 - 1.7.2.2.2 12% for gypsum board.
- 1.7.2.3 Test for moisture using calibrated electronic moisture meter. Test concrete floors for moisture using "cover patch test"
- 1.7.3 Surface and Environmental Conditions
 - 1.7.3.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - 1.7.3.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - 1.7.3.3 Apply paint when previous coat of paint is dry or adequately cured.

2 Products

2.1 MATERIALS

- 2.1.1 Paint materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.): As listed in the MPI Approved Products List (APL) are acceptable for use on this Project. All paints to be premium grade, as provided from one manufacturer.
- 2.1.2 Only qualified Products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this Project.
- 2.1.3 Conform to latest MPI requirements for exterior and interior painting Work including preparation and priming.
- 2.1.4 Shellac and turpentine: Highest quality Product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- 2.1.5 Provide paint Products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels.
- 2.1.6 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - 2.1.6.1 Water-based for concrete, concrete block and gypsum board
 - 2.1.6.2 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere
 - 2.1.6.3 Manufactured without compounds which contribute to smog in the lower atmosphere
- 2.1.7 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- 2.1.8 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.
- 2.1.9 All paint materials shall have good flowing and brushing properties and shall dry or cure free of blemishes or sags.

Painting

2.1.10 Where required, paints and coatings shall meet flame spread and smoke developed ratings designated by local code requirements and/or authorities having jurisdiction.

2.2 COLOURS

2.2.1 General: Colours for some elements to be painted are based on certain Product brands as indicated on the Drawings. Other Products may be used on the condition that colours selected by the Consultant must be matched at no extra cost even if it requires custom matching.

2.3 PAINT MIXES

2.3.1 Perform colour tinting operations prior to delivery of paint to site.

2.3.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

2.3.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

2.3.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.3.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

2.4.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60°	Sheen @ 85°
Gloss Level 1 - Matte Finish (flat)	Maximum 5	Maximum 10
Gloss Level 2 - Velvet-Like Finish	Maximum 10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

2.5 EXTERIOR PAINTING SYSTEMS

2.5.1 Concrete vertical surfaces; where indicated on drawings: (including horizontal soffits)

2.5.1.1 EXT 3.1A - Latex gloss finish

2.5.2 Concrete masonry units: (smooth and split face block and brick)

2.5.2.1 EXT 4.2A Latex finish (over block filler); gloss level: semi-gloss

2.5.3 Structural Steel and Metal Fabrications: Exposed steel, pipe bollards

2.5.3.1 EXT 5.1D - Alkyd semi-gloss finish

2.5.4 Galvanized metal (not chrome passivated): Exterior miscellaneous metal, hollow metal doors and pressed steel frames, rooftop ducts, vents, and piping, as indicated and as specified.

2.5.4.1 EXT. 5.3B - Alkyd semi-gloss finish

2.5.4.2 For hot dipped galvanized surfaces, apply polyamine epoxy tie-coat in lieu of cementitious primer and apply alkyd topcoat

2.5.5 Gas Piping

2.5.5.1 Paint surface of exterior natural gas piping

2.5.5.2 EXT 5.1D - Alkyd, semi-gloss finish, yellow colour

Painting

- 2.5.6 Dimension lumber: (columns, beams, exposed joists, underside of decking, siding, fencing, etc.)
- 2.5.6.1 EXT 6.2A Latex finish (over alkyd primer); gloss level: semi-gloss
- 2.5.6.2 EXT 6.2B Water based solid colour stain finish
- 2.5.7 Dressed lumber: (doors, door and window frames, casings, battens, smooth facias, etc.)
- 2.5.7.1 EXT 6.3A Latex finish (do not use flat finish on doors); gloss level: semigloss
- 2.6 INTERIOR PAINTING SYSTEMS**
- 2.6.1 Concrete Vertical Surfaces
- 2.6.1.1 INT 3.1C - Latex, semi-gloss finish
- 2.6.2 Concrete horizontal surfaces: (floors and stairs)
- 2.6.2.1 INT 3.2A Latex floor enamel finish; semi-gloss
- 2.6.3 Concrete masonry units: Concrete block
- 2.6.3.1 INT 4.2D - High performance architectural latex, semi-gloss finish
- 2.6.4 Structural steel and metal fabrications: Exposed structural and miscellaneous metals
- 2.6.4.1 INT 5.1C-DD - dry fall, water based acrylic, semi-gloss finish
- 2.6.5 Galvanized metal (not chrome passivated): Doors, frames, ferrous metal pickets/railings, miscellaneous steel, pipes, exposed decking underside, and ducts
- 2.6.5.1 INT 5.3K - water based acrylic, semi-gloss finish (over water based primer)
- 2.6.5.2 For hot dipped galvanized surfaces, apply polyamine epoxy tie-coat in lieu of cementitious primer and apply alkyd topcoat
- 2.6.6 Galvanized metal (not chrome passivated): Exposed decking underside, and ducts
- 2.6.6.1 INT 5.3H dry fall, water based acrylic, flat finish
- 2.6.7 Dressed lumber: (including doors, door and window frames, casings, mouldings, etc.)
- 2.6.7.1 INT 6.3A High performance architectural latex; semi-gloss
- 2.6.8 Gypsum board: Gypsum wallboard
- 2.6.8.1 INT 9.2B - High performance architectural latex, flat for ceilings; semi-gloss for walls, and semi-gloss for wet and service area walls and ceilings:
- 2.6.9 Interior of all Pipe Spaces and Ducts Visible Through Grilles, and all Surfaces Visible Through Louvres Occurring in Ceilings
- 2.6.9.1 INT 10.1A - Latex, flat finish, black colour unless indicated otherwise
- 2.6.9.2 Prepare surfaces as required by applying proper primers on the surface to which paint is applied. For surfaces above ceilings, paint surfaces after all services have been installed and prior to ceiling installation
- 2.6.10 Piping and Conduit (except gas piping)
- 2.6.10.1 INT 5.1C-G5 - dry fall, water based acrylic, semi-gloss finish
- 2.6.11 Gas Piping
- 2.6.11.1 INT 5.1C-G5 - INT 5.1C-G5 - dry fall, water based acrylic, semi-gloss finish, yellow colour
- 2.6.12 Fire Protection Piping
- 2.6.12.1 INT 5.1C-G5 - dry fall, water based acrylic, semi-gloss finish, red colour
- 3 Execution
- 3.1 MANUFACTURER'S INSTRUCTIONS**
- 3.1.1 Compliance: Comply with manufacturer's written recommendations or specifications, including Product technical bulletins, handling, storage and installation instructions, and data sheet.

Painting

3.2 GENERAL

- 3.2.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- 3.2.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

- 3.3.1 Examine substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with Work.
- 3.3.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with Work until conditions fall within acceptable range as recommended by manufacturer.

3.4 PROTECTION

- 3.4.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed Consultant.
- 3.4.2 Protect items that are permanently attached such as fire labels on doors and frames.
- 3.4.3 Protect factory finished Products and equipment.

3.5 SURFACE PREPARATION

- 3.5.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
- 3.5.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- 3.5.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Consultant.
- 3.5.4 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements.
- 3.5.5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- 3.5.6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
- 3.5.7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1 m.
- 3.5.8 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast Products from surfaces, pockets and corners to be painted by brushing with clean brushes or other suitable means.
- 3.5.9 Touch up of shop primers with primer as specified.

Painting

3.6 APPLICATION

- 3.6.1 Conform to manufacturer's application instructions unless specified otherwise.
 - 3.6.2 Brush and Roller Application
 - 3.6.2.1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - 3.6.2.2 Work paint into cracks, crevices and corners.
 - 3.6.2.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - 3.6.2.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - 3.6.2.5 Remove runs, sags and brush marks from finished work and repaint.
 - 3.6.3 Spray Application
 - 3.6.3.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - 3.6.3.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - 3.6.3.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - 3.6.3.4 Brush out immediately all runs and sags.
 - 3.6.3.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
 - 3.6.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
 - 3.6.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
 - 3.6.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
 - 3.6.7 Sand and dust between coats to remove visible defects.
 - 3.6.8 Finish closets and alcoves as specified for adjoining rooms.
 - 3.6.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- ### 3.7 MECHANICAL/ELECTRICAL EQUIPMENT
- 3.7.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
 - 3.7.2 Mechanical and electrical rooms: Paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
 - 3.7.3 Other unfinished areas: Leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
 - 3.7.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
 - 3.7.5 Do not paint over nameplates.
 - 3.7.6 Keep sprinkler heads free of paint.

Painting

- 3.7.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- 3.7.8 Paint fire protection piping red.
- 3.7.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- 3.7.10 Paint natural gas piping yellow.
- 3.7.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- 3.7.12 Do not paint interior transformers and substation equipment.

3.8 SITE TOLERANCES

- 3.8.1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.
- 3.8.2 Ceilings: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- 3.8.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.9 RESTORATION

- 3.9.1 Clean and re-install hardware items removed before undertaken painting operations.
- 3.9.2 Remove protective coverings and warning signs as soon as practical after operations cease.
- 3.9.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- 3.9.4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- 3.9.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

Loading Dock Equipment

1 General

1.1 SUMMARY

- 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.1.3 Loading dock equipment means dock levellers, door seals, vehicle restraints, dock lights and dock bumpers including all components and accessories to make the work fully operational.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **Canadian Standards Association (CSA):**

- 1.2.2.1 CSA-G40.20/G40.21-M - General Requirements for Rolled or Welded Structural Quality Steels/Structural Quality Steel
- 1.2.2.2 CSA C22.2 NO. 38-M - Thermoset Insulated Wires and Cables
- 1.2.2.3 CSA C22.2 NO. 45-M - Rigid Metal Conduit
- 1.2.2.4 CSA C22.2 NO. 56-77 - Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit

1.2.3 **Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association (CISC/CPMA):**

- 1.2.3.1 CISC/CPMA 2.75 - Canadian Institute of Steel Construction /Canadian Paint Manufacturers Association, "A Quick Drying Primer for Use on Structural Steel"

1.3 SUBMITTALS

- 1.3.1 All submittals as required by this Section, are shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.3.2 **Shop Drawings:** Submit Shop Drawings for fabrication and installation of loading dock equipment and master control panels for review in accordance with Section 01 33 00. Show materials and dimensions, arrangement and details of electrical Work, seal components, pit dimension and required clearances, method of attachment to structure and relationship to dock doors. Note that final pit dimensions are dependent on the type of equipment to be actually installed.
- 1.3.3 **Samples:** Submit samples of door seal covering material.
- 1.3.4 **Operation and maintenance data:** Submit operation and maintenance data containing complete description and sequence of operation together with wiring diagrams showing electrical connections, and parts catalogue giving complete list of repair and replacement parts and source, with cuts and identifying members. Submit in accordance with Section 01 33 00. Submit the following details on the manufacturer's local authorized dealers:
- 1.3.4.1 Name, address, years of business, proximity to dock equipment location, service capabilities, number of trucks, number of employees, length of time dealer has represented manufacturer.

Loading Dock Equipment

1.4 QUALITY ASSURANCE

- 1.4.1 Provide all materials and services required to provide the loading dock equipment and system integration services specified herein; all in accordance with applicable codes and regulations and the following requirements.
- 1.4.2 The intent of this Specification is to ensure that the equipment and controls specified are provided along with the necessary installation support, system integration, and commissioning services necessary to ensure a complete, safe, operational loading dock. These services shall include field verification of existing equipment, layout and arrangement; design and engineering of electrical controls for the integration of equipment; development and submission of Shop Drawings, maintenance, Product information and warranty documents; final installation check-out, punchlist development and commissioning; demonstration and training.
- 1.4.3 Loading dock equipment Supplier: The dock equipment Supplier shall be responsible for the complete installation, connection, start-up and integration responsibilities of all components of the dock system. As the system integrator, the equipment Supplier shall assume full responsibility for the proper and safe operation of the control system.
- 1.4.3.1 As the system integrator, coordinate equipment shop Drawings, perform field checks, develop overall electrical control Drawings, panel layouts, component identification and layout schematics; all as required to ensure proper electrical connection and installation.
- 1.4.4 Maintenance proximity: Not more than two hours normal travel time from Installer's place of business to Project site.
- 1.4.5 Installation of loading dock equipment: Carried out by the manufacturer or its authorized franchised installer, with workers specially trained and experienced in this type of Work. A senior qualified representative shall direct the Work at all times.
- 1.4.5.1 Obtain services of a fully certified electrician for electrical Work at (master) control panel and between each door unit and (master) control panel. Electrician to be a member of I.B.E.W. and to obtain Electrical Safety Authority (ESA) inspection permit.

1.5 DELIVERY, HANDLING AND STORAGE

- 1.5.1 Coordinate deliveries to comply with construction schedule. Handle at Site in a manner to avoid damage of any kind.
- 1.5.2 Protect Work of this section from damage. Protect other Work from damage resulting from this Work. Repair or replace damaged Work to the satisfaction of Consultant at no cost to Owner.

1.6 WARRANTY

- 1.6.1 Warrant Work of this section against defects and deficiencies for the periods stated below from date Work is certified as substantially performed in accordance with the general conditions of the Contract.
- 1.6.1.1 Dock levellers: 5 years on hydraulic elements, 15 years on structural elements
- 1.6.1.2 Door seals: 5 years
- 1.6.1.3 All others: 2 years

2 Products

2.1 GENERAL

- 2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.

Loading Dock Equipment

2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 SCISSORS LIFT

2.2.1 Blue Giant Model DL 12-72 x 96 - 14, or approved equal, with modifications as required to meet the following minimum requirements:

2.2.2 Capacity: 12000 LBS

2.2.3 DECK Size: 72" wide x 96" long

2.2.4 CSA APPROVED.

2.2.5 Checker deck and lip.

2.2.6 Provide 42 inch high removable bolt-on guard rails with mid-rail 4 inch kick plate on sides.

2.2.7 Hydraulic (velocity fuse) fall safe.

2.2.8 Built-in flip maintenance strut.

2.2.9 Safety striping on four deck sides.

2.2.10 Factory pre-set lowering speed for safe lowering of table with rated load.

2.2.11 Anti-slip powder coat on top surfaces, deck, and lip(s) powder coat finish

2.2.12 Power pack: Electric hydraulic with freestanding protective bollard system; power pack remote mounted complete with hydraulic hosing, applicable fittings, brackets and interconnection between power pack and leveller. Pump and motor to be shielded by a protective cover fabricated from 14 gauge mild steel with all joints welded and ground smooth, back of panel to be open to allow full air movement. Secure enclosure to bollard structure with four bolts which will allow removal for maintenance of equipment.

2.2.12.1 MOTOR, 7.5HP 575V/3Ph/60Hz,

2.3 DOCK SEALS

2.3.1 Blue Giant BG100V-22

2.3.2 Install as per manufacturers' recommendations.

Sized to suit Overhead door

2.4 TRUCK BUMPERS

2.4.1 Supplied and installed under the Work of this Contract.

2.4.2 Blue Giant DB-512 , or approved equal.

2.5 TRUCK WHEEL CHOCKS

2.5.1 Heavy duty cast aluminum 360 mm14" long x 180 mm7" wide x 254 mm10" high, nominal weight 6 kg13.23 lbs each. Provide 5500 mm18 feet of 2/0 welded cold steel zinc plated chain firmly attached to wall bracket and chock. Provide galvanized steel wall bracket to mount on foundation wall and for storage of chock and chain when not in use. Two per dock.

2.5.2 Blue Giant Wheel Chock Safety Kit (Chock & sign) 038-21E/720-5000/090-486-1,

Loading Dock Equipment

2.6 DOCK LIGHTS:

- 2.6.1 Serco "DH60", Kelley "Dual Arm Dock Lights" or Phoenix equivalent, conforming to the following requirements.
- 2.6.2 Support: Heavy duty square steel tubing construction in double strut design with steel wall mounting bracket, all in baked enamel finish.
- 2.6.3 Arm: Light to extend 1524 mm^{60"} with bronze sintered bearing, 360 degree rotation capability.
- 2.6.4 Light head: Steel construction to fit R40 or Par 38 type bulbs up to 300 watts with push button socket control to provide easy relamping. Supply light bulbs.

