
SPECIFICATIONS

Ontario Aboriginal Housing Services (OAHS)

**321 John Street,
Cobourg, Ontario**

Issued for Addendum #2

June 19th, 2026

LGA - Architectural Partners

Project No. 251088

Design Discipline

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

Owner (O)
Architect (A)
Structural Consultant (S)
Mechanical Consultant (M)
Electrical Consultant (E)
Solar Consultant (SL)
Civil Consultant (C)
Landscape Consultant (L)
Hardware Consultant (H)

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

Document	Title	Discipline	Pages
	Cover Page	A	
00 01 10	Table of Contents	A	5
00 01 15	List of Drawings	A	9
00 21 13	Instruction to Bidders	A	7
00 21 13	Information Available to Bidders	A	2
00 31 00	Bid Form - Stipulated Sum	A	4
00 43 01	Supplementary Bidding Information Form	A	11
00 72 00	General Conditions	-	-
	"Agreement Between Owner and "Definitions", and "General Conditions of Stipulated Price Contract", Standard Document CCDC2 - 2020.		
00 73 00	Supplementary Conditions	O	84

DIVISION 01 - GENERAL REQUIREMENTS

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01 11 00	Summary of Work	A	8
01 21 00	Allowances	A	3
01 25 00	Substitutions Procedures	A	3
01 26 00	Contract Modification Procedures	A	5
01 26 15	Requests for Interpretation	A	3
01 26 17	Request for Interpretation Form	A	1
01 29 00	Payment Procedures	A	2
01 31 00	Coordination	A	4
01 31 19	Project Meetings	A	3
01 32 00	Construction Progress Documentation	A	6
01 33 00	Submittal Procedures	A	10
01 35 25	Safety	A	4

DIVISION 01 - GENERAL REQUIREMENTS cont

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01 40 00	Quality Requirements	A	8
01 41 00	Regulatory Requirements	A	5
01 50 00	Temporary Controls and Facilities	A	12
01 60 00	Product Requirements	A	12
01 60 01	Product and Material Conformance Form	A	1
01 71 00	Examination and Preparation	A	3
01 73 29	Cutting and Patching	A	4
01 74 00	Cleaning and Waste Management	A	4
01 78 00	Closeout Submittals	A	5
01 78 39	Record Documents	A	2
01 90 00	General Requirements for Building Envelope	SL	5
01 90 10	General Requirements for Energy Efficiency	SL	2

DIVISION 02 - EXISTING CONDITIONS

Section	Title	Discipline	Pages
02 40 00	Demolition and Removals	A	10

DIVISION 03 - CONCRETE

Section	Title	Discipline	Pages
03 10 00	Concrete Forming and Falsework	S	21
03 20 00	Concrete Reinforcing	S	14
03 30 00	Cast-In-Place Concrete	S	17
03 51 13	Gypsum Topping	A	4

DIVISION 04 - MASONRY

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04 20 00	Unit Masonry	A	14

DIVISION 05 - METALS

Section	Title	Discipline	Pages
05 12 23	Structural Steel	S	24
05 50 00	Miscellaneous and Metal Fabrications	A	8

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

Section	Title	Discipline	Pages
06 10 53	Miscellaneous-Rough-Carpentry	S	11
06 11 00	Rough Carpentry	A	8
06 17 00	Shop-Fabricated Structural Wood	S	14
06 17 53	Shop-Fabricated Wood Trusses	S	17
06 20 00	Finish Carpentry	A	11
06 64 00	PVC Wall Materials	A	6

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

Section	Title	Discipline	Pages
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07 05 20	Air Tightness Testing		6
07 13 00	Sheet Water Proofing	A	4
07 21 00	Thermal Insulation	A	4
07 21 19	Spray Foam Insulation	A	4
07 26 00	Vapour Retarders	A	4
07 26 10	Under Slab Vapour Retarders	A	3
07 27 00	Air Barriers	A	4
07 41 13	Aluminum Roof Panels	A	10
07 46 19	Aluminum Siding and Soffit	A	13
07 62 00	Flashing and Sheet Metal	A	4
07 71 23	Manufactured Gutters And Downspouts	A	7
07 81 16	Fireproofing	A	6
07 81 16	EJ 728568a	A	2
07 81 23	Intumescent Fireproof Coating	A	6
07 85 00	Firestopping and Smoke Seals	A	8
07 92 00	Sealants	A	5

DIVISION 08 - OPENINGS

Section	Title	Discipline	Pages
08 11 13	Metal Doors and Frames	A	7
08 14 16	Wood Doors	A	5
08 31 13	Access Panels	A	2
08 44 00	Aluminum Work	A	15
08 53 13	Vinyl Windows	A	10
08 70 00	Finish Hardware	A	5
08 80 00	Glazing	A	10
08 91 00	Louvres	A	3

DIVISION 09 - FINISHES

Section	Title	Discipline	Pages
09 26 13	Gypsum Board	A	12
09 51 00	Acoustical Ceilings	A	5
09 65 00	Resilient Base	A	2
09 65 19	Resilient Tile Flooring	A	7
09 67 23	Epoxy Flooring	A	4

09 91 00	Painting	A	9
09 97 13	Exterior Steel Coatings	A	10

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10 55 23	Mailboxes	A	3
10 80 00	Miscellaneous Specialties	A	3

DIVISION 11 - EQUIPMENT

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11 31 00	Residential Appliances	A	3
11 83 13	In-Ground Waste Collection System	A	5

DIVISION 12 - FURNISHINGS

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12 21 23	Window Coverings	A	6

DIVISION 15 – CONVENYING EQUIPMEN

Section	Title	Discipline	Pages
14 21 21	Electric Traction Passenger Elevators	A	19

DIVISION 22 - PLUMBING

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DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING

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	See attached HVAC Table of Contents.	M	

DIVISION 26 - ELECTRICAL

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26 05 00	Common Work Results For Electrical	E	9
26 05 21	Wires and Cables (0-1000 V)	E	4
26 05 28	Grounding - Secondary	E	5
26 05 29	Hangers and Supports for Electrical	E	3
26 05 32	Outlet Boxes, Conduit Boxes and Fittings	E	3

26 05 34	Conduits, Conduit Fastenings and Conduit	E	5
26 05 43.01	Installation of Cables in Trenches and in Ducts	E	4
26 09 24	Lighting Control Devices – Low Voltage	E	9
26 24 16.01	Panelboards Breaker Type	E	4
26 27 26	Wiring Devices	E	4
26 28 13.01	Fuses – Low Voltage	E	2
26 28 16.02	Moulded Case Circuit Breakers	E	4
26 28 20	Ground Fault Circuit Interrupters – Class ‘A	E	4
26 28 23	Disconnect Switches – Fused and Non-Fused	E	3
26 29 01	Contactors	E	3
26 29 10	Motor Starters to 600 V	E	4
26 32 13	Engine Generator	E	12
26 36 23	Automatic Transfer Switches	E	7
26 50 00	Lighting	E	3
26 52 13.13	Emergency Lighting	E	4
26 52 13.16	Exit Signs	E	3

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 31 00.01	Multiplex Fire Alarm System	E	13

DIVISION 31 - EARTHWORK

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31 00 00	Earthwork	A	5

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section	Title	Discipline	Pages
32 11 19	GRANULAR SUB-BASE	C	4
32 12 16	ASPHALT PAVING	C	4
32 13 15	CONCRETE CURBS	C	3
32 13 16	CONCRETE SIDEWALKS	C	4
32 14 13	Precast Concrete Unit Paving	L	10
32 31 19	Decorative Metal Fences	L	10
32 37 00	Exterior Site Furnishings	L	2
32 84 00	Planting Irrigation	L	11
32 91 21	Topsoil Placement and Grading	L	4
32 92 23	Sodding	L	4
32 93 10	Tree Shrub and Groundcover Planting	L	7

DIVISION 33 - UTILITIES

Section	Title	Discipline	Pages
33 05 14	MANHOLES AND CATCH BASIN	C	4
33 11 00	STORM SEWERS	C	3
33 11 17	WATER SYSTEMS	C	4

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33 30 00	SANITARY SEWERS	C	4
33 44 01	SUBDRAINS	C	2
33 46 13	Foundation Drainage	A	3

DIVISION 48 - ELECTRICAL POWER
GENERATION

Section	Title	Discipline	Pages
48 14 00	Solar PV System Specification	SL	21

END OF DOCUMENT

1 DRAWINGS

- 1.1 The Drawings, appended to this Section, that the Bid and Contract Documents are based upon include the following:

Page/Dwg. No.	Title: ARCHITECTURAL
	Refer To Architectural drawings.
A000	COVER SHEET
A001a	OBC MATRIC AND DIRE SEPERATION DRAWINGS
A001b	OBC MATRIC AND DIRE SEPERATION DRAWINGS
A002a	ASSEMBLIES SCHEDULES, NOTES AND LEGENDS
A002b	ASSEMBLIES SCHEDULES
A003	DOOR SCHEDULE
A005	WINDOWS & SCREEN SCHEDULE
A010	SITE PLAN
A020	FOUNDATION PLAN
A021	FIRST FLOOR SLAB PLAN
A100	FIRST FLOOR PLAN
A100a	STEEL FIREPROOFING COATS & PAINTS GRD FLR RCP/ 2 ND FLR U/S FRAMING
A102	SECOND FLOOR PLAN
A103	THIRD FLOOR PLAN
A104	ROOF ATTIC PLAN
A105	ROOF PLAN
A106	SHED DRAWINGS
A120	FIRST FLOOR REFLECTED CEILING PLAN
A121	SECOND FLOOR REFLECTED CEILING PLAN
A122	THIRD FLOOR REFLECTED CEILING PLAN
A130	FIRST FLOOR FINISH PLAN
A131	SECOND FLOOR FINISH PLAN
A132	THIRD FLOOR FINISH PLAN

A200	EXTERIOR ELEVATIONS
A201	EXTERIOR ELEVATIONS
A300	BUILDING SECTIONS
A400	WALL SECTIONS
A401	WALL SECTIONS
A500	PLAN DETAILS
A510	SECTION DETAILS
A511	SECTION DETAILS
A512	ROFF DETAILS
A600	UNIVERSAL WASHROOM PLANS, INTERIOR ELEVATIONS, AND ACCESSORIES
A700	STAIRS, RAMPS & LIFTS
A800	INTERIOR ELEVATIONS
A810	INTERIOR DETAILS
A900	MILLWORK
A920	UNIT PLANS
A921	UNIT PLANS
A922	UNIT ELEVATIONS
A923	UNIT WASHROOMS
A924	UNIT WASHROOMS

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Page/Dwg. No.	<u>Title</u> : STRUCTURAL
	Refer To Mechanical drawings.
S101	GENERAL NOTES
S102	TYPICAL DETAILS
S103	TYPICAL DETAILS
S201	FOUNDATION PLAN
S201b	FOUNDATION PART PLAN
S202	SECOND FLOOR FRAMING PLAN
S203	THIRD FLOOR FRAMING PLAN
S204	ROOF FRAMING PLAN
S205	SHED FRAMING PLAN
S205	TRUSS BRACING PLAN
S401	SECTIONS AND DETAILS
S411	SECTIONS AND DETAILS
S412	SECTIONS AND DETAILS
S413	SECTIONS AND DETAILS
S414	SECTIONS AND DETAILS
S415	SECTIONS AND DETAILS
S500	SHEAR WALL - SCHEDULE
S501	SHEAR WALL - ELEVATIONS
S502	SHEAR WALL - ELEVATIONS
S503	SHEAR WALL - ELEVATIONS
S504	SHEAR WALL - ELEVATIONS

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Page/Dwg. No.	Title: MECHANICAL
	Refer To Architectural drawings.
	Refer To Mechanical drawings.
M-001	SITE PLAN
M-101	DETAILS
M-102	DETAILS
M-103	DETAILS
M-104	WATER METER AND BFPA DETAIL
M-105	ACOUSTIC DETAILS
M-106	CU-1 REFRIGERANT PIPING SCHEMATIC
M-107	CU-2 REFRIGERANT PIPING SCHEMATIC
M-108	CU-3 REFRIGERANT PIPING SCHEMATIC
M-109	SANITARY PIPING SCHEMATIC - WEST
M-110	SANITARY PIPING SCHEMATIC - EAST
M-111	DOMESTIC COLD & HOT PIPING SCHEMATIC - WEST
M-112	DOMESTIC COLD & HOT PIPING SCHEMATIC - WEST
M-113	CU-4 & CU-5 REFRIGERANT PIPING SCHEMATICS
M-201	MECHANICAL SCHEDULES SHEET 1
M-202	MECHANICAL SCHEDULES SHEET 2
M-203	SCHEDULES
M-301A	GROUND FLOOR WEST HVAC PLAN
M-301B	GROUND FLOOR EAST HVAC PLAN
M-302A	SECOND FLOOR WEST HVAC PLAN
M-302B	SECOND FLOOR EAST HVAC PLAN
M-303A	THIRD FLOOR WEST HVAC PLAN
M-303B	THIRD FLOOR EAST HVAC PLAN
M-400A	UNDERSLAB WEST ~~P&D~~ PLUMBING PLAN
M-400B	UNDERSLAB EAST ~~P&D~~ PLUMBING PLAN
M-401A	GROUND FLOOR WEST ~~P&D~~ PLUMBING PLAN
M-401B	GROUND FLOOR EAST ~~P&D~~ PLUMBING PLAN

M-402A	SECOND FLOOR WEST P&D PLUMBING PLAN
M-402B	SECOND FLOOR EAST P&D PLUMBING PLAN
M-403A	THIRD FLOOR WEST P&D PLUMBING PLAN
M-403B	THIRD FLOOR EAST P&D PLUMBING PLAN
M-404A	ROOF WEST P&D PLAN
M-404B	ROOF EAST P&D PLAN
M-405A	RADON ROUGH-IN - WEST
M-405B	RADON ROUGH-IN - EAST

Page/Dwg. No.	<u>Title:</u> SOLAR
	Refer To Electrical drawings
PV-101	Solar Photovoltaic Roof Plan
PV-201	Single Line Diagram

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Page/Dwg. No.	<u>Title:</u> ELECTRICAL
	Refer To Electrical drawings
E1	Site Plan
E2	Specifications and Details
E3	Single Line Diagram
E4	Panel Schedules
E5	Ground & Second Floors Lighting Plans
E6	~~First~~ Ground & Second Floors Power and Systems Plans
E7	Third & Attic Floors Lighting Plans
E8	Third & Attic Floors Power and Systems Plans
E9	Fire Alarm Riser
610	Door Entry and Access Control Details
E11	Telephone & Cable Risers and Details
E12	Legends and Schedules

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Page/Dwg. No.	<u>Title:</u> CIVL
	Refer To Civil drawings.
ES-1	EROSION & SEDIMENT CONTROL PLAN
SS-1	SITE SERVICING PLAN
SD-1	PRE DEVELOPMENT STORM DRAINAGE PLAN
SD-2	POST DEVELOPMENT STORM DRAINAGE PLAN
SA-1	SANITARY SEWER DESIGN PLAN
SG-1	SITE GRADING PLAN
SS-2	GRADING DETAILS
D-1	DETAILS PLAN
FSR	Functional Servicing / Stormwater Management Report 321 John Street.

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Page/Dwg. No.	<u>Title:</u> LANDSCAPE
	Refer To Landscape drawings.
L1	LANDSCAPE PLAN
L2	LANDSCAPE DETAILS
L3	LANDSCAPE DETAILS
L4	LANDSCAPE DETAILS

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Page/Dwg. No.	<u>Title:</u> WASTE COLLECTION	
	Refer To Electrical drawings	
A1	INSTALLATION DRAWINGS	REV#9
A2	INSTALLATION DRAWINGS	REV#9
A5	INSTALLATION DRAWINGS	REV#0
	EARTH BIN PRODUCT GUIDE	
	EARTH BIN INSTALLATION GUIDE	2023
	EARTH BIN EB 5000 SPEC SHEET	
	EARTH BIN EB 5000 CUT SHEET	

END OF DOCUMENT

1 GENERAL INSTRUCTIONS

- 1.1 Persons and firms submitting Bids shall be engaged in the type of Work required by the Contract Documents.
- 1.2 No facilities of the Owner or Consultant, such as telephones, facsimile (fax) machines, computers, desks or rooms, may be used by Bidders in the preparation of their Bids.
- 1.3 No cellular phones, computers, portable facsimile machines or other such devices are permitted in the Owner's or Consultant's offices during Bid preparation.

2 BID SUBMITTAL

- 2.1 Submit digital copies of the Bid on the Bid Form and Supplementary Bid Information Form provided, addressed and delivered via email to antero@lga-ap.com on or before:

Bid Form Submittal:

4:00:00 p.m. Local Time, Friday, July 10th, 2026.

Supplementary Bid Information Form Submittal:

12:00:00 p.m. (noon) Local Time, Wednesday, July 15th, 2026.

Subject line:

"CONFIDENTIAL BID FOR: OAHS 321 JOHN ST COBOURG - COMPANY NAME 123 CONTRACTORS"

c/o Antero Fonte
LGA Architectural Partners
antero@lga-ap.com

- 2.2 Bidders are solely responsible for the delivery and submission of their Bid in the manner and within the time prescribed. Oral, telephone, mail, or facsimile proposals or modifications will not be considered.
- 2.3 Submissions must be completed on or before the Submission's Deadline. Submissions submitted after the Submission Deadline will be rejected without exception.
- 2.4 OAHS strongly recommends Proponents give themselves sufficient time of at least one (1) hour before the Submissions Deadline to begin the uploading process and to finalize their submission.

- 2.5 OAHS shall not be responsible for technical issues such as network or power failures, computer failure, internet browser, and mistakes / errors in filling the Bids that cause Bidders to submit Bids after the Submission's Deadline as specified. Bids received after the Submission's Deadline will be deemed late and will not be considered even where a technical issue outside the Proponent's control caused the Bid to be submitted late.
- 2.6 The completed Bid Form shall be without alterations or erasures. Fill in all blank spaces on the Bid Form. Amounts shall be in words as well as figures. Bid forms not completed in full, may be rejected at the discretion of the Owner. Enclose or attach documents required to be submitted with Bid.
- 2.7 Bids shall be signed and sealed by the Bidder. Signatures shall be longhand and executed by the principal duly authorized to bind the company into a Contract.
- 2.8 Amendments to a submitted Bid will be permitted if received in writing prior to Bid closing and also endorsed by the same party or parties who signed the original Bid.

3 SUPPLEMENTARY BID INFORMATION

- 3.1 Supplementary Bid Information identified in Documents 00 43 01 and all specified Schedules and Appendices shall be submitted before Submission Deadline as indicated in this Document, identified as "Supplementary Bid Information" and with name and address of bidder. Failure to submit completed additional Supplementary Bid Information will result in disqualification of Base Bid.
- 3.2 The completed Supplementary Bid Information Forms shall be without alterations or erasures. Fill in all blank spaces on the Forms. Supplementary Bid Information Forms not completed in full, may cause the Contractor's Bid to be rejected at the discretion of the Owner.

4 QUERIES - ADDENDA

- 4.1 Bidders finding discrepancies or ambiguities in, or omissions from the Drawings, Specifications or other Bidding and Contract Requirements, or having doubt as to the meaning and intent of any part thereof shall contact the Consultant via email for clarification not later than **4:00:00 p.m. Local Time, 10 business days before Bid form submittal date.**
- 4.2 Direct questions to:

Antero Fonte
LGA Architectural Partners
Email: antero@lga-ap.com
- 4.3 Questions will be accepted only from invited Bidders. Subcontractors or suppliers shall obtain interpretations and clarifications from Contractors to whom they are Bidding.