2.7 CONTROL PANELS

- 2.7.1 Furnish control panels and components conforming to applicable provisions of NEMA and CSA Standards. Component minimum requirements:
 - 2.7.1.1 Control panel shall be arranged and furnished complete with components and wiring to perform sequence of operation with appropriate interlocks as specified.
 - 2.7.1.2 All components, hardware and finishing shall be as per JIC unless specified otherwise
 - 2.7.1.3 Enclosure constructed from 14 gauge sheet metal, with removable panel of 12 gauge steel. Enclosure to be to NEMA 4. Allow 20% spare space in the panel for future use.
 - 2.7.1.4 Equipment within the panel enclosure shall be mounted on removable back plate and secured to the back plate with machine screws, lock washers and drilled and tapped holes. No sheet metal screws or self-tapping screws are to be used.
 - 2.7.1.5 Wiring which is to connect to field shall be brought to terminal blocks. Sufficient room shall be allowed on the field side of terminal blocks for the connection of field wiring.
 - 2.7.1.6 Tag wires at each point of connection or termination. Wire numbers as indicated on wiring diagrams.
- 2.7.2 Provide the following in the control panels:
 - 2.7.2.1 Modicon programmable controller and Allen-Bradley starters and relays.
 - 2.7.2.2 Pictorial displays of equipment operation on control panel cover.
 - 2.7.2.3 "Rated Capacity" sticker on the control panel for the following equipment: Dock Leveller, Truck restraint
- 2.7.3 Control Panel Components
 - 2.7.3.1 Dock Leveller Controls: raise button, independent lip extend button, emergency stop - mushroom style button, automatic return to dock selector switch auto/manual.
 - 2.7.3.2 Truck Restraint Controls: engage button, release button, Three position selector switch Power on/Lights only/Power off
 - 2.7.3.3 Dock Door Controls: inside pull cord operation, outside three pushbuttons - Up/Down/Stop
 - 2.7.3.4 Flanged Mounted Disconnect: 120/1/60 single phase receptacle on the side of control panel, Push/Twist/Lock style
- 2.7.4 Pushbuttons, selector switches, indicating lights and similar items: Front panel mounted, heavy duty oil tight type.

2.8 HANDSET

- 2.8.1 Furnish control panels and components conforming to applicable provisions of NEMA and CSA Standards. Component minimum requirements:
- 2.8.2 Handset 2 Button- Up/ Down, as supplied by Blue Giant , or approved equal

Loading Dock Equipment

2.9 ELECTRICAL MATERIALS AND EQUIPMENT

- 2.9.1 New materials bearing approval of CSA, or arrange for and obtain approval label of the Special Inspections Branch of Electrical Safety Authority (ESA) or other authority having jurisdiction for the particular application and location in which they are used.
- 2.9.2 Furnish units of same manufacture where two or more units of same class or type of equipment are required.
- 2.9.3 Manufacturer's names are stated in the Specification to establish a definite basis for tender submission and to clearly describe the quality of Product that is desired for the Work. Alternatives will only be considered if specified and agreed by Consultant prior to award.
- 2.9.4 Furnish hangers, clips bolts and supports required to install electrical Work from existing structural members. Do not attach or suspend any electrical Product or service from roof deck.
- 2.9.5 Conduit
- 2.9.5.1 Minimum raceway size: 19 mm³/₄"
- 2.9.5.2 Conduit: Hot dipped rigid thickwall galvanized steel threaded conduit to CSA C22.2 No. 45-M
- 2.9.5.3 Liquid tight flexible steel conduit with PVC cover: To CSA C22.2 No.56
- 2.9.6 Wire and Cable
- 2.9.6.1 Conductors: ASTM Class B, soft, bare stranded electrolytic copper
- 2.9.6.2 Conductors: Insulation XLPE to CSA C22.2 No. 38-M
- 2.9.6.3 RW90XLPE 90°C (194°F) rated, 1000 V insulation.
- 2.9.7 Conduit Boxes – General
- 2.9.7.1 Size boxes in accordance with latest edition of Ontario Electrical Safety Code
- 2.9.7.2 Galvanized cast for rigid thickwall threaded conduit
- 2.9.8 Interlocked Components of Dock System
- 2.9.8.1 The following items are interlocked: truck restraint, truck door, dock leveller
- 2.9.8.2 All equipment will be electrically interlocked. Should an operator make an attempt to use any of the equipment not in sequence, that equipment will not operate. For power to be allocated to an individual piece of equipment the proper sequence of operation must be followed. All equipment except the dock leveller will have a manual override switch to bypass the interlock should it be required.
- 2.9.9 Sequence of operation: Initial conditions; hook stored, door closed, hydraulic leveller stored.
- 2.9.9.1 Operator can open door by momentarily depressing "door open" button. Door will open to full open position.
- 2.9.9.2 Operator can close door by depressing and holding "door close" pushbutton until door reaches full closed position.
- 2.9.9.3 With truck positioned at loading dock, operator momentarily depresses "lock" membrane button.
- 2.9.9.4 Hook engages I.C.C. bar of truck:
- 2.9.9.4.1 If the hook cannot engage I.C.C. bar, the horn will sound, indicating truck must be secured by other means.
- 2.9.9.4.2 It is the responsibility of the operator to secure the truck by alternate means before entering the horn silence. When horn silence code is entered, the horn will silence.
- 2.9.9.5 Operator can not activate the hydraulic leveller by depressing the "dock leveller raise/store" pushbutton until the leveller is raised and lip is extended.
- 2.9.9.5.1 Alternate operation is to depress "lip out" pushbutton, while still depressing "dock leveller raise/store" pushbutton, as soon as lip clears truck bed.

Loading Dock Equipment

- 2.9.9.6 By releasing operators, dock leveller will lower to truck bed. By depressing "dock leveller lip out" pushbutton, only leveller will lock into current position until "lip out" pushbutton is released.
- 2.9.9.7 Once load/unload is complete, dock leveller can be stored by depressing "dock leveller raise/store" pushbutton. When truck bed is clear and lip retracted, releasing pushbutton will allow leveller to lower to stored position.
- 2.9.9.8 Operator cannot depress "lock" membrane button and hook will return to the stored position.
- 2.9.9.8.1 If truck was secured by other means, operator must enter horn silence code and within five seconds depress "unlock" membrane button. Hook will return to the stored position.

2.10 EQUIPMENT IDENTIFICATION

- 2.10.1 Develop a numbering and identification system for Consultant review, to identify all equipment, enclosures, panels devices, wireway, wires and terminals.
- 2.10.2 Maintenance stock: Authorized dealer awarded this Contract shall stock at its facility a minimum of two spare parts for all components installed with equipment.

3 Execution

3.1 EXAMINATION

- 3.1.1 Examine existing or completed work surfaces to receive the work or work that may be affected by the work of this Section and ensure that work done as part of the work of other Sections is complete and that there are no conditions which will adversely affect the performance of this work. Notify the Consultant immediately, in writing of any unsatisfactory conditions. Do not proceed with this work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of surfaces and existing conditions.

3.2 INSTALLATION

- 3.2.1 Fabricate and install all dock equipment in accordance with manufacturers' printed directions and reviewed Shop Drawings.
- 3.2.2 Set and align leveller units so that in the locked cross-traffic position, deck platforms are level with loading dock pit angle framing.
- 3.2.3 Adjust and lubricate levellers and other dock equipment as required and test operate in the presence of Consultant.

3.3 ELECTRICAL WORK

- 3.3.1 Wire and interconnect all components of loading dock equipment back to (master) control panel.
- 3.3.2 Mount control panels at locations shown.
- 3.3.3 Install controls in accordance with manufacturer's directions.
- 3.3.4 Install wiring in raceways unless noted otherwise.
- 3.3.5 Use liquid tight flexible metal conduit with ground conductor for the last 450 mm¹⁸" to rotating equipment.
- 3.3.6 Minimum wire sizes:
 - 3.3.6.1 Power and lighting - No. 12 AWG
 - 3.3.6.2 Control - No. 14 AWG
- 3.3.7 Use type RW90 for all wiring.

Loading Dock Equipment

3.4 INSPECTION AND TESTING

3.4.1 Test installations including safety devices as Work progresses and on completion.

3.4.2 Inspect and test electrical Work on completion. Make adjustments in accordance with approved Drawings and manufacturer's instructions. Provide Electrical Safety Authority (ESA) Inspection Certificate.

END OF SECTION

Earthwork

31 00 00 - Earthwork

1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.2.2.2 ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

1.2.3 Canadian Standards Association (CSA):

1.2.3.1 CSA-A23.1 - Concrete Materials and Methods of Concrete Construction

1.2.3.2 CSA-G401 - Corrugated Steel Pipe Products

1.2.4 Ontario Provincial Standard Specification (OPSS):

1.2.4.1 OPSS 1004 - Aggregates - Miscellaneous

1.2.4.2 OPSS 1010 - Ontario Provincial Standard Specification, Material Specification for Aggregates - Granular A, B, M and Select Subgrade Material

1.2.4.3 OPSS 1901

1.3 GEOTECHNICAL INVESTIGATION

1.3.1 Geotechnical investigation of the site may have been carried out for the Owner as a guide in design and construction. A report and borehole logs on the investigation were prepared and may be available.

1.3.2 No responsibility is assumed by the Owner or Consultant for the scope, accuracy, or interpretation of the geotechnical investigation report. Soil conditions between boreholes may be at variance with the information shown on the soil investigation report.

1.3.3 Be responsible for including in the Work, costs for all conditions identified or inferred in the report, including disposal of contaminated materials, if any, in accordance with MOE regulations.

1.4 LINES AND LEVELS

1.4.1 Establish lines and elevations from existing lines and elevations shown on Drawings.

1.4.2 Have lines and levels established by a registered Land Surveyor or a qualified Civil Engineer licensed to practice in the place of the Work.

1.4.3 Indicate location of building walls in relationship to property lines on plan.

1.4.4 Protect and maintain lines and bench marks as long as they are required and leave in place at completion of the Work.

Earthwork

1.5 SUBMITTALS

- 1.5.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
- 1.5.2 Submit a certificate issued by fill Supplier to substantiate that fill materials are free of contaminants.

1.6 SITE ACCESS CLEANING

- 1.6.1 Keep site access clear of mud, debris and dirt resulting from work of this section.

1.7 TESTING AND INSPECTION

- 1.7.1 Be responsible for granular/soil materials, placing and compaction throughout the Work of this Contract, as it progresses and on completion, to ensure specified materials, placing and required compaction densities are obtained.
- 1.7.2 Owner may appoint a third party independent testing company at its own expense for checking or approval of the Contractor's material placing and compaction work. Pay charges for re-testing after making good defective areas. Coordinate construction schedule with Consultant so that Owner's testing company can be notified in advance.
- 1.7.3 Provide the following and pay for all associated costs as part of the Contract:
- 1.7.3.1 Retain an independent, well established and qualified commercial testing agency to, a) maintain field quality control operations such as compaction tests, and, b) perform material testing in the laboratory and prepare test reports and other submittals. Testing agency shall have enough personnel and resources to perform a) and b) in a timely manner.
- 1.7.3.2 The testing agency personnel shall be qualified and have had experience on projects equal to the complexity of this Project. Upon request from the Owner, submit qualifications of the testing agencies and include their personnel for approval prior to retaining either one of the agencies.
- 1.7.3.3 The Owner reserves the right to request change in personnel or testing agency at any time.
- 1.7.3.4 Submit proposed material, including off-site borrow material, to the testing agency for its analysis and report, in sufficient time so as not to delay the progress of the Work. The testing agency shall approve all fill material prior to placement and shall observe placement to ensure lift thickness is as specified.
- 1.7.3.5 Testing agency shall submit, in duplicate, test report which includes tests, investigations, findings and recommendations to the Contractor and to the Owner, within twenty-four hours of the tests.
- 1.7.3.6 For field quality control of operations, testing agency shall determine the compaction of material placed and shall conduct the following minimum number of in-place density tests after monitoring the placing and compacting of each lift:
- 1.7.3.6.1 For mass filling: one test per lift of fill for each 100 square metres
- 1.7.3.6.2 Pavement subgrade: one test per final lift (subgrade) of fill or backfill for each 500 square metres, both after compaction and before base construction
- 1.7.3.6.3 Floor subgrade: One test per final lift (subgrade) or fill or backfill within building wall lines, for each 500 square metres, both after compaction and before slab construction
- 1.7.3.6.4 For trenches: three tests per lift of trench backfill for each 150 linear metres
- 1.7.3.7 If compaction tests indicate that a layer has not been brought to the required compaction, re-compact the area, prior to placement of additional material, until the required compaction is obtained. If the layer has been covered by a subsequent operation, remove such material before re-compacting the defective layer.
- 1.7.4 Submit a testing and inspection program to account for all the items specified above. Submit to the Consultant at pre-construction meeting or prior to start of construction.

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1.8 PROJECT CONDITIONS

1.8.1 Cultural Heritage Resources

1.8.1.1 If cultural heritage resources (such as archaeological sites, artifacts, building and structural remains, and/or human burials) are encountered during performance of Work, contact Consultant immediately and suspend Work in immediate area until assessment has been completed by Ministry of Culture, Tourism and Recreation. Perform required measures to mitigate negative impacts on found resources to acceptance of Consultant.

1.8.2 Existing Buried Utilities and Structures

1.8.2.1 Prior to commencing excavation, establish locations of existing buried service installations in the construction area. Notify service owners and obtain their approval to work in such areas. Place adequate markers and take protective measures to ensure that no damage is caused under the work of this section. Repair damaged work as required at no change in Contract Price.

1.8.2.2 Temporarily cover local existing catchbasins and manholes exposed to construction traffic to prevent entry of earth or debris.

1.8.3 Excavations

1.8.3.1 Erect necessary hoardings, guardrails, markers; place temporary warning lights; take all other measures required to ensure that no damage or injury is caused to persons, or damage to property resulting from this work.

1.8.3.2 Protect excavations and maintain warning devices during construction and during time when work is closed down for any cause.

1.8.4 Other Contracts, Existing Buildings and Surface Features

1.8.4.1 Protect work of other trades or of other contracts in progress or completed and protect Owner's existing properties, stored Products, services and utilities from damage.

1.8.5 Environmental Requirements

1.8.5.1 Dust control: Prevent any nuisance caused by dust and dirt rising throughout the area of operations with an adequate dust control system acceptable to the Consultant. Maintain system for the duration of the Work.

1.8.5.2 Silt control: Prevent silt from entering any storm drainage system with an adequate silt control system acceptable to the Consultant. For the duration of the work, maintain system on a regular basis and after rainfall by removing trapped silt and re-aligning and re-staking control system as required.

1.8.6 Drainage

1.8.6.1 Maintain new and existing drainage during construction. Manage the overland flows so as not to impact the existing flows from adjoining properties during construction.

2 Products

2.1 GENERAL

2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.

2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.

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2.2 MATERIAL

2.2.1 Granular materials - general: New materials conforming to OPSS 1010, imported from off-site, and sourced from a member of the Aggregate Producers Association of Ontario. Note: The use of slag and recycled aggregates is prohibited.

2.2.2 Granular Fill Materials

2.2.2.1 Base course: Granular "A"

2.2.2.2 Sub-base course: Granular "B" Type II

2.2.2.3 Sub-ballast: Granular "B" Type I

2.2.3 **Granular surfacing material:** New Granular "A" material manufactured from crushed limestone.

2.2.4 **Clear stone:** 20 mm (conforming to OPSS 1004.

2.2.5 **Electrical insulating crushed stone:** In accordance with OPSS 1010, free of organic material, and conforming to the following gradation:

Sieve Size	% Passing by Weight
37.5 mm	100
19 mm	0

2.2.6 **Select fill:** Native excavated site material approved by Consultant and capable of being compacted to required density and free of any vegetable or organic matter and roots, cinders or ashes, building debris, and rocks and stones larger than 75 mm (.

2.2.7 **Geosynthetic filter cloth:** Non-woven filter cloth; Terrafix Type 270R.

2.2.8 **Pipe subdrains and granular bedding, surround and backfill:** 1.32 mm (18 gauge), round perforated pipe, helically corrugated, galvanized steel conforming to CSA-G401 and CSPI Specification 501, complete with geotextile knitted sock. New granular material conforming to CSA-A23.1, Table 11, Group 1, 20-5 mm.

2.2.9 **Pipe culverts and granular bedding and surround:** Gauge as shown, round pipe, helically corrugated galvanized steel conforming to CSA-G401 and CSPI Specification 501. Imported Granular "A" material conforming to OPSS 1010.

2.2.10 Rock fill:

2.2.10.1 Hard, durable, abrasion resistant such that it will not disintegrate from action of wetting and drying, wave action, freezing and thawing cycles.

2.2.10.2 Minimum 100 mm (to maximum 200 mm (dimension for individual stones.

2.2.11 **Soil sterilant:** Complying with OPSS 1901.

2.2.12 **Outfall headwall:** 20 MPa compressive strength concrete at twenty-eight days, air entrained as specified in Structural Drawings.

2.2.13 **Outfall grating:** Steel bar construction, welded or bolted together and 610 g/m² (hot dip galvanized after fabrication, and with cinch anchor for attachment to headwall. Connect to coupler section on end of corrugated steel pipe.

2.3 STOCKPILING OF GRANULAR MATERIALS

2.3.1 Stockpile materials in a manner to prevent segregation.

2.3.2 Protect materials from contamination.

2.3.3 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

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- 2.3.4 Do not use intermixed or contaminated materials. Remove and dispose of materials rejected by Consultant within forty-eight hours of rejection.
- 2.3.5 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- 3 Execution
- 3.1 EXAMINATION**
- 3.1.1 Examine existing or completed work surfaces to receive the work or work that may be affected by the work of this Section and ensure that work done as part of the work of other Sections is complete and that there are no conditions which will adversely affect the performance of this work. Notify the Consultant immediately, in writing of any unsatisfactory conditions. Do not proceed with this work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of surfaces and existing conditions.
- 3.2 TOPSOIL STRIPPING**
- 3.2.1 Strip topsoil from working area in locations shown. Load, haul and dump in stockpiles separate from subsoil. Load, haul and dump in stockpiles of sufficient quantity to provide for 100 mm (topsoil depth over areas to be seeded or sodded.
- 3.2.2 Strip to prevent intermixing with, or removal of, underlying soil or objectionable materials.
- 3.2.3 Dish topsoil surface to retain moisture in the stockpile. Crown top of subsoil stockpile to facilitate drainage.
- 3.3 DITCHING**
- 3.3.1 Form drainage ditches to elevations indicated on Drawings.
- 3.3.2 Maintain positive drainage at all times.
- 3.3.3 Provide whatever temporary ditches or culverts required to expedite and facilitate construction activities of this section. Backfill such temporary ditches. Remove culvert and backfill excavated area upon completion of Work.
- 3.4 GRADING**
- 3.4.1 Grade as necessary to bring area outside building to the required elevations. Supply additional material required to obtain new grade levels. Place and compact as specified.
- 3.4.2 Grade for drainage ditches for roads and railroads and elsewhere throughout the site.
- 3.4.3 Graded areas shall be smooth to profile, free of debris, with local excavations and depressions filled and compacted as specified hereunder.
- 3.4.4 Supply additional material required to obtain new grade levels.
- 3.4.5 Maintain positive drainage.
- 3.4.6 Remove surface debris, roots, vegetation, branches and stones in excess of 50 mm (in size.
- 3.4.7 Provide roundings at top and bottom of banks and at other breaks in grades.
- 3.4.8 Do not disturb soil within branch spread of trees and shrubs remaining.
- 3.4.9 Excavate existing subsoil from on-site as required to obtain design grades. Transport, grade and compact approved earth borrow material as required for use as fill over areas indicated. Compact to 98% standard proctor maximum dry density.

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3.5 DEWATERING

- 3.5.1 Keep excavated areas free from standing water using power operated mechanical equipment.
- 3.5.2 Protect open excavations against flooding and damage due to surface run-off.
- 3.5.3 Obtain letter of conditional approval from authorities having jurisdiction to dispose of ground water into sewer drainage system. Apply for water disposal permit.
- 3.5.4 Keep excavations and trenches free of water throughout construction period.
- 3.5.5 Groundwater removal:
 - 3.5.5.1 Lower groundwater level and maintain at depth below lowest point of excavation to ensure a dry stable surface.
 - 3.5.5.2 Dewater to prevent loss of soil and maintain stability of sides and bottom of excavation and of adjacent structures.
 - 3.5.5.3 Dispose of water in conformance with applicable by-laws and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - 3.5.5.4 Supply and install flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to sewers, water courses or drainage areas in accordance with authorities having jurisdiction. Perform testing on settlement tank discharge to confirm that effluent meets sewer bylaw requirements. Locate tanks to acceptable area determined by Consultant.
- 3.5.6 Surface water removal:
 - 3.5.6.1 Remove surface run-off in a manner that will prevent loss of soil and maintain stability of sides and bottom of excavation. Obtain Consultant's approval of dewatering method to be used.
 - 3.5.6.2 Discharge surface water into existing storm drainage system to acceptance of Consultant and local authorities.

3.6 EXCAVATION

- 3.6.1 Excavate to depths indicated with proper allowance for subsequent construction. Excavation shall be clean and clear of loose material and true to size.
- 3.6.2 Perform excavation at or adjacent to existing structures or foundations in such a way that structures and foundations are not weakened or endangered in any way.
- 3.6.3 If undisturbed soil having the required bearing capacity is not encountered at depths indicated, determine possible additional volume of excavation that will be required and obtain Consultant's instructions in writing to excavate to additional required depth.

3.7 FILL

- 3.7.1 Compact exposed sub-grade prior to placing any fill. Compact areas inaccessible to roller with portable mechanical tampers. Have Soils Consultant accept compacted sub-grade. Remove any soft spots prior to placing any fill material.
- 3.7.2 Remove loose materials, debris, etc., from areas to receive fill.
- 3.7.3 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice. Ensure no frozen material is used in placing.
- 3.7.4 Fill areas receiving pavement with compacted courses of granular base and granular sub-base.
- 3.7.5 Place granular fill in loose layers not exceeding 200 mm (, with each layer thoroughly compacted

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- 3.7.6 Grade materials using methods which do not lead to segregation or degradation of aggregate.
- 3.7.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- 3.7.8 Remove and replace that portion of layer in which material becomes segregated during spreading.

3.8 COMPACTION

- 3.8.1 Use compaction equipment capable of obtaining required material densities.
- 3.8.2 Compaction Densities
 - 3.8.2.1 Granular materials: to 100% modified proctor maximum dry density in accordance with ASTM D1557.
 - 3.8.2.2 Earth subgrade and select fill: to 98% standard proctor maximum dry density in accordance with ASTM D698.
- 3.8.3 Shape and roll alternately to obtain smooth, even and uniform compaction.
- 3.8.4 Apply water as necessary during compaction to obtain specified density.
- 3.8.5 In areas not accessible to rolling equipment, compact to specified density with power operated portable plate compactors.
- 3.8.6 Depth and layers specified are minimum dimensions of fill after compaction, except where loose layer is specified.
- 3.8.7 Ensure compaction operations do not cause vibration and noise levels exceeding acceptable limits established by authorities having jurisdiction.

3.9 SURPLUS MATERIALS

- 3.9.1 Remove from the site and legally dispose of, excess excavated material, waste material, trash, debris and rubble resulting from earthwork operations.
- 3.9.2 Be responsible for obtaining all necessary regulatory approvals, consents and permits at own cost.

END OF SECTION

Excavation and Backfill for Structures

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1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **American Society for Testing and Materials (ASTM):**

1.2.2.1 ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.2.2.2 ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact With Earth or Granular Fill Under Concrete Slabs

1.2.2.3 ASTM E1745 - Specification for Plastic Vapor Retarders Used in Contact With Soil or Granular Fill Under Concrete Slabs

1.2.3 **Canadian Standards Association (CSA):**

1.2.3.1 CSA A5 - Portland Cement

1.2.3.2 CSA A363 - Cementitious Hydraulic Slag

1.2.4 **Ontario Provincial Standard Specification (OPSS):**

1.2.4.1 OPSS 1010 - Ontario Provincial Standard Specification, Material Specification for Aggregates - Granular A, B, M and Select Subgrade Material for Concrete

1.3 LINES AND LEVELS

1.3.1 Establish lines and elevations from existing lines and elevations shown on Drawings.

1.3.2 Have necessary lines and levels established by a registered Ontario Land Surveyor or a qualified registered Civil Engineer.

1.4 SUBMITTALS

1.4.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.4.2 Submit a certificate issued by fill Supplier to substantiate that fill materials are free of contaminants.

1.4.3 Submit manufacturer's Product data and mix design information of unshrinkable fill to confirm Product conformance to Specifications.

1.5 ACCESS ROAD CLEANING

1.5.1 Keep access roads clear of mud, debris and dirt resulting from Work of this section.

1.6 GEOTECHNICAL INVESTIGATION

1.6.1 Geotechnical investigation of the site may have been carried out for the Owner as a guide in design and construction. A report and borehole logs on the investigation were prepared and may be available.

Excavation and Backfill for Structures

1.6.2 No responsibility is assumed by the Owner or Consultant for the scope, accuracy, or interpretation of the geotechnical investigation report. Soil conditions between boreholes may be at variance with the information shown on the geotechnical investigation report.

1.6.3 Be responsible for including in the Work, costs for all conditions identified or inferred in the report, including disposal of contaminated materials, if any, in accordance with MOE regulations.

1.7 QUALITY ASSURANCE

1.7.1 Testing and Inspection:

1.7.1.1 The Contractor is responsible for granular/soil materials, placing and compaction throughout the Work of this Contract as it progresses and on completion to ensure specified materials, placing and required compaction densities are obtained.

1.7.1.2 The Owner may appoint a third party independent testing company at its own expense for checking or approval of the Contractor's material placing and compaction Work. Pay charges for re-testing after making good defective areas. Coordinate construction schedule with Consultant so that Owner's testing company can be notified in advance.

1.7.1.3 The Contractor is to provide the following and pay for all associated costs as part of the Contract:

1.7.1.3.1 Retain an independent, well established and qualified commercial testing agency to, a) maintain field quality control operations such as compaction tests, and, b) perform material testing in the laboratory and prepare test reports and other submittals. Testing agency shall have enough personnel and resources to perform a) and b) in a timely manner.

1.7.1.3.2 The testing agency personnel shall be qualified and have had experience on projects equal to the complexity of this Project. Upon request from the Owner, submit qualifications of the testing agencies and include their personnel for approval prior to retaining either one of the agencies.

1.7.1.3.3 The Owner reserves the right to request change in personnel or testing agency at any time.

1.7.1.3.4 Submit proposed material, including off-site borrow material, to the testing agency for its analysis and report, in sufficient time so as not to delay the progress of the Work. The testing agency shall approve all fill material prior to placement and shall observe placement to ensure lift thickness is as specified.

1.7.1.3.5 Testing agency shall submit, in duplicate, test report which includes tests, investigations, findings and recommendations to the Contractor and to the Owner, within twenty-four hours of the tests.

1.7.1.3.6 For field quality control of operations, testing agency shall determine the compaction of material placed and shall conduct the following minimum number of in-place density tests after monitoring the placing and compacting of each lift:

1.7.1.3.6.1 For mass filling: One test per lift of fill for each one hundred square metres.

1.7.1.3.6.2 Floor subgrade: One test per final lift (subgrade) or fill or backfill within building wall lines, for each five hundred square metres, both after compaction and before slab construction.

1.7.1.3.6.3 For trenches: Three tests per lift of trench backfill for each one hundred fifty linear metres.

1.7.1.3.7 If compaction tests indicate that a layer has not been brought to the required compaction, re-compact the area, prior to placement of additional material, until the required compaction is obtained. If the layer has been covered by a subsequent operation, remove such material before re-compacting the defective layer.

1.7.1.4 Submit a testing and inspection program to account for all the items specified above. Submit to the Consultant at pre-construction meeting or prior to start of construction.

1.7.2 Cooperate with and assist Owner's inspection/testing company's personnel during inspections and tests.

Excavation and Backfill for Structures

1.7.3 Remove defective materials and completed work which fails tests and replace as directed by Consultant.

1.7.4 Where work or materials fail to meet strength requirements as indicated by test results, pay costs of additional inspection and testing required for new replacement work or materials.

1.8 PROJECT CONDITIONS

1.8.1 Cultural Heritage Resources

1.8.1.1 If cultural heritage resources (such as archaeological sites, artifacts, building and structural remains, and/or human burials) are encountered during performance of Work, contact Consultant immediately and suspend Work in immediate area until assessment has been completed by Ministry of Culture, Tourism and Recreation. Perform required measures to mitigate negative impacts on found resources to acceptance of Consultant.

1.8.2 Protection

1.8.2.1 Existing buried utilities and structures:

1.8.2.1.1 Prior to commencing excavation, establish locations of existing buried service installations in the construction area. Notify service owners and obtain their approval to work in such areas. Place adequate markers and take protective measures to ensure that no damage is caused under the work of this section. Repair damaged Work as required at no change in Contract Price.

1.8.2.1.2 Temporarily cover local existing catchbasins and manholes exposed to construction traffic to prevent entry of earth or debris.

1.8.2.2 Excavations:

1.8.2.2.1 Erect necessary hoardings, guardrails, markers; place temporary warning lights; take all other measures required to ensure that no damage or injury is caused to persons, or damage to property resulting from this Work.

1.8.2.2.2 Protect excavations and maintain warning devices during construction and during time when Work is closed down for any cause.

1.8.2.3 Other contracts, existing buildings and surface features:

1.8.2.3.1 Protect work of other trades or of other contracts in progress or completed and protect Owner's existing properties, stored Products, services and utilities from damage

2 Products

2.1 GENERAL

2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 MATERIALS

2.2.1 Granular materials - general: New materials conforming to OPSS 1010, free of organic matter, imported from off-site, and sourced from a member of the Aggregate Producers Association of Ontario. Note: The use of slag and recycled aggregates is prohibited:

2.2.1.1 Backfill: OPSS Granular "B Type I"

2.2.1.2 Sub-base: OPSS Granular "B Type I"

2.2.1.3 Base: OPSS Granular "A"

2.2.2 Impervious fill: Fine grain material such as clay.

Excavation and Backfill for Structures

- 2.2.3 Unshrinkable fill: Ready mixed Product consisting of CSA-A5, Type 10 portland cement, CSA-A363 cementitious hydraulic slag, sand and water proportioned and mixed to produce a stable, self-levelling, controlled density fill with a compressive strength of 0.7 MPa at twenty-eight days. Cement content to be at 50 kg/m³ of mix.
- 2.2.4 Vapour retarder: 0.38 mm (15 mils) thick sheet membrane conforming to ASTM E1745; Stego Wrap Vapor Barrier by Stego Industries or Perminator by W.R. Meadows:
- 2.2.4.1 Lap tape: minimum 100mm wide Stego Wrap Red Polyethylene or Perminator Tape by W.R. Meadows.

2.3 STOCKPILING OF GRANULAR MATERIALS

- 2.3.1 Stockpile materials in a manner to prevent segregation.
- 2.3.2 Protect materials from contamination.
- 2.3.3 Separate different aggregates by strong, full-depth bulkheads, or stockpile far enough apart to prevent intermixing.
- 2.3.4 Do not use intermixed or contaminated materials. Remove and dispose of materials rejected by Consultant within forty-eight hours of rejection.
- 2.3.5 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

3 Execution

3.1 EXCAVATION

- 3.1.1 Remove obstructions from surfaces to be excavated.
- 3.1.2 Perform excavation with proper allowance for subsequent work including shoring, bracing and formwork. Clean and clear loose material in excavated areas, and ensure excavation is true to size. Underpin as shown on Drawings and as recommended in the geotechnical report.
- 3.1.3 Securely shore and brace sides of trenches and excavation deeper than 1200 mm with shoring and bracing extending at least 300 mm above the top of trenches or excavation.
- 3.1.4 Do not obstruct flow of surface drainage or natural watercourses.
- 3.1.5 Perform excavation at or adjacent to existing structures or foundations in such a way that structures and foundations are not weakened or endangered in any way. Where it is required to excavate adjacent to an existing building, all fill under existing floor slabs must be contained.
- 3.1.6 If undisturbed soil or bedrock having the required bearing capacity is not encountered at footing depths indicated, determine the possible additional volume of excavation that will be required and obtain Consultant's instructions in writing to excavate to additional required depth.
- 3.1.7 Do not expose shale to weather in excavations and in any case, following inspection, cover with 50 mm of 15 MPa concrete within twelve hours after exposure.
- 3.1.8 Fill excavations for building foundations which are, through error, carried below the elevation shown or approved depth, with 15 MPa concrete, or as directed by Consultant, at no increase in Contract Price.
- 3.1.9 Notify Geotechnical Engineer when bottom of excavation is reached, and have same inspect excavation prior to resumption of Work.