- 4.4 Any interpretation of, or change in Bid Documents prior to Bid closing date will be made only by written addendum issued by the Consultant to each Bidder to whom Bid Documents have been issued.
- 4.5 Information contained in Addenda supersedes and amends the Bidding and Contract Documents. Bidders shall include and allow for Addenda accordingly. Bidders shall state in the space provided on the Bid Form, the numbers of all Addenda received and included for by them in the preparation of the Bid. If no Addenda have been received, insert the word "None".
- 4.6 Final Addenda will be issued not later than **4:00:00 p.m. Local Time, 5 business days before Bid form submittal date.**
- 4.7 Direct questions to:
- 4.8 No other interpretation or explanations shall be valid.

5 EXAMINATION

- 5.1 Prior to submitting Bid, examine the site and ascertain conditions affecting the Work. Determine nature and location of items and services which may have to be protected, removed, or relocated.
- 5.2 Prior approval is required to visit the property. Arrange visits with Consultant.
- 5.3 Examine Specifications, Drawings, and other Bid Documents, Contract Requirements and information available to Bidders. Report to Consultant, all ambiguities, discrepancies, omissions, errors, departure from building by-laws or from good practice, apparent during examination.
- 5.4 The bidder must carefully examine the site of the work before submitting the bid, either personally or through a representative and be satisfied as to the nature and location of the work, local conditions, soil structure and topography at the site of the work, the nature and quality of the materials to be used, the equipment and facilities needed preliminary to and during the prosecution of the work, the means and access to the site, on-site accommodation, all necessary information as to risks, contingencies and circumstances as may affect the bid, and other matters that can in any way affect the work under the contract.
- 5.5 The bidder is fully responsible for obtaining all information required for preparation of the bid and for execution of the work. It will be the responsibility of the successful bidder to provide all of the necessary materials and labour required to fully satisfy the requirements of this contract and to complete the works.

6 PREBID MEETING/SITE TOUR

- 6.1 A Prebid Meeting/Site Tour will be held for the benefit of Bidders to familiarize themselves with the site and to answer questions regarding the Bid Documents.
- 6.2 The Prebid Meeting/Site Tour will be held on **Wednesday, May 3rd** at 321 John St. Cobourg, at **11:00 a.m. Local Time.**
- 6.3 Face masks are optional for individuals attending a Prebid Meeting/Site Tour.

6.4 Prebid Meeting/Site tour is **mandatory** for all Bidders.

6.5 Purpose of the Prebid Meeting/Site Tour is to make Bidders familiar with the site and project. Any questions regarding the nature of the Work or the Bid and Contract Documents shall be submitted to the Consultant and, where necessary, written clarification and/or additional information will be issued in the form of Addenda to all Bidders who have obtained Bid Documents.

7 BID DOCUMENTS AVAILABILITY

7.1 Bid Documents will only be issued to invited Bidders. Each Bidder will receive digital copies of Drawings and Specifications, on loan. Bidders may print at their own expense additional reproductions from such Drawings and Specifications for Bidding purposes.

7.2 CAD drawings will not be supplied to the Bidders.

7.3 Upon receipt of Bid Documents, each Bidder shall verify that they are complete. Notify Consultant should Bid Documents be incomplete. Immediately notify Consultant upon finding discrepancies or omissions in Bid Documents.

7.4 Drawings and Specifications are the property of the Owner and shall be returned in good condition to the Consultant no more than 7 calendar days after Notice of Award of Contract, rejection of all Bids, or after expiry of Bids.

8 BONDS AND INSURANCE

8.1 Bids shall be accompanied with a Bid Bond and a letter or 'Agreement to Bond' Form from a Surety Company doing business in Canada and located in the place of the Work stating that the Surety Company will provide a **Performance Bond for 50 percent of the Contract price** and a **Labour and Material Payment Bond for 50 percent of the Contract price** for the successful bidder.

8.2 The **Bid Bond** shall be in the amount of **ten percent (10%) of the Bid Price**.

8.3 Endorse the Bid Bond in the name of the Owner as Obligee, signed and sealed by the principal and surety.

8.4 Bid Bonds and Agreements to Bond shall be valid for **60 calendar days** after time and date set for Bid closing.

8.5 Bonds of unsuccessful Bidders will be returned upon award of the Contract.

8.6 Failure of the successful Bidder to provide the Owner with the specified insurance policies and Bonds within 14 calendar days of the award date will cause the Bid to be declared invalid at Owner's sole discretion.

8.7 Except where specified otherwise, all premiums shall be paid by the Bidder.

8.8 Refer to the Bid Form and to the Canadian Standard Construction Document CCDC2-2020, as amended.

9 ALTERNATIVES

9.1 Submit Bid pricing for work specified in the Contract Documents. Alternatives beyond the ones listed in Section 00 43 01 may not be proposed by the Bidder during the Tender period.

9.2 Base Bid price must be based on specified Products, equipment or systems. Bids will be rejected if alternatives are included in the Bid price.

9.3 The Contractor shall accept full responsibility that a proposed alternative will not exceed dimensional requirements as indicated on the Drawings, that it is compatible in all ways with other specified work, that coordination and cost of installation is included in his price for the proposed alternative and that the Contractor will be responsible for additional engineering/design requirements.

10 PROJECT REQUIREMENTS

10.1 As per the Government of Canada and CMHC Build Canada Homes (BCH) Investment Policy Framework November 2025 (Revised) funding requirements, construction is required to include:

- .1 **Modern methods of construction** – including, but not limited to, factory and/or off-site built systems and rapid assembly.
- .2 Adhere to the **Buy Canadian policy** by prioritizing projects that utilize domestically produced materials, with a particular emphasis on Canadian softwood lumber and steel (structural steel and miscellaneous metal fabrications).

Bidders are encouraged to consider and demonstrate this capacity in their Bids.

10.2 Bidders to propose construction timelines, completion and occupancy dates.

11 SUBMISSION REQUIREMENTS

11.1 The Bidder shall furnish evidence, satisfactory to the Owner, of its ability to complete the Work in accordance with the Bid Documents.

11.2 With its Bid, the Bidder shall submit:

- .1 Complete and signed **Bid Form**.
- .2 Complete and signed **Supplementary Bid Form** and suppliers of all major equipment, materials, and systems intended for use on the Contract.
- .3 The executed **Bid Bond**.
- .4 The executed **Agreement To Bond**.
- .5 Workplace Safety and Insurance Board (WSIB): Submit a **WSIB Clearance Certificate**.

- .6 **Proof of insurance.**
- .7 **Bar Chart Schedule** showing how the Bidder proposes to meet their specified completion dates. The schedule shall indicate the start and finish dates for each phase and category of the Work.
- .8 **Organization chart** illustrating senior office and field staff to be assigned to this Contract. Identify names, titles and responsibilities.
- .9 All Appendices, as follows:
 - .1 Submit resumes for all the Bidders' key personnel available and assigned to this project, including Construction Superintendent and Project Manager. Personnel to have a minimum of 10 years' experience, on a minimum of three (3) similar projects, with a value ranging from \$5-20 million, of comparable components, size and complexity.
 - .1 Once reviewed and signed off on, the General Contractor shall not replace key personnel without the express written consent of the Consultant on behalf of the Owner.
 - .2 Submit Brick Veneer subcontractor company (scope included in Section 04 20 00), and metal soffit, siding and roofing company (scope included in Sections 07 41 00 and 07 46 00), to the satisfaction of article 1.5.1 of Sections 04 20 00, 07 41 13 and 07 46 19 including but not limited to;
 - .1 Company profile;
 - .2 Project portfolio for a minimum of three (3) and a maximum of five (5) comparable similar projects previously constructed in the last ten (10) years, with a contract value ranging from \$250,000 to \$5 million for brick veneer, and \$200,000 to \$5 million for metal soffit, siding and roofing.
 - i. References – submit references for a minimum of three (3) of those projects.
 - .3 Resumes for key personnel available and assigned for this project, including foreman, identifying a minimum of 10 years' experience on a minimum of three (3) similar projects
 - i. References – submit references for a minimum of three (3) of those projects.
 - .4 It is the responsibility of the Bidder to confirm the subcontractor companies and key personnel meet the above requirements.
 - .5 The Owner or the Consultant reserve the right to reject companies and/or personnel that do not meet the requirements and may request the Bidder to procure a new subcontractor company and/or personnel that does.
 - .6 Once reviewed and signed off on by the Owner or by the Consultant on behalf of the Owner, the General Contractor shall not replace the subcontractor company, and the subcontractor company shall not replace key personnel, without the express written consent of the Consultant on behalf of the Owner.

12 OPENING AND ACCEPTANCE OF BIDS

- 12.1 The Owner reserves the right to open the sealed Bids privately and to accept or reject any or all Bids without explanation. The Owner has the right not to accept the lowest Bid or not to accept any Bid, in its sole, absolute and unfettered discretion. The Owner may accept a non-compliant Bid, if, in the Owner's sole, absolute and unfettered discretion, the non-compliance is immaterial to the Owner's overall evaluation of the Bid.
- 12.2 The Owner will issue the successful Bidder a written Bid Acceptance.
- 12.3 Once submitted a Bid may be withdrawn or changed only before time of closing. Submitted Bids shall be irrevocable for **60 calendar days** after time and date set for Bid closing.
- 12.4 It shall be noted that prior to award of the Contract a meeting may be held to review the Bid and the Contractor's understanding of the scope of work, the terms and conditions which will apply and the requirements of the schedule.
- 12.5 The Owner reserves the right to cancel this tender at any time and for any reason without any explanation or liability whatsoever to the Bidders.
- 12.6 The Successful Contractor shall sign a formal Contract with the Owner based on the Stipulated Price Contract specified herein.

13 BID INELIGIBILITY

- 13.1 A Bid which is unsigned, improperly completed, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations or irregularities of any kind may not be considered, at the discretion of the Owner.
- 13.2 Bids from unsolicited Bidders will not be considered.
- 13.3 Bids shall be for a Stipulated Lump Sum without escalation clauses. Bids containing escalation clauses will not be considered.

END OF SECTION

1 **REPORT(S) AND DRAWING(S)**

1.1 A copy of the following report(s) and existing drawings(s) are appended to this Document under 'Appendices' or will be made available to the Bidders for their information:

- .1 **25 James As-Built Drawings:** As-built drawings for trinity Place - 25 James Street, by Totten Sims Hubicki Associates, not dated.
.1 Base Building Drawing List:

Page/Dwg. No.	Title: ARCHITECTURAL
A-1	SITE PLAN
A-2	FLOOR PLANS
A-3	TYPICAL UNITS

Page/Dwg. No.	Title: MECHANICAL
M-1	GROUND, SECOND & THIRD FLOOR PLANS & DETAILS
M-2	TYPICAL UNIT LAYOUTS
M-3	SERVICE AREA PLANS & SECTIONS & RISER DIAGRAMS

- .2 **Trinity Housing Phase 2, Cobourg, Acoustic Review.**
Prepared by Thorton Tomassetti
Dated: April 6, 2023
- .3 **25 James Street East, Cobourg, Tree Inventory Report.**
Prepared by Cressman
Dated: March 15, 2023
- .4 **321 John St Storm sewer video survey to Chapel St.**
- .5 **Hardware Schedule**
Prepared by Empire Hardware
Dated: May 29, 2026
- .6 **Geotechnical Investigation Report** (2019 superseded)
Prepared by Cambium (original report, for reference only)
Dated: 2019-06-14

- .7 **Foundation Waterproofing recommendations**
Prepared by Cambium
Dated: March 23, 2023
- .8 **Geotechnical Investigation Report** (revised to OBC 2024)
Prepared by Cambium
Dated: 2025-12-09
- .9 **Foundation Subdrainage recommendation letter**
Prepared by Cambium
Dated: March 26, 2026
- .10 **Phase I Environmental Site Assessment** (2019 superseded)
Prepared by Cambium (original report, for reference only)
Dated: 2019-06-07
- .11 **Phase I Environmental Site Assessment** (revised 2026)
Prepared by Cambium
Dated: December 2, 2025
- .12 **Site Survey**
2019.05.30_Site Survey:
4-4618-TOPO-SIGNED.pdf
2022.10.12 Surveys, easements and services agreement THs:
1 Shared Services Agreement, between THCC and THP2.pdf
17 Topographical survey of the site prepared by Ivan B. Wallace dated
April 22, 2016.pdf
Easement from THP2 to Lakefront, Aug 13, 2020.pdf
Easement from THP2 to Cogeco, Aug 13, 2021.pdf
R-plan survey, 39R14219.pdf
2022.10.28_Easement through chapel property:
LRO 39 - Instrument (LT15572) - OrderID 5112850.pdf
LRO 39 - Instrument (NC256785) - OrderID 5112857.pdf
LRO 39 - Plan (39R7952) - OrderID 5112864.pdf
LRO 39 - Plan (39R9109) - OrderID 5112850.pdf
2022.12.16 Rev Site Survey:
A-038401-TOPO-V5.pdf
A-038401-TOPO-V7.pdf
2023.02.01 final topographical survey (with underground locates:
61002574 - Final Report.pdf
A-038401-TOPO-V8.pdf

- 1.2 The report(s) and drawing(s), by their nature, cannot reveal all conditions that exist or can occur on the site. Should conditions be found to vary substantially from the report, immediately notify Consultant in writing and await instructions.
- 1.3 Contractor shall not be entitled to extra payment or extension of Contract Time for work which is required and which is reasonably inferable in the report(s) as being necessary.

1 **NAME OF BIDDER:** _____

BID FOR: **OAHS 321 JOHN ST, COBOURG**

TO: ONTARIO ABORIGINAL HOUSING SERVICES
 (OAHS)
 Provincial Office | 500 Bay Street
 Sault Ste. Marie, ON P6A 1X5

2 **BID PRICE**

2.1 The undersigned (hereinafter referred to as "Contractor") declares that they have carefully examined the Bid Documents and do hereby accept the same as part and parcel of the Contract and propose to provide all labour, supervision, materials, products, equipment and all other services for the proper completion of the Work of the referenced Contract, in accordance with Conditions, Drawings and Specifications included with the Bid Documents, for the Stipulated Contract Price (hereinafter referred to as "Bid Price") of:

_____ Dollars

(\$ _____) in Canadian funds which includes all prime costs, allowances, freight, duties and government excise or sales taxes in force on this date, except the Harmonized Sales Tax (HST) and as otherwise provided in the Bidding Documents.

2.2 The pricing quoted by the Bidder shall be all-inclusive and shall include all labour and material costs, all travel and carriage costs, all insurance costs, all costs of delivery to site, all costs of installation and set-up, including any pre-delivery inspection charges, and all other overhead, including any fees or other charges required by law.

2.3 The Contractor agrees that this Bid is open to acceptance for a period of **sixty (60) calendar days** from the Bid closing date.

2.4 The above stated Bid price includes fully for all increases, for whatever cause, in cost or price of labour, materials, products, equipment, or consumables. Escalation shall not apply for the duration of the Contract.

2.5 No allowances or extra consideration on behalf of the Contractor will be allowed by the Owner by reason of additional costs, damages or other difficulties incurred by the Contractor for failure to have fully investigated and determined conditions affecting the Work.

2.6 Where there is a discrepancy between the total sum of the unit prices when added together and the stated total price, the price which is the lower of the two shall prevail. Bidder may be entitled to withdraw Bid containing mathematical errors.

2.7 Bidders shall submit Bid form in the prescribed format, with ALL sections completed in full no later than specified in the Timetable. Prices, notes, comments, qualifications, or any other marks outside of the sections to be completed will not be considered. Bidders may be requested to re-submit Bid form as a result of any of the above.

2.8 Bidders may not make amendments to their Proposals after the Submission Deadline.

3 SCHEDULE

3.1 The Contractor agrees that "time is of the essence" in the Contract and has examined the Drawings and Specifications and the site of the proposed Work and has satisfied themselves as to their ability and the ability of the Subcontractors and suppliers that they will execute and perform the Work to be complete and meet Occupancy requirements granted by all Authorities Having Jurisdiction by the time indicated in the Contractor's Bar Chart Schedule submitted as part of this bid.

3.2 It is understood and agreed that the Bid Price stated herein includes all costs on account of premium time or overtime work required in order to meet the completion date, whether or not such work is done by the Contractor's own forces or by their Subcontractors.

4 DOCUMENTS AND ADDENDA

4.1 The Contractor submits that they have thoroughly reviewed the Instructions to Bidders, Bid Form, Conditions of the Contract, Specifications, Drawings, and the following Addenda and hereby accepts and agrees to all provisions and conditions stated therein and has included fully for all requirements in the Bid Price:

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Note: If no addenda have been received write in "NONE"

5 SITE EXAMINATION

5.1 Contractor warrants that:

- .1 the Contractor has visited and assessed the site prior to submitting a bid, and;
- .2 that the Contractor and the Subcontractors named by the Contractor are familiar with all matters discussed at any bidder's site meeting, and the Contractor and the subcontractors named by the Contractor are familiar with all visible, known or reasonably inferable site conditions.

5.2 No claims for extra payment will be allowed for extra work made necessary or difficulties encountered due to conditions of the site which were visible upon or reasonably inferable from an examination of the site, and the Contract Documents prior to the closing of the bids. Execution of the form of Contract shall be deemed a waiver of all claims for extra payment due to any visible or reasonably inferable condition of the site existing prior to the closing of bids.

6 CASH ALLOWANCE(S)

6.1 The Bid Price includes the cash allowance(s) indicated in Section 01 21 00.

7 SUPPLEMENTARY BID INFORMATION

7.1 Supplementary Bid Information identified in Section 00 43 01 are our price(s) for the items listed and the proposed Subcontractors to be used for this Project. The Owner may choose at their sole discretion any or all prices stated, add to or deduct from the work described, and adjust the Bid Price and Contract Time by the stated amount(s).

8 EXECUTE CONTRACT

8.1 The Contractor agrees that if this Bid is acceptable to the Owner, they will:

- .1 Accept a Letter of Award as authority to commence work before executing a formal Contract.
- .2 If required by Owner, execute a formal Contract with the Owner in accordance with the conditions of the Bid Documents.
- .3 Submit immediately, if required, Notice of Project to Authorities having Jurisdiction.
- .4 Furnish within seven (7) calendar days, certified copies of insurance policies as required by the Bid and Contract Documents.
- .5 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.

9 ADDRESS, LEGAL STATUS, AND SIGNATURE OF BIDDER

- 9.1 The Contractor does hereby designate the address, given below as the legal address to which all notices, directions or other communication may be served or mailed:

Street _____

City _____ Province _____

Postal Code _____ Tel. _____ Fax _____

- 9.2 Contact for questions relating to this Bid:

Name _____ Title _____

- 9.3 The undersigned does hereby declare that the Bidder has legal status in the Province of Ontario.

- 9.4 This Bid is submitted under the seal in the name:

(Company Name - Typed)

Seal

By _____
(Signature)

Name _____ Title _____
(Typed)

Signed and sealed this _____ Day of _____, 2026.

END OF DOCUMENT

Date:.....

Submitted

By: (name)

(address)

To: ONTARIO ABORIGINAL HOUSING SERVICES
Provincial Office | 500 Bay Street | Sault Ste. Marie, ON P6A 1X5

Project: **OAHS 321 JOHN ST, COBOURG**

1. In accordance with Document 00 21 13 - Instructions to Bidders and the Bid Form, we provide the Supplementary Bid Information Appendices listed below and attached. The information provided is an integral part of the Bid Form.
2. Supplementary Bid Information identified in Document 00 21 13.