Excavation and Backfill for Structures

3.2 DEWATERING

- 3.2.1 Keep excavated areas free from standing water using power operated mechanical equipment.
- 3.2.2 Protect open excavations against flooding and damage due to surface run-off.
- 3.2.3 Obtain letter of conditional approval from authorities having jurisdiction to dispose of groundwater into sewer drainage system. Apply for water disposal permit.
- 3.2.4 Keep excavations and trenches free of water throughout construction period.
- 3.2.5 Groundwater removal:
 - 3.2.5.1 Lower groundwater level and maintain at depth below lowest point of excavation to ensure a dry stable surface.
 - 3.2.5.2 Dewater to prevent loss of soil and maintain stability of sides and bottom of excavation and of adjacent structures.
 - 3.2.5.3 Dispose of water in conformance with applicable by-laws and in a manner not detrimental to public and private property, or portion of Work completed, or under construction.
 - 3.2.5.4 Supply and install flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to sewers, water courses or drainage areas in accordance with authorities having jurisdiction. Perform testing on settlement tank discharge to confirm that effluent meets sewer bylaw requirements. Locate tanks to acceptable area determined by Consultant.
- 3.2.6 Surface water removal:
 - 3.2.6.1 Remove surface run-off in a manner that will prevent loss of soil and maintain stability of sides and bottom of excavation. Obtain Consultant's approval of dewatering method to be used.
 - 3.2.6.2 Discharge surface water into existing storm drainage system to acceptance of Consultant and local authorities.

3.3 BACKFILLING

- 3.3.1 Prior to backfilling, remove loose materials, debris, etc., from excavated areas. Do not place backfill on contaminated or frozen ground.
- 3.3.2 Do not use backfill material which is frozen or which contains ice, snow or debris.
- 3.3.3 Place granular material, grade and compact to levels which provide for superimposed work at levels shown.
- 3.3.4 Notify Consultant for inspection when backfill is complete to compacted levels indicated on Drawings.
- 3.3.5 Place granular backfill in layers not exceeding 200 mm in depth and thoroughly compact. Each layer shall be compacted and accepted before next layer is placed.
- 3.3.6 Backfill simultaneously on both sides of walls. Do not backfill until walls have reached their design strength.
- 3.3.7 Take necessary precautionary measures during compaction of fill adjacent to foundations, walls, drains, etc., that such items are not displaced from their proper location or damaged by compacting equipment. In the event damage or displacement occurs during filling or resulting from compaction of fill, correct same, to approval of Consultant, and at no increase in Contract Price.

3.4 UNDERFLOOR GRANULAR SUB-BASE

- 3.4.1 Prior to filling, remove loose materials, debris, etc., from areas to be filled. Do not place fill on contaminated or frozen ground.

Excavation and Backfill for Structures

- 3.4.2 Do not use fill material which is frozen or contains ice, snow or debris.
- 3.4.3 Proof roll existing earth sub-grade in order to identify inconsistencies or soft areas.
- 3.4.3.1 If a soft area is encountered, promptly notify the Consultant and obtain his instructions in writing to rectify the soft area.
- 3.4.3.2 Proceed with filling operations only after inconsistencies or soft areas have been rectified.
- 3.4.4 Place Granular "B" sub-base in loose layers not exceeding 200 mm to a compacted depth of minimum 100 mm terminating as follows except where shown otherwise:
 - 3.4.4.1 For work with permanent, watertight enclosure installed prior to placing concrete.
 - 3.4.4.1.1 Terminate compacted granular sub-base 200 mm below underside of slab. This allows for 100 mm cushion to absorb bleed water from concrete allowing concrete to dry evenly on both sides.
 - 3.4.4.2 For work that are not permanently enclosed with a watertight enclosure prior to pouring concrete:
 - 3.4.4.2.1 Terminate compacted granular sub-base 100 mm below underside of floor slab.
- 3.5 UNDERFLOOR GRANULAR BASE**
- 3.5.1 Unless shown otherwise, form to the applicable OPSD. Finish concrete surface to a Prior to filling, remove loose materials, debris, etc. from areas to be filled. Do not place fill on contaminated or frozen ground.
- 3.5.2 Do not use fill material which is frozen or contains ice, snow or debris.
- 3.5.3 Proof roll granular sub-base in order to identify inconsistencies or soft areas.
- 3.5.3.1 If a soft area is encountered, promptly notify the Consultant and obtain his instructions in writing to rectify the soft area.
- 3.5.3.2 Proceed with filling operations only after inconsistencies or soft areas have been rectified.
- 3.5.3.3 Place Granular "A" crushed limestone base to a compacted thickness of 200 mm in loose layers.
- 3.6 VAPOUR RETARDER**
- 3.6.1 Ensure that granular surface is smooth and free of sharp projections that could puncture vapour retarder.
- 3.6.2 Place vapour retarder under floor slabs to receive epoxy, urethane and floor finishes installed with adhesive and thin set mortar:
 - 3.6.2.1 Install vapour retarder in accordance with ASTM E1643 and as specified.
 - 3.6.2.2 Ensure there are no discontinuities in vapour retarder at seams and penetrations.
 - 3.6.2.3 Unroll with the longest dimensions parallel with the direction of concrete placement.
 - 3.6.2.4 Join sections of vapour retarder and seal penetrations in vapour retarder with mastic tape. Ensure vapour retarder surfaces to receive mastic tape are clean and dry.
 - 3.6.2.5 Ensure there is no moisture entrapment by vapour retarder due to rainfall or ground water intrusion.
 - 3.6.2.6 Immediately repair holes in vapour retarder with self-adhesive repair tape.
 - 3.6.2.7 Seal around pipes and other penetrations in vapour retarder with pipe boots in accordance with manufacturer's instructions.
 - 3.6.2.8 Protect vapour retarder from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials.
 - 3.6.2.9 Immediately repair damaged vapour retarder in accordance with manufacturer's instructions.
- 3.6.3 Vapour Retarder Location:
 - 3.6.3.1 If the structure is enclosed with a permanent, watertight enclosure prior to concrete placing, place a 50 mm compacted thickness of granular limestone screenings cushion on top of vapour retarder to underside of floor slab.

Excavation and Backfill for Structures

3.6.3.2 If the structure is not enclosed with a permanent, watertight enclosure prior to concrete placing, place the vapour retarder directly under the floor slab. Do not use cushion method.

3.6.3.3 In any case, extend vapour retarder 1000 mm into areas without vapour retarder.

3.7 UNSHRINKABLE FILL

3.7.1 Use at locations indicated or where work area is too limited to permit proper granular material placing and compaction operations.

3.7.2 Discharge fluid backfill directly from ready mix truck to points of usage. Place in uniform lifts and simultaneously on both sides of members being backfilled to equalize loading.

3.7.3 Consolidate fill with vibrators.

3.7.4 If piping occurs in area being backfilled, coordinate with pipe installer to ensure disturbance of pipe alignment during backfilling is prevented.

3.7.5 Use temporary plates to support traffic loads over cementitious fill.

3.8 COMPACTION

3.8.1 Use compaction equipment capable of obtaining required material densities.

3.8.2 Compaction Densities:

3.8.2.1 Granular materials: To 98% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D698.

3.8.2.2 Earth fill and earth subgrade: To 95% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D698.

3.8.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

3.8.4 Apply water as necessary during compaction to obtain specified density.

3.8.5 In areas not accessible to rolling equipment, compact to specified density with power operated portable plate compactors.

3.8.6 Depth and layers specified are minimum dimensions of fill after compaction, except where loose layer is specified.

3.8.7 Ensure compaction operations do not cause vibration and noise levels exceeding acceptable limits established by authorities having jurisdiction.

3.9 PROTECTION OF FILL AND BACKFILL

3.9.1 Protect filled and backfilled areas against damage from any cause.

3.10 DISPOSAL OF SURPLUS MATERIALS

3.10.1 Remove from the site and legally dispose of excess excavated material, waste material, trash, debris and rubble.

3.10.2 Obtain and pay for all necessary regulatory approvals, consents and permits for disposal of surplus material.

END OF SECTION

Miscellaneous Exterior Concrete

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1 General

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 American Society for Testing and Materials (ASTM):

1.2.2.1 ASTM A820 - Specification for Steel Fibres for Fibre-Reinforced Concrete

1.2.2.2 ASTM C260 - Specification for Air-Entraining Admixtures for Concrete

1.2.2.3 ASTM C494 - Specifications for Chemical Admixtures for Concrete

1.2.2.4 ASTM C881 - Specification for Epoxy - Resin - Base Bonding Systems for Concrete

1.2.2.5 ASTM C920 - Standard Specification for Elastomeric Joint Sealants

1.2.3 Canadian Standards Association (CSA):

1.2.3.1 CSA-A23.1 - Concrete Materials and Methods of Concrete Construction

1.2.3.2 CSA-A23.2 - Methods of Tests for Concrete

1.2.3.3 CSA A3001 - Cementitious Materials for Use in Concrete supersedes

1.2.3.4 CSA G30.18-M - Billet-Steel Bars for Concrete Reinforcement

1.2.3.5 CSA G30.15-M - Welded Deformed Steel Wire Fabric for Concrete Reinforcement

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 Submit as Shop Drawings, Product data, performance and other criteria for each material specified in this section that is proposed for use, including:

1.3.2.1 Admixtures

1.3.2.2 Joint fillers

1.3.2.3 Joint sealants

1.3.3 Submit Shop Drawings of joint assemblies. Draw to a scale not smaller than 1:50 and include plans, sections and details.

1.3.4 Concrete Supplier's latest statistical analysis of all concrete mixes to be used on this Project.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

1.4.1 Store materials on site in a manner to prevent damage. Protect from the weather. Comply with CSA-A23.1.

1.4.2 Protect the materials and work of this section from damage. Protect other work from damage resulting from this work. Replace damaged work which cannot be satisfactorily repaired.

Miscellaneous Exterior Concrete

1.5 TESTING AND INSPECTION

- 1.5.1 Work will be inspected and tested for conformance to CSA-A23.1 by an independent inspection company selected and paid for by Owner.
- 1.5.2 Notify Consultant at least twenty-four hours in advance of placing concrete to permit inspection of formwork, reinforcing, bearings, etc.
- 1.5.3 Tests include the following:
 - 1.5.3.1 Obtaining verification of cement
 - 1.5.3.2 Tests of reinforcing
 - 1.5.3.3 Tests of aggregate
 - 1.5.3.4 Verification of steel fibre content
 - 1.5.3.5 Tests of setting mixes and design of mix
 - 1.5.3.6 Concrete cylinder test. Three cylinders from each day's pour for each 75 m³ of concrete or for each 30 m³ of concrete poured in small amounts on successive days.
- 1.5.4 Tests will be made in accordance with CSA-A23.2.
- 1.5.5 Inspection company's reports of tests will be forwarded to Consultant and to Contractor with an opinion or reason for any abnormalities noted thereon.
- 1.5.6 Cooperate with and assist inspection company's personnel during inspections and tests.
- 1.5.7 Remove defective materials and completed work which fail tests and replace as directed by Consultant.
- 1.5.8 Where work or materials fail to meet strength requirements as indicated by test results, the costs of additional inspection and testing required for the new replacement work or materials.

2 Products

2.1 GENERAL

- 2.1.1 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.

2.2 MATERIALS

- 2.2.1 Portland cement: CSA-A3001 Normal, Type GU Portland cement.
- 2.2.2 Coarse aggregate: CSA-A23.1, Clause 4.2.3.4 and Table 11, Group I, 20-5 mm, 100% crushed, in cubular size.
- 2.2.3 Fine aggregate: CSA-A23.1 Clause 4.2.3.3 and Table 10.
- 2.2.4 Reinforcing steel: CSA G30.18-M, Grade 400.
- 2.2.5 Reinforcing mesh: CSA G30.15-M, flat sheets. Rolls are not acceptable.
- 2.2.6 Shrinkage control fibres: Bekaert "Dramix" steel fibres conforming to ASTM A820, Type 1, deformed, cold drawn wire; RC-65/60-CN with a tensile strength of 895 MPa.
- 2.2.7 Water: CSA-A23.1, Clause 4.2.2.
- 2.2.8 Forms: New Douglas Fir plywood, G1S for all exposed concrete. Rough T and G lumber or used G1S Douglas Fir plywood for surfaces which will be concealed.
- 2.2.9 Air entraining admixture: Conforming to ASTM C260; Master Builders, "Micro-Air", Euclid "Airextra", or Grace "Darex AEA EH"/Catexol AE360 (for low slump concrete).

Miscellaneous Exterior Concrete

- 2.2.10 Water reducing admixture: Conforming to ASTM C494 Type A, Master Builders "Pozzolith 200N", Euclid "WR75", Grace "WRDA 20" or Axim "Catexol 1000N".
- 2.2.11 Form ties: Adjustable snap ties, formed to break 25 mm or more from surface of concrete after form removal, with a minimum working strength of 13 kN. Wire ties will not be permitted.
- 2.2.12 Formwork release agent: Imperial Oil "Filmo No. 40", W.R. Meadows "Duogard II", Euclid "Super Slip" or Dayton Superior "Clean Strip (J-1)".
- 2.2.13 Premoulded joint filler: Asphalt impregnated, W.R. Meadows "Fibre Expansion Joint", CPD "Flexcell" or approved equivalent. Furnish with 13 mm x 13 mm removable "tacked-on" strip in the formation of the joint, to provide for proper sealant depth after stripping.
- 2.2.14 Standard joint sealant: Two component chemically reactive polyurethane modified sealant, self-levelling type, grey colour meeting ASTM C920:
- 2.2.14.1 W.R. Meadows "Sealtight Pourthane"
 - 2.2.14.2 Euclid "Eucolastic II"
 - 2.2.14.3 Sika "Sikaflex 2C NS/SL"
 - 2.2.14.4 Tremco "Vulkem 245"
 - 2.2.14.5 CPD "PSI 551"
- 2.2.15 Bonding agent: Meeting ASTM C-881, Sika "Sika-Dur Hi Mod", or W.R. Meadows "Rezi-Weld 1000", Euclid "452 MV", Cappar "Capbond E" or Dayton Superior "Resi-Bond (J-58)".
- 2.3 CONCRETE PROPORTIONS**
- 2.3.1 Concrete to be ready-mixed and proportioned in accordance with CSA-A23.1 Clause 4.3.1, and as follows:
- 2.3.1.1 Minimum allowable compressive strength at twenty-eight days: 32 MPa, unless otherwise noted or shown.
 - 2.3.1.2 Minimum cement content: 325 kg/m².
 - 2.3.1.3 Slump at point of deposit: 60 mm maximum and 20 mm minimum.
 - 2.3.1.4 Add shrinkage control fibres into the slab mix in the truck on site at the specified dosage rate to the next highest half bag. Minimum dosage rate: 19 kg/m³.
 - 2.3.1.1 In no case shall the total amount of steel fibres added to each load of the ready mix concrete average less than the specified dosage rate.
 - 2.3.1.2 Add superplasticizer as required to both fibre reinforced concrete and plain concrete.
 - 2.3.1.3 Confirm mix design to ensure conformance with requirements specified herein.
 - 2.3.1.4 Air entrain all concrete work. Conform to CSA A23.1, Clause 4.3.3, Table 4.
 - 2.3.1.5 Exposure classification: as shown on drawings and as defined in Table 2 of CSA A23.1.
- 2.3.2 Add admixtures to concrete mix in accordance with the manufacturer's recommendations.
- 2.3.3 The use of calcium chloride or additional admixtures, other than those specified, is prohibited.
- 3 Execution
- 3.1 EXAMINATION**
- 3.1.1 Confirm that surfaces on which concrete is to be placed are free of frost, water and debris before placing concrete.
 - 3.1.2 Ensure that substrates are compacted and acceptable, and that reinforcement, inserts and all other built-in work are in place and secured before pouring concrete.

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3.2 FORMWORK

- 3.2.1 Construct formwork according to CSA-A23.1, except where shown otherwise. Ensure no lumber remains in concrete.
- 3.2.2 Form for depressions and recesses required in concrete to receive all other work.
- 3.2.3 Form 13 mm x 13 mm minimum chamfered edges on all exposed concrete corners.
- 3.2.4 Forms may be removed any time after seven days from date of placing concrete or otherwise as directed by the Consultant. Remove forms in accordance with CSA-A23.1

3.3 PLACING

- 3.3.1 Place concrete to prevent layering and segregation and vibrate sufficiently to ensure thorough compaction, maximum density, and according to CSA-A23.1 Clause 6.8.5.4. Hand spade concrete adjacent to forms with metal spatulas.
- 3.3.2 Before placing fresh concrete against set or partially set concrete, clean surfaces to remove dirt, scum, shavings, debris, laitance, etc. On set surfaces, brush generously with bonding agent.
- 3.3.3 Check Work frequently with accurate instruments during concrete placing.

3.4 FINISHING - GENERAL

- 3.4.1 For concrete mixes containing steel fibre reinforcement, ensure that finishing process leaves surface free of protruding fibres. If fibres protrude from surface after concrete has set, remove protruding fibres.