Supplementary Bid Information Signatures

The Corporate Seal of

.....
(Bidder - please print)

as hereunto affixed in the presence of:

.....
Authorized Signing Officer

.....
Title

(Seal)

.....
Authorized Signing Officer

.....
Title

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

1 DEFINITIONS

1. All prices submitted take into consideration and allow for changes and adjustments in other work as may be necessary to provide a finished and functional result, unless specifically indicated otherwise.
2. A **Separate Price** is for work that is **not** included in the Bid Price offered in the Bid Form but **which the Owner may add** for the amount quoted below. If no price is shown for work which a Separate Price is required, it shall mean that the work is offered to the Owner at no increase in the Bid Price.
3. An **Alternative Price** is for work that is **not** included in the Bid Price offered in the Bid Form but **which the Owner may substitute** for work which is included in the Bid Price, for the amount quoted below. If no price is shown for work for which an Alternative Price is required, it shall mean the substitute work is offered to the Owner at no charge in the Bid Price.
4. An **Itemized Price** is for work that **is** included in the Bid Price offered in the Bid Form but which the **Owner may delete** for the amount quoted below. Itemized prices are mandatory be provided.
5. Without limiting its rights under the Instructions to Bidders, the Owner reserves the right to accept or reject any of the prices proposed in this Section.
6. Prices listed hereunder do not include Harmonized Sales Tax (HST) but include all other eligible taxes.

2 LIST OF SUBCONTRACTORS AND SUPPLIERS

1. The following are Subcontractors and suppliers we propose to use for the items of Work listed hereunder and upon which the Bid is based. Only those Subcontractors expressly listed may perform the scope of the Work expressly indicated therein.
2. The list is subject to the approval of the Owner and no changes from this list will be allowed without the Owners written permission.
3. The Owner reserves the right to reject any named Subcontractor at its sole discretion. Only those Subcontractors expressly listed on the Supplementary Bid Information Form, may perform the scope of the work expressly indicated therein. The Contractor is not permitted to subcontract any part of the work to a Subcontractor, or to change Subcontractors previously approved, without prior written approval of the Owner

3 LIST OF SOLAR PV SUBCONTRACTORS AND SUPPLIERS

1. The following are experienced Solar PV Subcontractors and suppliers we accept to procure and use for the items of Work listed hereunder. Only those Subcontractors expressly listed may perform the scope of the Work expressly indicated therein.
2. No changes from this list will be allowed without the Owners written permission.

4 SEPARATE PRICES

1. The following are our prices for the items listed hereunder. The Owner may choose any or all prices stated, add to or deduct from the work described, and adjust the Bid Price by the stated amount(s).

2. The following work items and amounts are not included in our Bid Price:

.1 **Separate Price 1:** reserved \$ N/A
(ADD)

END OF SEPARATE PRICES

5 ALTERNATIVE PRICES

1. The following are our prices for the items listed hereunder. The Owner may choose any or all prices stated, add to or deduct from the work described, and adjust the Bid Price by the stated amount(s).

2. The following alternative work items and amounts are not included in our Bid Price:

.1 **Alternative Price 1:** reserved \$ N/A
(ADD/DEDUCT)

.2 **Alternative Price 2:** Brick Types **BR-11**, **BR-22** and **BR-33**. Supply only, in accordance with Section 04 20 00, in lieu of Itemized Price 2. \$
(ADD/DEDUCT)

.3 **Alternative Price 3:** reserved \$ N/A
(ADD/DEDUCT)

.4 **Alternative Price 4:** Supply and installation of Acoustic Tile ceilings **C2**, in accordance with Section 09 51 00, in areas and lieu of Itemized Price 4. \$
(ADD/DEDUCT)

.5 **Alternative Price 5:** Vinyl floor tile type 11 **VFT-11**. Supply only, in accordance with Section 09 65 19, in areas and lieu of Itemized Price 5. \$
(ADD/DEDUCT)

.6 **Alternative Price 56:** Vinyl floor tile type 22 **VFT-22**. Supply only, in accordance with Section 09 65 19, in areas and lieu of Itemized Price 6. \$
(ADD/DEDUCT)

.7 **Alternative Price 7:** Feature Lighting fixture, as Cash Allowance item .9 of Section 01 21 00, in Lobby 116, supply and install, in lieu of Itemized Price 7. \$ included in 01 21 00
(ADD/DEDUCT)

END OF ALTERNATIVE PRICES

6 ITEMIZED PRICES

- .1 The following are our Itemized Prices which are an integral part of the Bid. Unit prices are in effect for the duration of this Project's construction period.
- .2 Unit prices shall be applied to Work measured in place, inclusive of all charges and costs for material, labour, equipment, delivery, storage, handling, duties, taxes, warranty, overhead, profit and all other costs, and shall be placed or installed per the Contract Documents.
- .3 Applications of unit prices will be to the net difference of quantities of individual products and materials in each contemplated Change Notice or Revision Notice.

<u>Item</u>	<u>Description of Work</u>	<u>Unit</u>	<u>Addition</u>	<u>Deletion</u>
.1	Itemized Price 1: Supply and application of anti-graffiti coating in accordance with sections 04 20 00 and 09 91 00.	Lump sum	\$ <u>N/A</u>	\$ <u> </u>
.2	Itemized Price 2: Brick Types BR-1 , BR-2 and BR-3 . Supply only, in accordance with Section 04 20 00, to accommodate Alternative Price 2.	Lump sum	\$ <u>N/A</u>	\$ <u> </u>
.3	Itemized Price 3: Supply and installation of Faux Wood Slat Panel FWS2 , in accordance with Section 06 20 00.	Lump sum	\$ <u>N/A</u>	\$ <u> </u>
.4	Itemized Price 4: Supply and installation of Wood Ceiling Units C3 , in accordance with Section 09 51 00.	Lump sum	\$ <u>N/A</u>	\$ <u> </u>
.5	Itemized Price 5: Vinyl floor tile type 1 VFT-1 . Supply only, in accordance with Section 09 65 19.	Lump sum	\$ <u>N/A</u>	\$ <u> </u>
.5	Itemized Price 6: Vinyl floor tile type 2 VFT-2 . Supply only, in accordance with Section 09 65 19.	Lump sum	\$ <u>N/A</u>	\$ <u> </u>
.6	Itemized Price 7: 914mm diameter surface mounted led lighting fixture W , Williams RND5-3-L150-80-35-FXA-DIM1, in Lobby 116, supply and install, in accordance with E12	Lump sum	\$ <u>N/A</u>	\$ <u> </u>

Light Fixture Schedule and Section
26 50 00.

END OF ITEMIZED PRICES

7 LIST OF SUBCONTRACTORS AND SUPPLIERS

	<u>Section of Work</u>	<u>Subcontractor Name</u>
.4	02 40 00 - Demolition and Removals:	_____
.5	03 10 00 - Concrete Forming and Falsework:	_____
.6	03 20 00 - Concrete Reinforcing:	_____
.7	03 30 00 - Cast-In-Place Concrete:	_____
.8	03 51 13 - Gypsum Topping:	_____
.9	04 05 19 - Masonry Anchorage and Reinforcement:	_____
.10	04 20 00 - Unit Masonry:	_____
.11	05 12 23 - Structural Steel:	_____
	Indicate provenance of steel to be sourced for this project:	_____
.12	05 50 00 - Miscellaneous and Metal Fabrications:	_____
	Indicate provenance of steel to be sourced for this project:	_____
.13	06 10 00 - Rough Carpentry:	_____
.14	06 10 53 - Miscellaneous-Rough-Carpentry:	_____
.15	06 17 00 - Shop-Fabricated Structural Wood:	_____
	Indicate Shop-Fabricated Structural Wood system fabricator if different than subcontractor:	_____
	Indicate provenance of softwood lumber to be sourced for this project:	_____
.16	06 17 53 - Shop-Fabricated Wood Trusses:	_____
	Indicate Shop-Fabricated Wood Trusses system fabricator if different than subcontractor:	_____
	Indicate softwood lumber provenance:	_____
.17	06 11 00 - Rough Carpentry:	_____
.18	06 20 00 - Finish Carpentry:	_____

-
.19	07 05 20 - Air Tightness Testing:	_____
.20	07 13 00 - Sheet Water Proofing:	_____
.21	07 21 00 - Thermal Insulation:	_____
.22	07 21 19 - Sprayed Foam Insulation:	_____
.23	07 26 00 - Vapour Retarders:	_____
.24	07 26 10 - Under Slab Vapour Retarders:	_____
.25	07 27 00 - Air Barrier:	_____
.26	07 41 13 - Aluminum Roof Panels:	_____
	Indicate Aluminum Roof Panels system carried in bid if different than basis of design:	_____
.27	07 46 19 - Aluminium Siding and Soffits:	_____
.28	07 62 00 - Flashing and Sheet Metal:	_____
.29	07 71 23 - Manufactured Gutters and Downspouts:	_____
	Indicate Manufactured Gutters and Downspouts system carried in bid if different than basis of design:	_____
.30	07 81 16 - Fireproofing:	_____
.31	07 81 23 - Intumescent Fireproof Coating:	_____
.32	07 85 00 - Firestopping and Smoke Seals:	_____
.33	07 92 00 - Sealants:	_____
.34	08 11 13 - Metal Doors and Frames:	_____
.35	08 14 16 - Wood Doors:	_____
.36	08 31 16 - Access Panels:	_____
.37	08 44 00 - Aluminium Work:	_____
	Indicate Aluminum Work system carried in bid if different than basis of design:	_____
.38	08 53 13 - Vinyl Windows:	_____
	Indicate Vinyl Windows system carried in bid if different than basis of design:	_____

.39	08 70 00 - Finish Hardware:	_____
.40	08 80 00 - Glazing:	_____
.41	08 91 00 - Louvres:	_____
.42	09 21 16 - Gypsum Board:	_____
.43	09 51 00 - Acoustical Ceilings:	_____
.44	09 65 00 - Resilient Base:	_____
.45	09 65 19 - Resilient Tile Flooring:	_____
	Indicate Resilient Tile Flooring carried in bid if different than basis of design:	_____
.46	09 67 23 - Epoxy Flooring:	_____
.47	09 91 00 - Painting:	_____
.48	09 97 13 - Exterior Steel Coatings:	_____
.49	10 28 13 - Washroom Accessories:	_____
.50	10 55 23 - Mailboxes:	_____
.51	10 80 00 - Miscellaneous Specialties:	_____
.52	11 31 00 - Residential Appliances:	_____
.53	11 82 13 - In-Ground Waste Collection System:	_____
.54	12 21 23 - Window Coverings:	_____
.55	14 21 23 - Electric Machine Room-less Elevators:	_____
.56	31 00 00 - Earthwork:	_____
.57	33 46 13 - Foundation Drainage:	_____
.58	Division 22 - Plumbing:	_____
.59	Division 21 - Fire Suppression:	_____
.60	Division 22 - Plumbing:	_____
.61	Division 23 - Heating Ventilating and Air Conditioning:	_____
.62	Division 26 - Electrical:	_____

.63 Division 27 - Communications: _____

.64 Division 32 – Exterior Improvements: _____

.65 Division 33 - Utilities: _____

Note: If work is performed by Bidder, write-in, Own Forces.

END OF LIST OF SUBCONTRACTORS AND SUPPLIERS

8 LIST OF SOLAR PV SUBCONTRACTORS AND SUPPLIERS

.66 48 14 00 - Solar Photovoltaic System (under Cash Allowance):

Arcadian Projects

Luke Shantz / Jeff Vidmar

T: 519-804-9697

luke@arcadianprojects.ca / jeff@arcadianprojects.ca

Crescent Ridge Services

Ryan Parton

T: 519-590-6418

ryan@crescentridge.ca

Generation Solar Inc.

J.P. Pawliw

T: 705-741-1700

info@generationsolar.com

Fitzpatrick Electrical Contractor Inc.

Robbie Shelson. PM - Renewable Energy

C: 647-984-3667

robert.shelson@bgis.com

Ozz Electric

Chris Buligan

C: 647-339-1524

cbuligan@enlightenedbuilding.com

RESCo Energy

Michael Scott / Lena Hellyer

T: 416-361-0752 x 1426

Michael.Scott@Rescoenergy.com / Lena.Hellyer@rescoenergy.com

END OF DOCUMENT

SCHEDULE 1

ONTARIO ABORIGINAL HOUSING SERVICES

(OAHS)

321 JOHN ST, COBOURG

PROJ. No. 251088

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CCDC2-2020 SUPPLEMENTARY CONDITIONS: SECTION 00 73 00

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

AGREEMENT BETWEEN OWNER AND CONTRACTOR

SC1 ARTICLE A-1 THE WORK

SC1.1	1.3	<u>Delete</u> all of the words after "<i>Contract Documents</i>" and <u>replace</u> them with the following, as agreed upon between the Owner and the Contractor: "attain <i>Substantial Performance of the Work</i> by the ___ day of _____ in the year 20__, <i>Occupancy</i> by the ___ day of _____ in the year 20__, and attain <i>Ready-for-Takeover</i> by the ___ day of _____ in the year 20__."
SC1.2	1.4 and 1.5	<u>Add</u> new paragraphs 1.4 and 1.5 as follows: "1.4 complete the <i>Work</i> in a thorough, expeditious, economical and good and competent manner in all respects in accordance with the <i>Contract</i>, including the <i>Construction Schedule</i>; and 1.5 in the execution, performance and completion of the <i>Work</i>, except as otherwise agreed between the <i>Contractor</i> and the <i>Owner</i>, provide all labour, <i>Products</i>, <i>Construction Equipment</i> and <i>Work</i> required for the performance and completion of the <i>Project</i> and carry out, perform, observe, fulfill and abide by all the covenants, agreements, stipulations, provisos and conditions of the <i>Contract Documents</i>."

SC2 ARTICLE A-4 CONTRACT PRICE

SC2.1	4.4	<u>Delete</u> paragraph 4.4 and <u>replace</u> it with the following: "4.4 The <i>Contract Price</i> shall remain fixed for the duration of the <i>Contract Time</i>, subject only to adjustments as provided for in the <i>Contract Documents</i>. For certainty, the <i>Contractor</i> assumes all risks in connection with cost increases for <i>Products</i>, <i>Labour</i>, and <i>Construction Equipment</i> prescribed by the <i>Contract Documents</i> for the performance of the <i>Work</i>, and the <i>Contractor</i> assumes all responsibility for liabilities and additional costs that may arise as a result of the <i>Contractor's</i> inclusion of any <i>Product</i>, <i>Construction Equipment</i>, <i>Supplier</i>, or <i>Subcontractor</i> in its calculation of the <i>Contract Price</i>."

SC3 ARTICLE A-5 PAYMENT

SC3.1	5.1	<u>Delete</u> paragraph 5.1 in its entirety, including all subparagraphs thereunder and <u>replace</u> it with the following: "5.1 Subject to the provisions of the <i>Contract Documents</i> and the <i>Construction Act</i>, the <i>Owner</i> shall:

		.1 make progress payments to the <i>Contractor</i> on account of the <i>Contract Price</i> when due together with such <i>Value Added Taxes</i> as may be applicable to such payments, .2 upon <i>Substantial Performance of the Work</i>, as certified by the <i>Consultant</i>, and upon the expiry of the holdback period that follows the publication of the certificate of <i>Substantial Performance of the Work</i>, as stipulated in the <i>Construction Act</i>, there being no claims for lien registered against the title to the <i>Place of the Work</i> and no written notices of lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> the unpaid balance of the holdback, together with such <i>Value Added Taxes</i> as may be applicable to such payment, less any amount stated in any <i>Notice of Non-Payment</i> that is published by the <i>Owner</i> in accordance with the <i>Construction Act</i>, .3 after <i>Ready-for-Takeover</i> has been achieved in accordance with the <i>Contract Documents</i> and the <i>Work</i> is complete, there being no claims for lien registered against the title to the <i>Place of the Work</i> and no written notices of lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> the unpaid balance of the <i>Contract Price</i> in accordance with GC 5.5. – FINAL PAYMENT, together with such <i>Value Added Taxes</i> as may be applicable to such payment, and .4 starting on the second <i>Anniversary</i> that follows the day on which section 26 of the <i>Act Update</i> comes into force, and subject to section 31 of the <i>Act Update</i> (section 87.4 of the <i>Construction Act</i>), and upon the expiry of the holdback period that follows the publication of the notice of annual release of holdback, as stipulated in the <i>Act Update</i>, there being no claims for lien registered against title to the <i>Place of Work</i> and no written claims for lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> the accrued holdback retained under section 22(1) of the <i>Construction Act</i> in respect of <i>Work</i> performed by the <i>Contractor</i> during the year immediately preceding the current <i>Anniversary</i>, subject to the provisions of the <i>Act Update</i>, in accordance with GC 5.4. – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK.”
SC3.2	5.2.1	<u>Delete</u> paragraph 5.2.1 and <u>replace</u> it with the following: “Should either party fail to make payments as they become due under the terms of the <i>Contract</i> or in an award by adjudication, arbitration, or court, interest shall also become due and payable on such unpaid amounts at 1% above the prime rate. Such interest shall be compounded on a monthly basis. The prime rate shall be the rate of interest quoted by the Canadian Imperial Bank of Commerce (or other chartered bank in Canada designated by OAHS) as it may change from time to time.”

SC4 ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING

SC4.1	6.1	<u>Delete</u> the text of ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING (retaining the provisions setting out the addresses of the <i>Owner</i>, <i>Contractor</i> and <i>Consultant</i>) and <u>replace</u> it with the following: “6.1 <i>Notices in Writing</i> between the parties or between them and the <i>Consultant</i> shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier during normal business hours or if sent during normal business hours by e-mail during the transmission of which no indication of

		failure of receipt is communicated to the sender, and addressed as set out below. Such <i>Notices in Writing</i> will be deemed to be received by the addressee on the next <i>Working Day</i> if sent by e-mail after normal business hours or if sent by overnight commercial courier. Such <i>Notices in Writing</i> will be deemed to be received by the addressee on the fifth <i>Working Day</i> following the date of mailing, if sent by pre-paid registered post, when addressed as set out below. An address for a party may be changed by <i>Notice in Writing</i> to the other party setting out the new address in accordance with this article."

SC5 ARTICLE A-9 TIME OF THE ESSENCE

SC5.1	Article A-9	<u>Add</u> new Article A-9 – TIME OF THE ESSENCE as follows: “ARTICLE A-9 TIME OF THE ESSENCE 9.1 Time is of the essence of the <i>Contract</i>, the performance of the <i>Work</i>, and in respect of all requirements of the <i>Contract Documents</i> that relate to the passage of time. 9.2 It is understood, acknowledged, and agreed that the <i>Owner</i> has advised the <i>Contractor</i> of the critical importance that <i>Ready-for-Takeover</i> is achieved within the <i>Contract Time</i> and that one of the reasons that the <i>Contractor</i> was selected for the performance of the <i>Work</i> prescribed by the <i>Contract Documents</i>, and awarded this <i>Contract</i> by the <i>Owner</i>, is the <i>Contractor's</i> representation and warranty that it will attain <i>Substantial Performance of the Work, Occupancy, and Ready-for-Takeover</i> within the <i>Contract Time</i> stated in Article A-1.3.”