3.5 CONCRETE CURB, GUTTER AND OUTLETS

- 3.5.1 Unless shown otherwise, form to the applicable OPSD. Finish concrete surface to a broom finish. Round outside curb edges to radii shown. Do not dust neat cement onto freshly placed concrete to facilitate finishing.
- 3.5.2 During pouring, properly vibrate concrete to prevent honeycombs.
- 3.5.3 Provide transverse joints by sawcutting at intervals not exceeding 5.5 m and filling with backer rod and sealant. Provide premoulded joint filler to form expansion joints between curb and abutting concrete work, and other dissimilar structures.

3.6 SIDEWALKS

- 3.6.1 Screed concrete sidewalks to required levels, with falls indicated, to tolerance of 6 mm in 3000 mm.
- 3.6.2 Wood float and finally, steel float or trowel. Avoid excessive trowelling.
- 3.6.3 Finish concrete with one directional screed and coarse broom finish.
- 3.6.4 Form dummy joints 6 mm deep at 1500 mm o.c. Tool joints with 6 mm wide steel trowel, radiusing edges 6 mm.
- 3.6.5 Form expansion joints at 6 mm o.c., maximum.
- 3.6.6 Tool edges of sidewalk with 50 mm wide steel trowel, radiusing edges 6 mm.
- 3.6.7 Apply one coat of curing and sealing compound to surface immediately after final finishing in accordance with manufacturer's printed instructions.

3.7 EXPANSION/ISOLATION JOINTS

- 3.7.1 Form expansion/isolation joints at building face or other abutments. Place 12 mm thick joint filler keeping top 12 mm below concrete surface.

Miscellaneous Exterior Concrete

3.8 SEALANT

- 3.8.1 Remove tacked-on strip on top of joint filler.
- 3.8.2 Apply kraft paper or polyethylene bond breaker over premoulded filler and fill with self-levelling sealant applied in accordance with manufacturer's printed instructions.
- 3.8.3 Install sealant in sawcut joints and in expansion/isolation joints.
- 3.8.4 Comply with sealant manufacturer's primer, application and temperature requirements. After initial set, prime sealant surface and refill joints with sealant as required to produce slightly convex joint surface.

END OF SECTION

Asphalt Paving

- 1 General
- 1.1 SUMMARY**
 - 1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.
 - 1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.
- 1.2 REFERENCES**
 - 1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:
 - 1.2.2 **Canadian General Standards Board (CGSB):**
 - 1.2.2.1 CAN/CGSB 1.74 - Alkyd Traffic Paint
 - 1.2.3 **Ontario Provincial Standard Specification (OPSS):**
 - 1.2.3.1 OPSS 310 - Ontario Provincial Standard Specification, Construction Specification for Hot Mix Asphalt
 - 1.2.3.2 OPSS 1101 - Ontario Provincial Standard Specification, Material Specification for Performance Graded Asphalt Cement
- 1.3 SUBMITTALS**
 - 1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.
 - 1.3.2 **Shop Drawings:**
 - 1.3.2.1 Submit Asphalt mix designs.
 - 1.3.2.2 Information regarding manufacture and installation of pavement markings, asphalt crack sealant and road reinforcement mesh.
- 1.4 QUALITY ASSURANCE**
 - 1.4.1 Implement a quality control program which includes testing and inspection to comply with the intent of these Specifications.
 - 1.4.2 Owner may employ an independent testing and inspection company to perform additional testing and inspection, and costs of such tests and inspections will be paid for by Owner.
 - 1.4.3 Consultant may have cores taken from finished pavement by an independent testing firm to ensure that paving has been placed to required thickness as shown and to specified degree of compaction. Testing will be at the expense of the Owner. Patch core holes resulting from the removal of samples, with asphaltic concrete material as specified herein.
 - 1.4.4 Remove and replace areas of asphalt work proven defective by the tests or contrary to requirements shown and specified, as directed by Consultant and at no cost to Owner.
- 1.5 PROJECT CONDITIONS**
 - 1.5.1 Protect buildings and work of other trades from damage caused by work of this section. Correct damage caused by work of this section at no cost to Owner.
 - 1.5.2 Protect work of this section from damage or deformation during period of construction. Remove and replace precast bumper curb that are cracked, chipped, broken or otherwise damaged with new units acceptable to Consultant at no cost to Owner.
 - 1.5.3 Erect temporary barriers, signs, protective covers, and rain protection as required. Remove protection when pavement is ready for traffic.

Asphalt Paving

- 1.5.4 Do not apply pavement during wet weather, or unless granular base is dry in terms of asphaltic concrete paving
- 2 Products
- 2.1 GENERAL**
- 2.1.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.
- 2.1.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified products. Submit for review as specified in sections 01 62 00 Alternates and Substitutions and 01 62 01 Substitution Request Form. Submittals which do not include adequate data for the product evaluation will not be considered.
- 2.2 MATERIALS**
- 2.2.1 **Asphaltic concrete paving:** Conforming to OPSS 310, composed of a base course and a surface course, of types as shown:
- 2.2.1.1 Asphalt cement: Conforming to requirements of OPSS 1101, PGAC 58-28 for light duty traffic and PGAC 64-28 for heavy duty traffic.
- 2.2.1.2 Asphalt primer: Liquid asphalt emulsion, slow drying for spray or brush application.
- 2.2.1.3 Recycled content: Use recycled asphalt product (RAP) in binder/base course mixes only. Do not use for wearing course.
- 2.2.2 **Pavement marking:** Paint conforming to CAN/CGSB 1.74, white or yellow, with glass beads for reflectorized lines. Colours:
- 2.2.2.1 Yellow: For parking lot stalls and directional lines
- 2.2.2.2 Blue: For accessible parking lot stalls and symbols
- 2.2.3 **Precast bumper curbs:** 35 MPa compressive strength at twenty-eight days, air entrained, smooth finished with chamfered edges, 140 mm x 250 mm x 2400 mm (long sections, with two anchor holes.
- 2.2.4 **Grout:** Pre-mixed, non-shrink, flowable type, without aggregate fillers:
- 2.2.4.1 Euclid "Euco NS"
- 2.2.4.2 Master Builders "Construction Grout"
- 2.2.4.3 Sika "Grout 212" or "M-Bed Standard"
- 2.2.4.4 W.R. Meadows "CG 86"
- 2.2.4.5 CPD "Non-Shrink"
- 2.2.4.6 Dayton Superior "1107 Advantage Grout"
- 2.2.5 **Asphalt crack sealant:** Hot poured rubberized asphalt thermoplastic sealing compound. Hydrotech Sealz 6165 or approved alternative.
- 2.2.6 **Road reinforcement mesh:** Glasgrid 8502.
- 3 Execution
- 3.1 EXAMINATION**
- 3.1.1 Inspect state of paving base preparation and other existing conditions upon which work of this section is dependent. Report to Consultant in writing any defects or discrepancies. Commencement of Work implies acceptance of existing conditions.
- 3.2 PREPARATION**
- 3.2.1 Shape bases as necessary to correspond with finish elevations of pavement, providing for slope as shown. Compact granular bases to densities and methods specified in Section 31 00 00.

Asphalt Paving

- 3.2.2 Correct irregularities or depressions that develop under rolling by loosening granular material at such locations and adding or replacing material and recompact until the surface is smooth and uniform. Dig out and replace soft spots which develop in granular base during or after compaction operations.
- 3.2.3 To aid in compaction work or to reduce dust nuisance or both, sprinkle granular base with water during rolling, tamping and blading. Where water is added for improvement of compaction, apply immediately ahead of the compacting unit pass.
- 3.2.4 Maximum allowable tolerance in cross-sectional and longitudinal profile is 6 mm (at any place measured with a 3000 mm (straight edge).
- 3.3 PRIMING**
- 3.3.1 Prior to application of paving, prime paint vertical contact surfaces with liquid asphalt emulsion.
- 3.3.2 Where paving of a course of asphalt has been delayed and/or will not be completed immediately after the underlying course of asphalt has been placed, thoroughly clean surfaces to be paved and apply one full coverage tack coat of asphalt primer immediately before paving.
- 3.4 APPLICATION**
- 3.4.1 Install asphaltic concrete paving to lines and compacted thicknesses shown conforming to methods of application and compaction requirements of OPSS 310.
- 3.4.2 Clean prepared base of all foreign matter prior to application of the mixture to substrate.
- 3.4.3 Form well bonded joints. Cut back bituminous course to full depth in straight line as required to expose fresh vertical surfaces. Remove broken or loose material. Paint exposed vertical edge of asphaltic joints with asphalt primer prior to placing asphalt courses.
- 3.4.4 Form joints between new and existing work in same manner as specified herein for new work, and in such a manner as to ensure continuous bond at interface.
- 3.4.5 Finish surface of pavement free from depressions exceeding 6 mm (when measured with a 3000 mm (straight edge. Remedy any low or defective areas by cutting out the course and replacing it with fresh hot mixture, and re-compact.
- 3.5 PAVEMENT MARKINGS**
- 3.5.1 Allow paving to cure before applying markings.
- 3.5.2 Paint 100 mm (wide lines on asphalt paving for parking stalls and handicapped symbol.
- 3.5.3 Apply paint with mechanical equipment to clean, dry surface, to a minimum dry film thickness of 228 microns (. Provide well defined and straight lines; do not overspray.
- 3.5.4 Take precautions to protect freshly painted linework from being marked or otherwise disturbed by traffic, by use of fluorescent cones, barricades or other means until paint is dry.
- 3.5.5 Remove spills or tracking of paint and clean up as required.
- 3.6 ASPHALT CRACK REPAIR**
- 3.6.1 Clean out and let dry existing cracks with hot compressed air lance.
- 3.6.2 Fill crack with sealant to minimum depth of 10 mm (in accordance with manufacturer's recommendations.

Asphalt Paving

3.6.3 Dust sealant with sand to prevent vehicle tracking.

3.7 PRECAST BUMPER CURBS

3.7.1 Compact grade and secure bumper curbs in place with 600 mm long x 12 mm diameter (anchor bar pins. Drive top of pins to slightly below top of curb. Grout holes with non-shrink grout.

3.8 PROTECTION OF PAVING

3.8.1 After completion of surface course, prevent vehicular parking on pavement until surface has cured and hardened.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Notify Construction Manager of proposed date for use of materials. Order and schedule shipments to coincide with construction schedule.

1.2 SUMMARY

- A. Section Includes Concrete Paving. Including the Following:
 - 1. Walks.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for general building applications of concrete.
 - 2. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 MEASUREMENT PROCEDURES

- A. Measure Portland cement concrete paving in square metres.
- B. Measure supply of Portland cement in tonnes.
- C. Measure sealing of joints including saw cutting and preparation, in linear metres.

1.4 REFERENCE STANDARDS

- A. ASTM International
 - 1. ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - 2. ASTM C171-07, Standard Specification for Sheet Materials for Curing Concrete.
 - 3. ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - 4. ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 5. ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.
 - 6. ASTM C666/C666M-03(2008), Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

7. ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Bituminous Expansion Joint Fillers for Concrete Paving and Structural Construction.
 8. ASTM D2628-91(2011), Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
 9. ASTM D3569-95(2000), Standard Specification for Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant Type for Portland Cement Concrete Pavements.
 10. ASTM D5329-09, Standard Test Methods for Sealants and Fillers, Hot-Applied, For Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.
 11. ASTM D6297-13, Standard Specification for Asphaltic Plug Joints for Bridges.
 12. ASTM D6690 -12, Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- B. CSA Group
1. CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 2. CSA-A3000-13, Cementitious Materials Compendium.
 3. CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
 4. CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- A. Submit in accordance with Section 01 33 00- Submittal Procedures.
- B. Product Data:
1. Submit manufacturer's instructions, printed product literature and data sheets for concrete paving material and include product characteristics, performance criteria, physical size, finish and limitations.
 2. Submit following sampling and testing data:
 1. Sieve analysis for gradation of bedding and joint material.
 2. Evaluation of sealing and cleaning compound.
- C. Samples:
1. Inform Construction Manager of proposed source of aggregates and provide sampling at least 4 weeks prior to commencing work.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installer: Company or person specializing Portland cement concrete paving with 5 documented years of experience.

B. Certifications:

1. Submit to Construction Manager manufacturer's test data and certification that following material meets criteria and requirements of this section prior to starting concrete work:
 1. Portland Cement.
 2. Blended Hydraulic Cement.
 3. Supplementary Cementing Material.
 4. Admixtures.
 5. Joint Sealants.
 6. Curing Materials.
 7. Joint Filler.
2. Submit certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA A23.1/A23.2, and that mix design is adjusted to prevent alkali aggregate reactivity problems.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials in accordance with manufacturer's written instructions.

B. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

C. Storage and Handling Requirements:

1. Store materials off ground in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 1. Unload cement and store in weathertight bins or silos that protect cement from dampness and contamination and provide easy access for inspection and identification of each shipment.
 2. Stockpile minimum 50% of total required amount of each size of aggregate prior to commencing mixing operation.
2. Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Portland cement: to CSA A3000.
- B. Aggregates: to CSA A23.1/A23.2 and to following requirements:
 - 1. Coarse aggregate:
 - 1. Produce coarse aggregate in at least two separate sizes which, when combined, yields gradation specified. Each component size to form approximately equal percentage of total coarse aggregate.
 - 2. Gradation: to CSA A23.1/A23.2, table 5, nominal size 28-5.
 - 3. Flat and elongated particles: to CSA A23.1/A23.2 (13A) (length to width and width to thickness ratio greater than 3) not to exceed 0.5% by mass.
 - 2. Fine aggregate:
 - 1. Gradation: to CSA A23.1/A23.2, Table 1. Material passing 0.160 mm sieve: maximum 5%.
 - 2. Aggregates for use in concrete pavement shall not be susceptible to D-cracking. Unless field experience, aggregate history or prior laboratory testing have proven otherwise.
 - 3. Aggregates for use in concrete pavement shall be tested in accordance with ASTM C666/C666M. Test shall be in accordance with Procedure A for a period of 350cycles.
- C. Supplementary cementing materials: to CSA A3000.
- D. Air entraining admixture: to ASTM C260/C260M.
- E. Chemical admixtures: to ASTM C494/C494M. Construction Manager to approve accelerating or set retarding admixtures during cold and hot weather placing.
- F. Curing compound: to ASTM C309, Type 1-D or 2.
- G. Joint seal, preformed polyurethane sealant: to ASTM C920.
- H. Polyethylene backer rod, properly friction-fitted for use with self-leveling sealants.
- I. Preformed 12.7 mm thick bituminous expansion joint filler: to ASTM D1752.
- J. Dowels and tie-bars: to CSA G30.18.
 - 1. Dowels: clean, straight and free from flattened or burred ends, plain round bars of grade 300 or better conforming to CSA G40.20/G40.21 and be epoxy-coated to ASTM A775/A775M.

2. Tie-Bars: deformed steel bars in compliance with CSA G30.18 and be epoxy-coated to ASTM A775/A775M.
- K. Protective covers and insulation for cold weather concreting: to CSA A23.1/A23.2.
- 2.2 MIXES
- A. Job mix formula to be reviewed by Construction Manager in accordance with CSA A23.1/A23.2, Table 13 and as specified below.
- B. For concrete proportioned in accordance with Alternative 1:
1. Use type 10 cement.
 2. Compressive strength when tested in accordance with CSA A23.1/A23.2, (9C): average 28day compressive strength to be minimum 28MPa for pedestrian paving and 35MPa for heavy duty vehicular paving.
 3. Cementing materials content: 290 to 335kg/m³ of concrete mix.
 4. Air content when tested in accordance with CSA A23.1/A23.2, (4C), immediately after discharge: in accordance with CSA A23.1/A23.2, Table 10.
 5. Class of exposure: Class C-2.
 6. Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.
- PART 3 EXECUTION
- 3.1 EXAMINATION
- A. Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for concrete paving installation in accordance with manufacturer's written instructions.
1. Visually inspect substrate in presence of Construction Manager.
 2. Inform Construction Manager of unacceptable conditions immediately upon discovery.
 3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Construction Manager.
- 3.2 EQUIPMENT
- A. Concrete plant: in accordance with CSA A23.1/A23.2.
- B. Where fixed form paving is used provide equipment with following features:
1. Mechanical self-propelled spreader capable of moving concrete forward and laterally.