SC6 ARTICLE A-10 COUNTERPARTS

SC6.1	A-10	<u>Add</u> a new Article A-10 – COUNTERPARTS as follows: “ARTICLE A-10 – COUNTERPARTS 10.1 This Contract may be signed in counterparts, manually or electronically, and each of which shall be an original, with the same effect as if the signatures thereto and hereto were upon the same instrument. Any signature delivered by facsimile or in "pdf" or similar electronic format shall be deemed an original signature hereto.”

SC7 DEFINITIONS

SC7.2	Owner	<u>Add</u> to the end of the definition for <i>Owner</i> the following: “For purposes of the <i>Contract</i>, the terms “Owner”, “Ontario Aboriginal Housing Services” and “OAHS” shall be considered synonymous. The <i>Owner's</i> designated Project Manager identified to the Contractor in the <i>Owner's</i> letter of award will be the <i>Owner's</i> representative on the <i>Project</i>.”
SC7.3	Other Contractor	Delete the words “for the project” at the end of the sentence in the definition for <i>Other Contractor</i> .

SC7.4	Payment Legislation	<u>Delete</u> the Definition for <i>Payment Legislation</i> and replace it with <i>Construction Act</i> as follows: <i>'Construction Act'</i> means the <i>Construction Act</i>, R.S.O. 1990, c. C.30, as amended, including all regulations passed under it that are enforceable as of the date of execution of this Contract. For certainty, the first procurement process for the Project (i.e., the "improvement" as that term is defined in the <i>Construction Act</i>) was commenced on or after October 1, 2019." -and- Upon the coming into force of the <i>Act Update</i>, <u>add</u> "and Act Update" after "this <i>Contract</i>" in the first sentence of the definition of "<i>Construction Act</i>".
SC7.5	Ready-for-Takeover	<u>Delete</u> all the words after "as verified" in the definition for <i>Ready-for-Takeover</i> and <u>replace</u> them with "and approved by the <i>Owner</i>."
SC7.6	Act Update	<u>Add</u> the following new definition: "Act Update <i>'Act Update'</i> means Schedule 4 of <i>Building Ontario For You Act (Budget Measures)</i>, S.O. 2024, c. 20, including all regulations passed in relation to it. The <i>Act Update</i> is not in force as of the date of execution of this <i>Contract</i>, but the <i>Contractor</i> and <i>Owner</i> acknowledge that the <i>Act Update</i> may come into force during the term of this <i>Contract</i>, thereby amending the terms of the <i>Contract</i> and affecting the application and effect the provisions of this <i>Contract</i>."
SC7.7	Adjudication	<u>Add</u> the following new definition: "Adjudication <i>'Adjudication'</i> means construction dispute interim adjudication as defined under <i>the Construction Act</i>."
SC7.8	Administration Costs	<u>Add</u> the following new definition: "Administration Costs <i>'Administration Costs'</i> means those costs and expenses incurred by the <i>Owner</i> as a result of carrying out a process or activity due to a breach of the <i>Contractor's</i> obligations under this <i>Contract</i>, default of the <i>Contractor</i>, or delay in the performance of the <i>Work</i> by the <i>Contractor</i>. <i>Administration Costs</i> include but are not limited to the following: .1 additional fees payable by the <i>Owner</i> to the <i>Consultant</i> according to the <i>Consultant's</i> personnel rates; .2 <i>Owner</i> personnel costs associated with the breach, default, or delay, in an amount determined by the <i>Consultant</i>; and .3 any additional costs or loss of revenue incurred by the <i>Owner</i> due to the breach, default, or delay."
SC7.9	Anniversary	<u>Add</u> the following new definition: "Anniversary

		<i>'Anniversary'</i> means the annual recurrence of the day on which this <i>Contract</i> was entered into by the <i>Owner</i> and the <i>Contractor</i> ."
SC7.10	As-Built Drawings	<u>Add</u> the following new definition: "As-Built Drawings <i>'As-Built Drawings'</i> or <i>'as-built drawings'</i> means are those <i>Drawings</i> prepared by the <i>Contractor</i> as it constructs the <i>Project</i> and upon which the <i>Contractor</i> documents the actual locations of the building components and changes to the original <i>Contract Documents</i>."
SC7.11	Baseline Schedule	<u>Add</u> the following new definition: "Baseline Schedule <i>'Baseline Schedule'</i> means the initial <i>Construction Schedule</i> approved by the <i>Owner</i>, that includes all approved <i>Milestone</i> dates, as further described in GC 3.4."
SC7.12	By Others	<u>Add</u> the following new definition: "By Others The words <i>'By Others'</i> or <i>'by others'</i> when used in the <i>Specifications</i> or on the <i>Drawings</i> means a person performing part of the <i>Work</i>, other than the <i>Contractor</i>. For greater certainty, the only means by which work or services shown or specified shall be indicated as not being in the <i>Contract</i> is by use of the initials <i>'N/C'</i> or the words <i>'Not In Contract'</i> or the words <i>'by Owner'</i>."
SC7.13	Confidential Information	<u>Add</u> the following new definition: "Confidential Information <i>'Confidential Information'</i> means all information, data, documents, agreements, files and other materials regarding or concerning the <i>Owner</i> or its affiliates, whether disclosed orally or disclosed or stored in written, electronic or other form or media, which is disclosed, communicated or otherwise furnished by the <i>Owner</i> before, on or after the execution of this <i>Contract</i> to the <i>Contractor</i>, whether or not marked, designated or otherwise identified as "confidential".
SC7.14	Construction Schedule	<u>Add</u> the following new definition: "Construction Schedule <i>'Construction Schedule'</i> means the schedule for the performance of the <i>Work</i> provided by the <i>Contractor</i> pursuant to GC 3.4, including any amendments to the <i>Construction Schedule</i> made pursuant to the <i>Contract Documents</i>."
SC7.15	Contemplated Change Notice	<u>Add</u> the following new definition: "Contemplated Change Notice <i>'Contemplated Change Notice'</i> means a written notice issued by the <i>Consultant</i>, on behalf of the <i>Owner</i>, to the <i>Contractor</i> describing a contemplated change in scope of the <i>Work</i>."
SC7.16	Direct Costs	<u>Add</u> the following new definition: "Direct Costs

		'Direct Costs' has the meaning prescribed to it in GC 6.3.7."
SC7.17	Environmental Programs	<i>Reserved.</i>
SC7.18	Excess Soil	<u>Add</u> the following new definition: "Excess Soil 'Excess Soil' means "excess soil" as that term is defined under section 3 of the <i>Excess Soil Regulation</i>."
SC7.19	Excess Soil Regulation	<u>Add</u> the following new definition: "Excess Soil Regulation 'Excess Soil Regulation' means O. Reg. 406/19: On-Site and Excess Soil Management to the <i>Environmental Protection Act</i>, R.S.O. 1990, c. E.19."
SC7.20	Force Majeure	<u>Add</u> the following new definition: "Force Majeure 'Force Majeure' means any cause, beyond either party's control, other than bankruptcy or insolvency, which prevents the performance by a party, or both, of any of their respective obligations under the <i>Contract</i> and the event of <i>Force Majeure</i> did not arise from a party's default and could not be avoided or mitigated by the exercise of reasonable effort or foresight. <i>Force Majeure</i> includes <i>Labour Disputes</i>; fire; unusual delay by common carriers or unavoidable casualties; delays in obtaining third-party approvals (excluding approvals of any <i>Subcontractors</i> or <i>Suppliers</i> of any tier), permits, or licenses; civil disturbance; emergency acts, orders, legislation, regulations or directives of any government or other public authority other than stop work orders issued as a direct result of a circumstance described in GC 6.5.2; acts of a public enemy; war; riot; sabotage; blockage embargo; lightning; earthquake; adverse weather conditions, but only if substantially beyond the weather norms of the <i>Place of the Work</i>; acts of God; or declared epidemic or pandemic outbreak or other public health emergency (e.g. SARS, COVID-19)."
SC7.21	General Labour Conditions	<u>Add</u> the following new definition: "General Labour Conditions 'General Labour Conditions' means the requirements for the use of union labour by the <i>Contractor</i> and <i>Subcontractors</i> as more particularly set out in GC14.2 – GENERAL LABOUR CONDITIONS."
SC7.22	Install	<u>Add</u> the following new definition: "Install 'Install' means install and connect. Install has this meaning whether or not the first

		letter is capitalized.”
SC7.23	Labour Dispute	<u>Add</u> the following new definition: “Labour Dispute <i>‘Labour Dispute’</i> means any lawful or unlawful labour problems, work stoppage, labour disruption, strike (including lockouts decreed or recommended for its members by a recognized contractor’s association of which the <i>Contractor</i> is a member or to which the <i>Contractor</i> is otherwise bound), job action, slow down, picketing, refusal to work or continue to work, refusal to supply materials, cessation or work or other labour controversy, whether caused by a failure of the <i>Contractor</i> to comply with the <i>General Labour Conditions</i> or not, which does, or might, affect the <i>Work</i>.”
SC7.24	Milestone	<u>Add</u> the following new definition: “Milestone <i>‘Milestone’</i> means the following events, when applicable to the project scope, each of which must be identified and labelled as a “Milestone” in the <i>Baseline Schedule</i>: (a) completion of foundations; (b) completion of superstructure; (c) completion of HVAC, plumbing, and electrical rough-ins; (d) completion of life-safety systems (public address, fire alarm, sprinkler systems) and security systems; (e) achieving <i>Substantial Performance of the Work</i>; (f) achieving <i>Occupancy</i>; and (g) achieving <i>Ready-for-Takeover</i> including the applicable date for achieving such <i>Milestone</i> (as such date may be extended strictly in accordance with the requirements of the <i>Contract</i>).”
SC7.25	Notice of Non-Payment	<u>Add</u> the following new definition: “Notice of Non-Payment <i>‘Notice of Non-Payment’</i> means a notice of non-payment of holdback (Form 6) or a notice of non-payment (Form 1.1) under <i>the Construction Act</i>, as applicable to the circumstances.”
SC7.26	Occupancy	<u>Add</u> the following new definition: “Occupancy <i>‘Occupancy’</i> means full occupancy or use after completion of the whole of the <i>Project</i> as evidenced by a certificate of occupancy issued by the governmental authority having jurisdictions or, where no certificate is issued, the whole of the <i>Project</i> has been certified or deemed by the governmental authority having jurisdictions to be compliant with the occupancy requirements of the Ontario Building Code (O. Reg. 332/12: Building Code).”