2. Vibrator locations and spacings whether surface or internal to be installed as per manufacturer's specifications or as directed by the Construction Manager .
 3. Mechanical, self-propelled finisher with two independently operated transverse screeds.
 4. Float to be aluminium or magnesium, straight, smooth, sufficiently light to avoid sinking into concrete surface, operated mechanically or manually from edge to edge while advancing longitudinally.
- C. Use following equipment on approval of Construction Manager :
1. Hand operated transverse screeds spanning side forms.
 2. Mechanically powered vibrating beam spanning side forms.
 3. Hand operated floats and fluting tools used by skilled workers.
- D. Provide following miscellaneous equipment where required:
1. Edging tool.
 2. Water truck equipped with pump, hose line and fine spray nozzle.
 3. Self-propelled concrete saws equipped with rubber-tired wheels, readily adjustable blade depth controls, and sawing line guide pointers both front and rear. Provide adequate number of units to complete sawing at rate required and have ample supply of suitable saw blades and at least one standby sawing unit available on job site before concrete placement is started.

3.3 SUBGRADE AND SUBBASE PREPARATION

- A. Soft, yielding materials or other portions of subgrade that will not compact to specification shall be removed and replaced with suitable material. Subgrade to be brought to a firm unyielding condition with a uniform density. It shall be compacted at or above optimum moisture content to 95% Standard Proctor density.
- B. When concrete is placed directly on subgrade, it will be checked for conformity with the cross-section tolerance. Finished surface shall not deviate more than 0mm above and 20mm below specified grade and cross-section, and the surface shall not deviate more than 10mm at any place on a 3mm template.
- C. Subbase to consist of specified material and have a compacted thickness of not less than specified.
- D. Subbase shall be compacted to specified density.
- E. Prepared subbase shall be checked for conformity with the cross-section and grad tolerances. Finished surface of subbase shall not deviate more than 0mm above and 20mm below specified grade and cross-section, and surface shall not deviate more than 10mm at any place on a 3mm template.

- F. Repair damage to subbase resulting from hauling or equipment operations.
- G. Prior to placing concrete, subbase shall be thoroughly wetted. Wetting shall be carried out, such that standing water is not present on grade.
- H. Surface condition of base to be approved by Construction Manager before placing concrete.

3.4 REINFORCING STEEL AND DOWELS

- A. Place reinforcing steel and dowels as indicated and to Section 03 20 00- Concrete Reinforcing.
- B. Dowel bars shall be plain round bars of grade 300 or better conforming to CSA G40.20/G40.21 and be epoxy-coated to requirements of ASTM A775/A775M, also coated with bond breaker material.
- C. Steel for tie bars or tie bolts to comply to CSA G30.18 and be epoxy-coated to ASTM A775/A775M.
- D. Place sufficient number of joint dowel assemblies in advance of paver to avoid delay in concrete placement.
- E. Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.
- F. Steel placement to be approved by Construction Manager before placing concrete.

3.5 PLANT AND MIXING REQUIREMENTS

- A. If crusher screenings are approved as mixture component, proportion separately from sand.
- B. If washing of aggregate required, allow aggregate to drain for 24 hours or longer as required to stabilize moisture content.
- C. For truck mixers, mixing to be in accordance with CSA A23.1/A23.2.
- D. Mix produced to be within following tolerances from mix design:
 - 1. Air content: as per CSA A23.1/A23.2, Table 10.

3.6 TRANSPORT AND DELIVERY OF MIX

- A. Time from initial mixing to final placing to be not more than 120 minutes if mix is transported by agitating equipment (e.g. truck mixer) in accordance with CSA A23.1/A23.2, clause 18.4.2 - Delivery with Agitating Equipment.
- B. Transport mix by non-agitating equipment only if;
 - 1. Time from addition of cement to time of placing not to exceed 45 minutes.

2. Haul units to be of sufficient capacity to transport at least one regular size batch from mixer.
3. Haul routes to be well maintained to prevent undue disturbance of concrete mix during transport.

3.7 PLACING

- A. Place concrete to lines, grades and depths as indicated.
- B. Discharge concrete into forms as soon as practical after mixing.
- C. Construct pavement lanes in sequence approved by Construction Manager.
- D. Use hand placing where machine spreading is not feasible.
- E. Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing. Do not apply external tractive force to paver.
- F. Operate with continuous forward momentum. Schedule concrete supply to minimize interruptions.
- G. Insert tie bars as indicated.
- H. When completing concrete placement for day, carry placement through to scheduled control joint location.
- I. Where concrete placement is stopped for more than 30 min due to breakdowns, weather or other reasons, construct extra bulkhead and construction joint as directed by Construction Manager.
- J. Do not place concrete on frozen surface.
- K. No concrete shall be placed during rain.
- L. When rain appears imminent paving operation should cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CSA A23.1/A23.2. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.
- M. Concrete shall be placed when the projected temperature is 10 degrees C or higher for a minimum of 72 hours.
- N. If concrete has been placed when the ambient temperature is at or above 32 degrees C, the concrete is to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.
- O. If concrete has been placed in cold weather and the site temperature is expected to drop below 10 degrees C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is above 10 degrees C, has totalled a minimum of 7days. Alternatively, if

compressive tests of cylinders cured under field conditions achieve at least 70% of the specified compressive strength, curing may be discontinued.

- P. Concrete pavement placed in cool weather shall experience a minimum of 30 day air-drying period, following final curing, before first application of de-icing salts.

3.8 CONSOLIDATION

- A. When internal vibrators are used:

1. For slab depths up to 50mm, mount vibrators parallel to base at mid depth. For slab depths greater than 50mm, mount vibrators with tips minimum 50mm above base and tops minimum 50mm beneath pavement surface.
2. Operate at manufacturer's recommended number of vibrations and specifications.

- B. When surface vibrators are used:

1. Synchronize units on each individual screed or pan.
2. Operate at minimum of 3,500 vibrations per minute and minimum amplitude of 0.4mm.
3. Treat each pavement section to at least 2 passes of vibratory equipment unless otherwise directed by Construction Manager.

- C. Stop vibrators when paver stops.

- D. Use hand operated vibrator on odd shaped slabs inaccessible to frame mounted units. Do not operate vibrator in one location longer than 5 seconds.

- E. Ensure concrete adjacent to edge forms or previously constructed slabs is thoroughly vibrated.

3.9 FINISHING

- A. After consolidation by vibration, finish with equipment approved by Construction Manager.

- B. When striking off concrete surface, maintain uniform roll of concrete ahead of first screed for its full length when finishing machine is on first pass.

- C. Make 2 passes with transverse finishing machine.

- D. Where joints are formed rather than sawn, form longitudinal and transverse joints after final pass of finishing machine.

- E. Hand finish areas inaccessible to finishing machines to same quality and surface characteristics as machine finished surfaces.

- F. Finish concrete surface with approved float at proper time. Operate from edge to edge with wiping motion while advancing, with each succeeding pass overlapping previous one.
- G. Check surface with approved 3.5m long straightedge. Correct irregularities exceeding 5mm before concrete takes initial set.
- H. Finish edges of slabs with edging tool to form smooth squared surface on city sidewalks only. Do not apply the smooth squared surface on internal site concrete paving inside property lines. Do not patch with cement paste.

3.10 SURFACE TEXTURING

- A. Commence texturing immediately after float finishing.
- B. Use stiff bristled broom to produce nonslip concrete surface finish approved by Construction Manager, with fine granular texture free from disfigurements.
- C. Texturing to be straight, precise and not damaging to pavement edges.

3.11 CURING

- A. Cure for minimum 7 days by one of following methods:
 - 1. Curing compound:
 - 1. Apply in two coats with approved spray equipment to form complete and unbroken film on surface of concrete. Mechanically agitate compound before and during use.
 - 2. For hand application apply first coat immediately after texturing operations, second coat to be applied immediately after first coat in a perpendicular direction.
 - 3. For machine application curing compound to be applied in accordance with manufacturers' specifications.
 - 4. Apply second spray in accordance with manufacturer's instructions.
 - 5. Apply each spray at application rate recommended by manufacturer.
 - 6. Spray slab edges immediately after removal of forms.
 - 7. Protect formed or sawed joints from evaporation during curing period.
 - 8. Respray areas where membrane is damaged during curing period.
 - 2. Burlap or cotton mats:
 - 1. As soon as concrete surface has been finished and can bear weight without marking, carefully cover with burlap or cotton mats.

2. Place mats to overlap each other by 300mm or more and to overlap concrete slab by 300mm or more at each side secured by a continuous bank of sand and gravel.
3. Cover sides and ends of slab with mats as soon as forms are removed.
4. Thoroughly wet mats before placing them on concrete and keep saturated during curing period with water spray sufficiently fine to avoid damaging concrete surface, avoiding wet/dry cycles.

3.12 PROTECTION

- A. Do not open concrete pavement to traffic or construction equipment until joints have been sealed and concrete has cured for a minimum of 3 days.
- B. When placing concrete in lanes adjacent to existing concrete, operate placing equipment on rubber wheels or pads to prevent damage to existing surface.

3.13 TOLERANCES

- A. Finished concrete surface to be within 5mm of design grade but not uniformly high or low.
- B. Finished concrete surface not to have irregularities exceeding 5mm when checked with 4.5m straight edge placed in any direction.
- C. Horizontal deviations of slab edge from alignment of pavement not to exceed 10mm.

3.14 JOINTS

- A. General:
 1. Construct joints plumb, straight and square to details indicated.
 2. Transverse joints to coincide with those in adjacent pavement unless indicated or directed otherwise.
 3. Install preformed joint filler at locations and to details indicated.
 4. Install isolation joints around structures and features that project through, into or against pavement.
- B. For sawn joints.
 1. Ensure joints are sawn straight. Install end stakes to ensure straight joint alignment across paved area. Mark joint alignment with chalk line or other suitable guide to approval of Construction Manager .
 2. Saw joints using approved equipment and methods to produce joint dimensions indicated.

3. Restrict speed of saw cutting to ensure proper joint alignment and to avoid damage to concrete.
4. Supply sufficient workers and equipment including standby equipment, to maintain satisfactory sawing schedule.
5. Make initial saw cuts in progressive manner and as soon as concrete surface has hardened sufficiently to resist ravelling as cut is made and before shrinkage cracks occurs.
6. If cracking occurs ahead of saw cut, stop sawing immediately. Move ahead several joints and cut one or more joints before returning to saw intermediate joints. Where cracking persists, make 1m saw cut from one edge and complete sawing from opposite edge. Adjust sawing schedule accordingly.
7. If uncontrolled cracking or other surface damage results from inadequate or improper sawing techniques suspend further concrete operations until situation is corrected and immediately remove and replace damaged slabs.
8. Immediately on completion of sawing, flush joints with water to remove laitance.

C. Sealing:

1. Seal joints before allowing vehicular traffic on new pavement.
2. Provide Construction Manager with copy of sealant manufacturer's instructions for application.
3. Just prior to sealing joint, clean with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air and vacuum to remove loose and foreign material.
4. Do not apply joint sealant in rainy weather or when ambient temperature is less than 5degrees C.
5. Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.
6. Prepare sealant for application using equipment and methods approved by Construction Manager.
7. Apply sealant strictly in accordance with manufacturer's recommendations and cleanliness of concrete to be bonded.
8. On completion of first application of sealant, return and top up any underfilled areas.
9. Replace sealant which fails to bond to concrete or fails to cure properly, as directed by Construction Manager .

3.15 DEFECTIVE CONCRETE

- A. Concrete is defective when:

1. It contains: honeycombing, embedded debris, uncontrolled shrinkage cracking, or other surface defects.
2. It is damaged by freezing.
3. It is placed at too high temperature.
4. Standard deviation of 28 day strength test results exceeds CSA A23.1/A23.2 clause 17.6.7.1 requirements.

3.16 REPAIR/RESTORATION

A. Repair of defective concrete work:

1. Where defective concrete is identified by Construction Manager during plastic condition, repair using methods approved by Construction Manager .
2. Grind off high surface variations where directed by Construction Manager .

B. Remove and replace defective concrete where directed by Construction Manager .

1. Remove minimum 3m of pavement by sawing through concrete across full lane width.
2. Replace with new concrete to this specification.
3. Construct contraction joint at boundary between sawn face of existing concrete and new concrete.

3.17 CLEANING

A. Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

1. Leave Work area clean at end of each day.

B. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.18 PROTECTION

A. Keep vehicular traffic off newly paved areas until paving has properly cured and joints have been sealed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Joint-sealant backer materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 13-mm-wide joints formed between two 150-mm-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Paving-Joint-Sealant Schedule: Contractor to submit the following information to the architect:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant colour – submit samples or colour chart.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of joint sealant and accessory.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 5 deg C.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
 - 1. Pourthane SL Self Leveling Joint Sealant by W. R. Meadows of Canada, 70 Hannant Court, Milton ON, L9T 5C1, 905-878-4122.
 - 2. Other approved equal: Contractor to submit product and manufacturer's info to architect for approval.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1 or 3, of diameter (25% larger than joint to be sealed) and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact joint substrates.
 - 2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving.
 1. Joint Location:
 1. Expansion and isolation joints in concrete paving.
 2. Other joints as indicated.
 2. Joint Sealant: Single-component, self-leveling, silicone joint sealant
 3. Joint-Sealant Color: As selected from manufacturers standard colour palette.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete pavers set in aggregate setting beds.
2. Aluminum edge restraints.
3. Cast-in-place concrete edge restraints.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For materials other than water and aggregates.

B. Product Data: For the following:

1. Concrete Pavers.
2. Edge restraints.

- C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.

- D. Samples for Verification: For full-size units of each type of unit paver indicated.

1.5 INFORMATIONAL SUBMITTALS

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.

1.8 FIELD CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 CONCRETE PAVERS

- A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936/C 936M and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.

B. Materials

1. Unit Paver

- 1. Manufacturer: 'Unilock'.
- 2. Model: 'Promenade Plank Paver'.
- 3. Size: 400mm X 100mm X 100mm (4" X 16" X 4").
- 4. Colours:
 - 1. Type 1: 'Steel Grey Blend'.
 - 2. Type 2: 'Opal Blend'.
 - 3. Type 3: 'Sandstone'.
- 5. Colour Mix:

1. Blend areas: 70% Opal Blend, 30% Steel Grey.
2. Sandstone area solid as indicated on drawings.
6. Finish: Standard.
7. Pattern: 'Running Bond'.

2.3 CURBS AND EDGE RESTRAINTS

- A. Aluminum Edge Restraints: Manufacturer's standard L-shaped, 4.8-mm-thick by 57-mm-high by 57-mm wide extruded-aluminum edging.
 1. 'StructureEdge' – by 'Permaloc' or approved equal. www.permaloc.com
- B. Built Concrete Edge Restraints: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 20 MPa.

2.4 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase for walkways: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 57.
- B. Graded Aggregate for Base for traffic areas: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- C. Graded Aggregate for Leveling Course over traffic areas on concrete slab: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 9.
 1. Aggregate Material: Crushed granite.
- D. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.
- E. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.
- F. Polymeric Joint Sand: Dry mix, contains polymeric binding agent, activated with water.
 1. Provide Polymeric Joint Sand meeting the minimum material and physical properties as follows:
 1. Compression Strength: minimum compression of 550 PSI after drying for 7 days under controlled conditions 23C at 50% humidity.
 2. Test sand sample shape: cylinder 5 cm dia. X 10 cm high.
 3. Gradation: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing 1.18-mm sieve and no more than 10 percent passing 0.075-mm sieve.
 4. Colour: grey.

- G. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2, AASHTO M 288.
 - 2. Apparent Opening Size: 0.250-mm sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

- H. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2, AASHTO M 288.
 - 2. Apparent Opening Size: 0.425-mm sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

- I. Herbicide: Commercial chemical for weed control, registered with the CE. Provide in granular, liquid, or wettable powder form.

2.5 ACCESSORIES

- A. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.
- B. Aluminum edge restraint as specified in Curb and Edge Restraints section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and waterproofing protection is in place.

3.2 PREPARATION

- A. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

- B. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 - 1. For concrete pavers, a block splitter may be used.
- D. Joint Patterns: As indicated.
- E. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.
 - 1. Provide joint filler at waterproofing that is turned up on vertical surfaces unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete.
- F. Tolerances: Do not exceed 0.8-mm unit-to-unit offset from flush (lippage) or 3 mm in 3 m from level, or indicated slope, for finished surface of paving.
- G. Tolerances: Do not exceed 1.6-mm unit-to-unit offset from flush (lippage) nor 3 mm in 600 mm and 6 mm in 3 m from level, or indicated slope, for finished surface of paving.
- H. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 32 13 73 Concrete Paving Joints Sealants.
- I. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes at least 25 mm below top edge.

3. Install job-built concrete edge restraints to comply with requirements in Section 033000 "Cast-in-Place Concrete."

3.4 AGGREGATE SETTING-BED APPLICATIONS

- A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.
- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Place aggregate subbase and base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.
- D. Place leveling course and screed to a thickness of 25 to 38 mm, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
- E. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- F. Set pavers with a minimum joint width of 1.5 mm and a maximum of 3 mm, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 10 mm with pieces cut to fit from full-size unit pavers.
- G. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 16- to 22-kN compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 900 mm of uncompacted pavers adjacent to temporary edges.
 2. Before ending each day's work, compact installed concrete pavers except for 900-mm width of uncompacted pavers adjacent to temporary edges (laying faces).
 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 90 mm of laying face.
 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
- H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- I. Install Polymeric Joint Sand per manufacturer's recommended instructions.
- J. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- K. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

END OF SECTION

Pavement Markings

32 17 23 – Pavement Markings

1 General

1.1 SUMMARY

1.1.1 Section includes pavement markings.

1.1.2 Thermoplastic crosswalk markings.

1.2 SUBMITTALS

1.2.1 Comply with requirements of Section 01 33 00 – Submittal Procedures.

1.2.2 Submit product data for traffic marking paint, including MPI product number.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Deliver materials in sealed original labeled containers bearing manufacturer's name, type of material, brand name, colour designation.

1.4 SEQUENCING AND SCHEDULING

1.4.1 Sequence and schedule work so as to provide access to buildings at all times. Arrange work so as not to interfere with normal use of premises.

2 Products

2.1 MATERIALS

2.1.1 Materials are specified by the designated MPI systems, with colours specified herein.

2.1.2 Only products listed in the MPI "Approved Product List" are acceptable for use.

2.2 TRAFFIC MARKING PAINT SYSTEM

2.2.1 System for New Work: EXT 2.1A, Latex.

2.2.1.1 Colour: to be selected by Consultant.

2.2.2 System for Maintenance Work: REX 2.1A, Latex.

2.2.2.1 Colour: to be selected by Consultant.

2.3 THERMOPLASTIC PAVEMENT MARKING SYSTEM (AT CROSSWALKS)

2.3.1 Description: pavement marking system made of durable, reinforced thermoplastic that provides textured, attractive surface on asphalt pavement intended for use on asphalt pavements to create traffic calming solutions and decorative features in parking lots, intersections, and crosswalks.

2.3.1.1 System must be able to be applied to asphalt surfaces without preheating the application surface to a specific temperature.

2.3.1.2 System utilizes resilient, aggregate reinforced preformed thermoplastic product which contains a minimum of 30% intermixed anti-skid/anti-slip elements and where the top surface contains antiskid/anti-slip elements. Anti-skid/anti-slip elements must have a minimum hardness of 6 (Mohs scale).

2.3.2 Preformed thermoplastic material: Must be composed of an ester modified rosin impervious to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, and anti-skid/anti-slip elements. Pigments and anti-skid/anti-slip elements must be uniformly distributed throughout the material.

2.3.3 Skid Resistance: The surface of the material shall contain factory applied anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 BPN when tested according to ASTM E 303.

Pavement Markings

2.3.4 Slip Resistance: The surface of the material shall contain factory applied anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum static friction of coefficient of 0.6 when tested according to ASTM C 1028 (wet and dry), and a minimum static coefficient of friction of 0.6 when tested according to ASTM D 2047.

2.3.5 Thickness: The material must be supplied at a minimum thickness of 150 mil (3.8mm).

2.3.6 Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.

2.3.7 Acceptable Product: TrafficPatterns XD by Ennis Flint.

3 Execution

3.1 PROTECTION OF EXISTING WORK

3.1.1 Protect structures, buildings, sidewalks, landscaping and other surface features against spillage and over-spray during painting operation.

3.2 PREPARATION OF SUBSTRATE

3.2.1 Prepare new pavement in accordance with manufacturer's instructions and in accordance with "Architectural Painting Specification Manual", Chapter 2, Section 3.

3.2.2 Prepare for maintenance repainting for the existing degree of surface deterioration (DSD) in accordance with "Maintenance Repainting Manual", Chapter 2, Section 3.

3.3 APPLICATION OF PAVEMENT LINE MARKINGS

3.3.1 Clean pavement surface as recommended by paint manufacturer.

3.3.2 Paint lines straight and in uniform width, at locations indicated on drawings.

3.3.3 Apply paint using marking machine or line stencil, and as recommended by manufacturer, to minimum 0.18 mm dry film thickness.

3.3.4 Line Width:

3.3.4.1 Roadways and Parking Areas: match existing.

3.4 APPLICATION OF THERMOPLASTIC PAVEMENT MARKING SYSTEM

3.4.1 Apply in strict accordance with manufacturer's instructions and using specialized equipment.

3.5 CLEAN UP

3.5.1 Remove spillage and over-spray of paint from pavement, sidewalks, building and other site features. Use methods and materials without damaging and leaving visible residue on substrates.

3.6 PROTECTION OF COMPLETED WORK

3.6.1 Keep traffic off pavement markings for a time as recommended by paint manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Cast-in-place steel detectable warning tiles.

B. Related Requirements:

- 1. Section 32 13 13 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Shop Drawings required for tactile plate installation:

- 1. Include plans, layout, and attachment details.

- C. Samples for Initial Selection: For each type of exposed finish requiring color selection.

- D. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

- 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Adhesive Application:
 - 1. Apply adhesive only when ambient temperature is above 10 deg C and when temperature has not been below 2 deg C for 12 hours immediately before application. Do not apply when substrate is wet or contains excess moisture.
- C. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 38 deg C and higher.
 - 1. When ambient temperature exceeds 38 deg C, or when wind velocity exceeds 13 km/h and ambient temperature exceeds 32 deg C, set unit pavers within 1 minute of spreading setting-bed mortar.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - 1. Deterioration of finishes beyond normal weathering and wear.
 - 2. Separation or delamination of materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

- A. Accessibility Requirements: Comply with applicable provisions in The Accessibility for Ontarians with Disabilities Act (OADA) for tactile warning surfaces.
 - 1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

- B. Source Limitations: Obtain each type of tactile warning surfacing, setting material, anchor, and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 DETECTABLE WARNING TILES

- A. Product: Cast-in-place steel detectable warning tiles.

B. Manufacturers:

1. Brad Dunlop, Regional Sales Manager
 1. Bibby Ste Croix (Div of Canada Pipe Co. Ltd.)
 2. 1757 Burlington Street East
 3. Hamilton ON L8H 3L5
 4. brad.dunlop@bibby-ste-croix.com
2. John DiCesare
 1. GORA Construction Products
 2. 1939 Kilgorman Way
 3. London ON N6K 0G6
 4. john@goracon.ca
3. Ted Lalogiannis, Director of Business Development
 1. Ontario Utility Castings Inc.
 2. P.O. Box 96761
 3. RPO Jane/Major Mac
 4. Vaughan ON L6A-0A2
 5. ted@oucastings.

C. Mounting:

1. Permanently embedded detectable warning tile wet-set into freshly poured concrete.
2. Permanently embedded detectable warning tile set into formed recess in concrete and adhered with mortar.

3. Replaceable embedded detectable warning tile fastened to permanently installed anchors.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
 1. Furnish Type 304 or 308 stainless-steel fasteners for exterior use.
 2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.
- B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.
- C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

- A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.
- B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.3 INSTALLATION OF DETECTABLE WARNING TILES

- A. Cast-in-Place Detectable Warning Tiles:
 1. Concrete Paving Installation: Comply with installation requirements in Section 32 13 13 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.
 2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.

3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 3 mm from flush.
4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
5. Clean tiles using methods recommended in writing by manufacturer.
6. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
7. Clean tiles using methods recommended in writing by manufacturer.

3.4 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.
- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Decorative Aluminum Fence.
 - 2. Decorative 3-Rail Aluminum Picket Fence.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings Required:
 - 1. Include plans, elevations, sections, post spacing, mounting/ attachment details and locking mechanisms for the following:
 - a. Decorative Aluminum Fence.
 - b. Decorative Picket Fence.
- C. Samples: For each fence material and for each color specified.
 - 1. Provide Samples 300 mm in length for linear materials.
 - 2. Provide Samples 300 mm square for bar grating and sheet or plate materials.
- D. Product Schedule: For site metal fencing.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation. Mockups may form a part of the completed work.
 - 1. Include 1 panel of fence complying with requirements.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty against defects in materials and workmanship for a period of 5 Years.

PART 2 - PRODUCTS

2.1 DECORATIVE ALUMINUM FENCE

- A. Decorative Aluminum Fences: Fences made from aluminum extrusions.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Iron Eagle Industries, Inc.
 - .1 Product:
 - .1 Material: Aluminum.
 - .2 Style: Manufacturer's standard 'Iron Eagle II' Series.
 - .3 Length: As indicated in the drawings.
 - .4 Overall Height: As indicated in the drawings.
 - .5 Overall Width: As indicated in the drawings.
 - .6 Overall Depth: As indicated in the drawings.
 - .7 Post Cap: As indicated in the drawings.
 - .8 Installation Method: Embedded in concrete retaining wall as indicated in the drawings.
 - .9 Finish: Black Powder Coat.
- B. Fasteners: Manufacturer's standard concealed fastening system.
- C. Fasteners: Manufacturer's standard tamperproof, corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.
- D. Fabrication: Assemble fences into sections by fastening pickets to rails.
 - 1. Fabricate sections with clips welded to rails for field fastening to posts.
 - 2. Drill clips for fasteners before finishing.
- E. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

2.2 DECORATIVE 3-RAIL ALUMINUM FENCE

- A. Manufacturer: Knotwood Aluminum Fencing – Knotwood, 404 – 12914 Anvil Way, Surrey, BC V3W 8E7, (604) 501-0151, ext 311/316.
- B. Product:
 - 1. Material: Aluminum.
 - 2. Style: Manufacturer's standard with 3 rails.
 - 3. Length: As indicated in the drawings.
 - 4. Overall Height: As indicated in the drawings.
 - 5. Overall Width: As indicated in the drawings.
 - 6. Overall Depth: As indicated in the drawings.
 - 7. Accessories: Manufacturer's standard components.
 - 8. Fasteners: Manufacturer's standard hardware.
 - 9. Installation Method: Embedded in concrete footings as indicated in the drawings.
 - 10. Finish: Black Ash simulated wood pattern.

2.3 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: ASTM B 221M, Alloy 6063-T5.
- C. Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
- D. Plate and Sheet: ASTM B 209M, Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B 247M, Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.4 COATING MATERIALS

- A. Polyurethane Intermediate Coat and Topcoat: Complying with MPI #72 and compatible with undercoat.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 20 MPa, 75-mm slump, and 25-mm maximum aggregate size or dry, packaged, normal-weight concrete mix complying with ASTM C 387/C 387M mixed with potable water according to manufacturer's written instructions.

- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.

2.6 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 0.05 mm. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 152.5 m or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening rails and infill panels to posts. Peen threads of bolts after assembly to prevent removal.
- C. Post Setting: Set posts in concrete footing at indicated spacing.
 - 1. Posts Set into Voids in Concrete: Form or core drill holes not less than 20 mm larger than outside diagonal dimension of post.
 - a. Extend posts at least 125 mm into concrete.
 - b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, waterproof grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
 - 2. Space posts uniformly at standard manufacturers panel size.

3.4 PROTECTION

- A. Clean and protect products in accordance with the manufacturer's recommendations.
- B. Touch-up, repair or replace damaged products before substantial completion.
 - 1. Touch-up any necessary areas by following the manufacturer instructions.
 - 2. Touch-up paint available from the manufacturer.
- C. Level uneven areas due to excavations created by fence installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood Benches.
2. Bicycle racks.
3. Waste Receptacle.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast installing anchor bolts cast formed voids in concrete footings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Data for all:

1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

C. Shop Drawings required for all furnishings and hardware:

1. Include plans, elevations, sections, mounting heights, and attachment details.
2. Detail fabrication and assembly of components.
3. Show locations for blocking, reinforcement, and supplementary structural support.

D. Samples: For each exposed product and for each color and texture specified.

E. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

F. Warranty: for all site furnishings.

PART 2 - PRODUCTS

2.1 WOOD BENCHES

A. Type A (at Entry Feature)

1. Manufacturer – Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048. Phone: (800) 521-2546.
2. ‘Neoromatico’ Bench with Back.
 1. Quantity: 3
 2. Bench Length: 3000 mm long.
 3. Backed Bench
 4. Bolt down:
 1. Hardware: Refer to attachment hardware in the detail.
 5. Finish/ Colour:
 1. Aluminum finish: Standard and powder coated ‘Meteor Grey’.
 2. Wood Type: Jarrah.

B. TYPE B (at Entry Feature)

1. Manufacturer – Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048. Phone: (800) 521-2546.
2. ‘Neoromatico’ Bench with Back.
 1. Quantity: 4
 2. Bench Length: 1750 mm long.
 3. Backed Bench
 4. Bolt down:
 1. Hardware: Refer to attachment hardware in the detail.
 5. Finish/ Colour:
 1. Aluminum finish: Standard and powder coated ‘Meteor Grey’.
 2. Wood Type: Jarrah.

C. Type C

1. Manufacturer – Hauser Site Furniture, sales@hausersite.com Phone: 1-800-268-7328.
 1. Owner Provided Contractor Installed
2. ‘Rio-Can’ Aluminum Bench with Back & Arms (Model No. PS-882-AL-EW-A-TC-SB-BD).
 1. Quantity: 1
 2. Backed bench.
 3. With arms.
 4. Bolt down.

1. Hardware: Refer to attachment hardware in the detail.
 3. Finish/ Colour:
 1. Envirowood slats in colour 'Sand'.
 2. Frame Metal Colour 'Designer White'.
 3. Inset Metal Colour Red.
- 2.2 BICYCLE RACK
- A. Manufacturer – Hauser Site Furniture, sales@hausersite.com Phone: 1-800-268-7328.
 1. Owner Provided Contractor Installed
 - B. Style – 'Rio-Can Skyline' Bicycle Rack (Model No. PS-78-102-21-TC-A).
 1. Quantity: 21.
 2. Size: 762mm X 806mm X 50.8mm.
 3. Bolt down.
 1. Hardware: Refer to attachment hardware in the detail.
 4. Finish/ Colour:
 1. Aluminum Frame in colour 'Designer White'.
 2. Formed aluminum insert with metal colour Red.
 5. Installation: Bolt down with embedded anchors to a concrete base as per manufacturer specifications.
- 2.3 WASTE RECEPTACLE
- A. Manufacturer – Hauser Site Furniture, sales@hausersite.com Phone: 1-800-268-7328.
 1. Owner Provided Contractor Installed
 - B. Style – 'Rio-Can City 3-Stream' Waste Receptacle (Model No. GS-945-AL-TC-35-BD).
 1. Quantity: 4.
 2. Size: 889mm X 1206.5mm X 584.2mm.
 3. Bolt down.
 1. Hardware: Refer to attachment hardware in the detail.
 4. Finish/ Colour:
 1. Aluminum Frame in colour 'Designer White'.
 2. Bolt down deflectors colour 'Gunmetal'.
 3. Inset metal colour 'Gunmetal'.
 5. Accessories:
 1. Polyliners.
 2. Back Panel.
 3. Coin lock for front loading door.

6. Installation: Bolt down with embedded anchors to a concrete base as per manufacturer specifications.

2.4 MATERIALS

- A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513/A 513M, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.

- B. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.

1. Polyethylene: Fabricated from virgin plastic HDPE resin.

- C. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.5 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces.

- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.6 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.9 IRON FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.10 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run directional finishes with long dimension of each piece.
 2. Directional Satin Finish: No 4.
 3. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION

Site Specialties

1 GENERAL

1.1 SUMMARY

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, products, equipment and services to complete the Work of this Section and as indicated on the Drawings and specified herein.

1.1.2.1 Tactile warning surfacing.

1.1.2.2 Reflective tape.

1.1.2.3 Bollard covers.

1.2 REFERENCES

1.2.1 Conform to the latest edition of the following. Where Standards are listed throughout the specifications, but are not listed below, conform to the latest edition of the listed Standard:

1.2.2 **Canadian Standards Association (CSA):**

1.2.2.1 CSA B651 - Accessible Design for the Built Environment

1.2.3 **International Organization for Standardization (ISO):**

1.2.3.1 ISO 23599 - Assistive products for blind and vision-impaired persons
— Tactile walking surface indicators

1.3 SUBMITTALS

1.3.1 All submittals as required by this Section, shall conform strictly to the requirements of Section 01 33 00 – Submittal Procedures.

1.3.2 **Product Data:** Submit manufacturer's product data, catalogue cuts, installation instructions and other relevant information for each material and product used.

1.3.3 **Samples:** Submit for each exposed product and for each colour and texture specified.

2 PRODUCTS

2.1 TACTILE WARNING SURFACING

2.1.1 Accessibility Requirements: Comply with applicable provisions in CSA B651, ISO 23599 and Ontario Building Code for tactile warning surfaces.

2.1.2 Obtain each type of tactile warning surfacing joint material, setting material, anchor fastener, joint material, setting material, anchor, and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.1.3 Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles with replaceable surface configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.

2.1.4 Color: As selected by Consultant from manufacturer's full line.

2.1.5 Shapes and Sizes: Refer to Drawings.

2.1.6 Dome Spacing and Configuration: Manufacturer's standard compliant spacing .

2.1.7 Acceptable Manufacturer: Kinesik or acceptable equivalent.

2.2 REFLECTIVE TAPE

2.2.1 Outdoor-grade, weather, impact, abrasion and solvent resistant highly reflective tape for applications indicated on Drawings.

Site Specialties

- 2.2.2 Tape must be suitable of adhesion to substrates noted on Drawings and application using high-tack pressure sensitive acrylic adhesive.
- 2.2.3 Reflective High Durability Concrete and Pavement Marking Tape. Product: 'DuraMark RPT-750', as manufactured by DuraMark, or Consultant approved equivalent.
- 2.2.4 Reflective Accent Bands for Concrete Pole Base. Product: 'Kellamy 610R', as manufactured by ArtForms, or Consultant approved alternate.
- 2.2.5 To be provided in red and white, refer to the architectural details for sizes.
- 2.3 SIGN POSTS**
- 2.3.1 Provide Parking Lot Sign Posts. Refer to drawings for location and size.
- 2.3.2 Product: 'Post-Flat Top – White' as manufactured by Impact Recovery Systems, or consultant approved alternate.
- 2.3.3 Adhesive for rigid posts: Product 'Davidson Traffic Product - 795A One Part Fast Cure Adhesive' as manufactured by Pexco LLC, or Consultant approved alternate.
- 2.3.4 Adhesive for flex posts to be manufacturer's recommended adhesive pads.
- 2.4 FABRICATION**
- 2.4.1 Metal Components: Submit form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- 2.4.2 Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- 2.4.3 Pipes and Tubes: Submit form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- 2.4.4 Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- 2.4.5 Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.
- 2.5 EARTH BINS**
- 2.5.1 **Model EB505**
Capacity/ Volume 6.5 cu.yd (5000 litres)
Install Earthbin, as per manufacturer's recommendations and guidelines.
www.earthbin.com
- 2.6 PARKING LOT SHOPPING CART CORRAL:**
- 2.6.1 Supply and install Parking Lot Shopping Cart Corral # 600-10.
- 2.6.2 Refer to drawings for location.
- 2.6.3 Refer to National Accounts for Vendors.

Site Specialties

2.7 GENERAL FINISH REQUIREMENTS

2.7.1 Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

3 EXECUTION

3.1 EXAMINATION

3.1.1 Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

3.1.2 Commencement of construction activities implies acceptance of in-place conditions.

3.2 INSTALLATION

3.2.1 Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

3.2.2 Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

3.2.3 Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.
- B. Related Requirements:
 - 1. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 2. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
- H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
 - L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
 - M. SSSA: Soil Science Society of America or CSSS: Canadian Society of Soil Science
 - N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
 - O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
 - P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
 - Q. CCME: The Canadian Council of Ministers of the Environment
- 1.4 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site.
- 1.5 ACTION SUBMITTALS
- A. Product Data: For each type of product.
 - 1. Include test data substantiating that products comply with requirements.
 - 2. Material Certificates: For each type of imported soil before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
- 1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
- 1.7 TESTING REQUIREMENTS
- A. General: Perform tests on soil samples according to requirements in this article.
 - B. Physical Testing:
 - 1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
 - a. Hydrometer Method: Report percentages of sand, silt, and clay.

- C. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAFT NCR-13, including the following:
1. Percentage of organic matter.
 2. CEC, calcium percent of CEC, and magnesium percent of CEC.
 3. Soil reaction (acidity/alkalinity pH value).
 4. Buffered acidity or alkalinity.
 5. Nitrogen ppm.
 6. Phosphorous ppm.
 7. Potassium ppm.
 8. Manganese ppm.
 9. Manganese-availability ppm.
 10. Zinc ppm.
 11. Zinc availability ppm.
 12. Copper ppm.
 13. Sodium ppm and sodium absorption ratio.
 14. Soluble-salts ppm.
 15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
 16. Other deleterious and hazardous materials, including their characteristics and content of each.
- D. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- E. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients. Amend soil as per soil testing amendment recommendations in the soil test report and re-test if not within recommended nutrient/fertility ranges. Hazardous materials to human and/or plant health shall not be permitted in the final installed planting soil.

1.8 SOURCE QUALITY CONTROL

- A. Provide a minimum of 3 samples of planting soil/ topsoil to a qualified testing lab for analysis.
- B. Planting soil/ topsoil to meet the following criteria:

Description	Typical Guidelines
pH	5.5 – 7.0
Organic Matter (%)	4 – 10
Total Salts	<1.5
Phosphorus (ppm)	10 - 60
Potassium (ppm)	80 - 250

Calcium (ppm)	1000 – 4000
Magnesium (ppm)	100 - 300
Chloride (ppm)	<100
Sodium (ppm)	<200
Sodium Adsorption Ratio	<15
Sand Fraction (%)	40 – 75
Silt Fraction (%)	5 – 50
Clay Fraction (%)	20 - 30
Texture	Loam / Sandy Loam

- C. All required planting soil topsoil amendments to meet the above-mentioned criteria.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Do not move or handle materials when they are wet or frozen.
 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam loam silt loam soil according to USDA textures; and modified to produce viable planting soil.

1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 100 mm deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
3. Unacceptable Properties: Clean soil of the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and extraneous materials that are harmful to plant growth.
 - b. Contain no toxic elements or growth inhibiting materials.
 - c. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
 - d. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 50 mm in any dimension.
4. Amended Soil Composition: Blend imported, unamended soil with the following soil amendments and fertilizers to produce planting soil:
 - a. Ratio of Loose Compost to Soil: 1:4 by volume.
 - b. Soil amendment to be provided as recommended in soil reports from a qualified testing agency.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: T, with a minimum of 99 percent passing through a 2.36-mm sieve and a minimum of 75 percent passing through a 0.25-mm sieve.
 2. Form: Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a 3.35-mm sieve and a maximum of 10 percent passing through a 0.425-mm sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a 0.30-mm sieve.

- E. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing CCME's "Seal of Testing Assurance," and as follows:
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 13-mm sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture with 100 percent passing through a 13-mm sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
- D. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 - 1. Partially Decomposed Wood Derivatives: In lieu of shredded and composted wood derivatives, mix shredded and partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 2.4 kg/cu. m of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 4 kg/cu. m of loose sawdust or ground bark.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.
- D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 100 mm. Remove stones larger than 38 mm in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 50 mm of subgrade. Spread remainder of planting soil.
- C. Mixing: Spread unamended soil to total depth of 100 mm, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
 - a. Mix lime and sulfur with dry soil before mixing fertilizer.
 - b. Mix fertilizer with planting soil no more than seven days before planting.
 - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 200 mm in loose depth for material compacted by compaction equipment, and not more than 100 mm in loose depth for material compacted by hand-operated tampers.
- D. Soil Depth Minimum:
 - 1. Sodded areas: Minimum 150 mm depth.
 - 2. Planting Beds – grasses, perennials and groundcover: Minimum 450 mm depth.
 - 3. Planting Beds – Medium to small shrubs: Minimum 600 mm depth.
 - 4. Raised Planters: 600 mm depth.
 - 5. Shade and Ornamental Trees: 1200 mm depth where possible.
- E. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.

- F. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PROTECTION

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Contract Administrator and replace contaminated planting soil with new planting soil.

3.4 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Sodding.

- B. Related Requirements:

- 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
 - C. Product Certificates: For fertilizers, from manufacturer.
 - D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the Canadian Nursery Landscape Association.
 2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Lawncare Manager.
 - c. Landscape Industry Certified Lawncare Technician.
 5. Pesticide Applicator: State licensed, commercial.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
 - B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
 - C. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
 - 1. Spring Planting: May-June.
 - 2. Fall Planting: September-October.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

- A. Turfgrass Sod: Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
 - 2. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 10 percent perennial ryegrass (*Lolium perenne*).
 - d. 10 percent redtop (*Agrostis alba*).
 - 3. Shade: Proportioned by weight as follows:
 - a. 50 percent chewings red fescue (*Festuca rubra* variety).
 - b. 35 percent rough bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 0.45 kg/92.9 sq. m of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 PESTICIDES

- A. General: Pesticide, registered and approved by Environment Canada, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by the Consultant and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Blend planting soil in place.
 - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Consultant's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SODDING

- A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Consultant prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 38 mm below sod.

3.5 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 100 mm.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas if no irrigation is available.
 2. Water turf with fine spray at a minimum rate of 25 mm per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow Kentucky bluegrass annual ryegrass chewings red fescue to a height of 38 to 50 mm.
- D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that provides actual nitrogen of at least 0.45 kg/92.9 sq. m to turf area.

3.6 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by the Consultant:
1. Satisfactory Sodded Turf: At end of maintenance and warranty period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities. Sodded turf in dead or poor condition during the maintenance and warranty period shall be replaced by the contractor to the satisfaction of the consultant.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.7 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.8 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

- D. Remove nondegradable erosion-control measures after grass establishment period.

3.9 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
 - 1. Sodded Turf: 24 months from date of Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Aluminum edge restraint.
4. Decorative Mineral Mulch

B. Related Requirements:

1. Section 329113 "Soil Preparation" for planting soils specified by composition of the mixes.
2. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by CSNS 8th Edition for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by CSNS 8th Edition.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by CSNS 8th Edition for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to CSNS 8th Edition for type and size of plant required.
- E. Canadian Standards for Nursery Stock 8th Edition (**CSNS 8th Edition**).
- F. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root

mass during shipping and be sized according to CSNS 8th Edition for type and size of plant required.

- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by CSNS 8th Edition for type and size of plant.
- H. Finish Grade: Elevation of finished surface of planting soil.
- I. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- J. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- K. Planting Area: Areas to be planted.
- L. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.
- M. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- N. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- O. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- P. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

B. Samples for Verification: For each of the following:

1. Organic Compost Mulch: 0.5-L volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

2. Mineral Mulch: 1.0 kg of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.

3. Weed Control Barrier: 300 by 300 mm.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor to submit a phasing completion submittal prior the commencement of plant installation.

B. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.

2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

E. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the Canadian Nursery Landscape Association.

2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 1. Landscape Industry Certified Technician - Exterior.
 2. Landscape Industry Certified Interior.
 3. Landscape Industry Certified Horticultural Technician.
 5. Pesticide Applicator: Province licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in CSNS 8th Edition.
1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.
- C. Measurements: Measure according to CSNS 8th Edition. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 150 mm above the root flare for trees up to 100-mm caliper size, and 300 mm above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Architect of sources of planting materials seven days in advance of delivery to site.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
 - B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at 16 to 18 deg C until planting.
- G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- I. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 3. Do not remove container-grown stock from containers before time of planting.
 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: May-June.
 - 2. Fall Planting: September-November.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - 1. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - 2. Structural failures including plantings falling or blowing over.
 - 3. Faulty performance of tree stabilization.
 - 4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods: From date of Substantial Completion.
 - 1. Within the City's right-of-way:
 - 1. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months following written acceptance by the city.
 - 2. Ground Covers, Biennials, Perennials, and Other Plants: 24 months following written acceptance by the city.
 - 2. Within Private property:
 - 1. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months from the date of substantial completion.
 - 2. Ground Covers, Biennials, Perennials, and Other Plants: 24 months from the date of substantial completion.

3. Include the following remedial actions as a minimum:
 1. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 2. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with CSNS 8th Edition; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 19 mm in diameter; or with stem girdling roots are unacceptable.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with CSNS 8th Edition for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to CSNS 8th Edition. Root flare shall be visible before planting.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
1. Size: 21-gram tablets.
 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
1. Type: Shredded hardwood.
 2. Size Range: 76 mm maximum, 13 mm minimum.
 3. Color: Natural.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 25-mm sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- C. Decorative Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:
1. Type: Riverstones: Washed and round granite riverstones.
 2. Size Range: 50 mm maximum, 100 mm minimum.
 3. Color: Readily available natural grey gravel color range.
 4. Installation: Min. 10mm depth (two layers of riverstones) on filter fabric and compacted granular A base.

2.4 ALUMINUM EDGE RESTRAINTS

- A. Aluminum Edge Restraints: Manufacturer's standard, 4.8-mm-thick by 127-mm-high extruded-aluminum edging.
1. 'Cleanline' Commercial Grade Landing Edging by 'Permaloc' or approved equal.
www.permaloc.com

1. Finish: Mill Finish – Natural Aluminum.

2.5 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 101g/sq. m minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

2.6 PESTICIDES

- A. General: Pesticide registered and approved by Environment Canada, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.7 TREE-STABILIZATION MATERIALS (For use only if specifically requested or required)

- A. Trunk-Stabilization Materials:
 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 38-by-38-mm actual by length indicated, pointed at one end.
 2. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 2.7 mm in diameter.
 3. Flags: Standard surveyor's plastic flagging tape, white, 150 mm long.

2.8 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWP A U1, Use Category UC4a; acceptable to authorities having jurisdiction, and containing no arsenic or chromium.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Burlap: Non-synthetic, biodegradable.
- D. Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- E. Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

- F. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per 0.45 kg of vesicular-arbuscular mycorrhizal fungi and 95 million spores per 0.45 kg of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Install aluminum edge restraint as per manufacturer's installation guidelines.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

- B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 2. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted, container-grown, fabric bag-grown stock.
 - 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 6. Maintain supervision of excavations during working hours.
 - 7. Keep excavations covered or otherwise protected after working hours when unattended by Installer's personnel.
 - 8. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - 1. Hardpan Layer: Drill 150-mm-diameter holes, 600 mm apart, into free-draining strata or to a depth of 3 m, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to CSNS 8th Edition. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 25 mm above adjacent finish grades.
 - 1. Backfill: Planting soil.
 - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 25 mm from root tips; do not place tablets in bottom of the hole.
 - 1. Quantity: As indicated on Drawings.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 25 mm above adjacent finish grades.
 - 1. Backfill: Planting soil.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 25 mm from root tips; do not place tablets in bottom of the hole.
 - 1. Quantity: As indicated on Drawings.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.

- E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 25 mm above adjacent finish grades.
 - 1. Backfill: Planting soil.
 - 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 25 mm from root tips; do not place tablets in bottom of the hole.
 - 1. Quantity: As indicated on Drawings.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION (For use only if specifically requested or required)

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Tying: Stake trees of 50- through 125-mm caliper. Stake trees of less than 50-mm caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 450 mm below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - 2. Upright Staking and Tying: Stake trees with two stakes for trees up to 3.6 m high and 63 mm or less in caliper; three stakes for trees less than 4.2 m high and up to 100 mm in caliper. Space stakes equally around trees.

3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 4.2 m in height and more than 75 mm in caliper unless otherwise indicated.
1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
 1. Securely attach guys to stakes 760 mm long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
 2. For trees more than 150 mm in caliper, anchor guys to wood deadmen buried at least 900 mm below grade. Provide turnbuckle for each guy wire and tighten securely.
 3. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 4. Support trees with guy cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 5. Attach flags to each guy wire, 760 mm above finish grade.
 6. Paint turnbuckles with luminescent white paint.

3.8 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 300mm and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 75-mm average thickness, with 900-mm radius around trunks or stems. Do not place mulch within 75 mm of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 75-mm average thickness of organic mulch extending 300 mm beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 75 mm of trunks or stems.
 - 3. Mineral Mulch Areas: Apply 75-mm average thickness of mineral mulch over whole surface of area, and finish level with adjacent finish grades.
- C. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.10 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.12 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size as those being replaced for each tree of 100 mm or smaller in caliper size.
 - 2. Species of Replacement Trees: Same species being replaced.

3.13 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.14 MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Maintenance Period: 24 months from date of Substantial Completion.
- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin

maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 24 months from date of Substantial Completion.
- C. Weed Control: Hand remove all weeds and any plants that do not appear on the planting plan. Chemical weed control is not permitted. Schedule Weeding shall be as needed but not less than 5 times a year and not less than maintenance period below:
1. Maintenance Period: 24 months from date of Substantial Completion.

END OF SECTION