SC7.27	OHSA	<u>Add</u> the following new definition: “OHSA ‘OHSA’ means the Occupational Health and Safety Act (Ontario).”
SC7.28	Payment Period	<u>Add</u> the following new definition: “Payment Period ‘<i>Payment Period</i>’ or ‘payment period’ the fixed segments of time for which the <i>Contractor</i> shall be entitled to claim payment for <i>Work</i> performed during such period, as agreed upon by the <i>Owner</i> and the <i>Contractor</i> at the first pre-construction meeting. To be effective, such agreement must be in writing or reflected in the final and approved pre-construction meeting minutes. In the event that the <i>Owner</i> and the <i>Contractor</i> do not fix the segment of time for each <i>Payment Period</i> at the first pre-construction meeting, then each <i>Payment Period</i> shall be a one (1) month period during which <i>Work</i> was performed, with the start and end dates of each <i>Payment Period</i> deemed to be the first (1st) calendar day of the applicable month and the last calendar day of the same month, respectively.”
SC7.29	Pre-Invoice Submission Meeting	<u>Add</u> the following new definition: “Pre-Invoice Submission Meeting ‘<i>Pre-Invoice Submission Meeting</i>’ has the definition given to it under GC 5.2.1.”
SC7.30	Procurement Documents	<u>Add</u> the following new definition: “Procurement Documents ‘<i>Procurement Documents</i>’ means those documents issued by the <i>Owner</i> as part of the competitive procurement to identify the successful <i>Contractor</i> for the <i>Contract</i>.”
SC7.31	Procurement Response	<u>Add</u> the following new definition: “Procurement Response ‘<i>Procurement Response</i>’ means the <i>Contractor’s</i> tender, bid or proposal submitted to the <i>Owner</i> in response to a procurement process issued by the <i>Owner</i>. For greater certainty, the <i>Contractor’s Procurement Response</i> includes the <i>Contractor’s</i> original bid for the <i>Contract Price</i> (inclusive of cash allowances prescribed in the <i>Procurement Documents</i>, if any), as well as any alternative and separate price(s) solicited from the <i>Contractor</i> in the bid documents.”
SC7.32	Proper Invoice	<u>Add</u> the following new definition: “Proper Invoice ‘<i>Proper Invoice</i>’ means a “proper invoice” as that term is defined in Section 6.1 of the <i>Construction Act</i>, with the minimum requirements set out in Exhibit “1” of the Supplementary Conditions.”
SC7.33	Proper Invoice Submission Date	<u>Add</u> the following new definition: “Proper Invoice Submission Date ‘<i>Proper Invoice Submission Date</i>’ has the definition given to it under GC 5.2.2.”
SC7.34	Provide	<u>Add</u> the following new definition:

		“Provide ‘Provide’ means to supply and install. <i>Provide</i> has this meaning whether or not the first letter is capitalized.”
SC7.35	Quality Management Plan	<u>Add</u> the following new definition: “Quality Management Plan ‘Quality Management Plan’ or ‘QMP’ means the program and process of quality assurance and quality control developed by the <i>Contractor</i> and implemented with all <i>Subcontractors</i> and <i>Suppliers</i> providing labour, <i>Construction Equipment</i>, <i>Work</i>, <i>Products</i> or services to the <i>Project</i>.”
SC7.36	Request for Information	<u>Add</u> the following new definition: “Request for Information ‘Request for Information’ or ‘RFI’ means written documentation sent by the <i>Contractor</i> to the <i>Consultant</i>, with a copy to the <i>Owner</i>, requesting written clarification(s) and/or interpretation(s) of the <i>Drawings</i> and/or <i>Specifications</i>, <i>Contract</i> requirements and/or other pertinent information required to complete the <i>Work</i> of the <i>Contract</i> without applying for a change or changes to the <i>Work</i>.”
SC7.37	Restricted Period	<u>Add</u> the following new definition: “Restricted Period ‘Restricted Period’ means the (inclusive) period of time between November 15 to December 31 (inclusive) in any given year throughout the duration of the <i>Contract</i>.”
SC7.38	Reviewed, Instructed, Required, Directed, Permitted, Inspected, Ordered	<u>Add</u> the following new definition: “Reviewed, Instructed, Required, Directed, Permitted, Inspected, Ordered Wherever the words ‘reviewed’, ‘instructed’, ‘required’, ‘directed’, ‘permitted’, ‘inspected’, ‘ordered’ or similar words are used they shall mean, unless the context provides otherwise, ‘reviewed by the <i>Consultant</i>’, ‘instructed by the <i>Consultant</i>’, ‘required by the <i>Consultant</i>’, ‘directed by the <i>Consultant</i>’, ‘permitted by the <i>Consultant</i>’ and ‘ordered by the <i>Consultant</i>’.”
SC7.39	Rules	<u>Add</u> the following new definition: “Rules ‘Rules’ has the meaning given to it under GC 8.3.1.”
SC7.40	Satisfactory	<u>Add</u> the following new definition: “Satisfactory Wherever the word ‘satisfactory’ or similar words or phrases are used in the <i>Contract Documents</i>, it means, unless the context provides otherwise, ‘satisfactory to the <i>Owner</i> and the <i>Consultant</i>’.”
SC7.41	Schedule Recovery Plan	<u>Add</u> the following new definition: “Schedule Recovery Plan ‘Schedule Recovery Plan’ is a written document setting out: (i) specific changes to the construction scheduling, sequencing, means, methods, and processes that the <i>Contractor</i> will implement to accelerate the <i>Work</i> so to ensure conformance with the

		<i>approved Construction Schedule</i> ; and (ii) a narrative of these changes.”
SC7.42	Submittals	<u>Add</u> the following new definition: “Submittals ‘<i>Submittals</i>’ means documents or items required by the <i>Contract Documents</i> to be provided by the <i>Contractor</i> such as: • <i>Shop Drawings</i>, samples, models, mock-ups to indicate details or characteristics, before the portion of the Work that they represent can be incorporated into the <i>Work</i>; and, • <i>As-Built drawings</i> and manuals to provide instructions to the operation and maintenance of the <i>Work</i>.”
SC7.43	Tariff Mitigation Plan	<u>Add</u> the following new definition: “Tariff Mitigation Plan ‘<i>Tariff Mitigation Plan</i>’ has the meaning ascribed to it in GC 10.1.7.”
SC7.44	Wage Rates	<u>Add</u> the following new definition: “Wage Rates ‘<i>Wage Rates</i>’ means <i>Contractor</i> personnel and/or third-party labour wage rates, inclusive of hourly rates, benefits, and payroll burden, as applicable to the <i>Contractor</i> or its <i>Subcontractor(s)</i>, which shall be set out in a schedule included in the <i>Contractor’s Procurement Response</i> and any supplementary schedule approved by the <i>Owner</i> for labour wage rates not included in the <i>Procurement Response</i>. The <i>Wage Rates</i> shall include the <i>Contractor’s</i> or <i>Subcontractor’s</i> markup (for overhead, general expenses, and profit combined) on personnel or labour, which shall be deemed to be in accordance with GC 6.2.4. The labour wage rates set out in the <i>Wage Rates</i> shall remain fixed for the duration of the <i>Project</i>.”

AMENDMENTS TO THE GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

SC8 GC 1.1 CONTRACT DOCUMENTS

SC8.1	1.1.1	<u>Delete</u> the first sentence in paragraph 1.1.1 and <u>replace</u> it with the following: “The intent of the <i>Contract Documents</i> is to include the construction, labour, <i>Products</i>, <i>Construction Equipment</i> and other services necessary, complementary or ancillary, for the performance and completion of the <i>Work</i> by the <i>Contractor</i> in accordance with the <i>Contract Documents</i> or properly inferable from them.” -and- <u>Add</u> the following sentence between the first and second sentences in paragraph 1.1.1: “In many cases, the language of the <i>Contract Documents</i> is written in the imperative for the sake of brevity. Clauses containing instructions or directions are intended for the <i>Contractor</i> and such sentences are deemed to include the words, “the <i>Contractor</i> shall”.”
SC8.2	1.1.3	<u>Delete</u> paragraph 1.1.3 and <u>replace</u> it with the following:

		"1.1.3 The <i>Contractor</i> shall review the <i>Contract Documents</i>, including without limitation, for the purpose of facilitating co-ordination and execution of the <i>Work</i> by the <i>Contractor</i>. Such review by the <i>Contractor</i> shall be to the standard of care provided in GC 3.12."
SC8.3	1.1.4	<u>Delete</u> paragraph 1.1.4 and <u>replace</u> it with the following: "1.1.4 Except for the obligation to make such review and report the results, the <i>Contractor</i> is not responsible for errors, omissions or inconsistencies in the <i>Contract Documents</i> provided that the <i>Contractor</i> exercised the degree of care and skill described in GC 1.1.3. If there are errors, omissions or inconsistencies discovered by or made known to the <i>Contractor</i>, the <i>Contractor</i> shall promptly report to the <i>Consultant</i> and shall not proceed with the <i>Work</i> affected until the <i>Contractor</i> has received corrected or additional information from the <i>Consultant</i>. Errors, inconsistencies and/or omissions in the <i>Drawings</i> and/or <i>Specifications</i> which do not allow completion of the <i>Work</i> shall be brought to the <i>Consultant's</i> attention prior to the execution of the affected <i>Work</i> by means of an <i>RFI</i>. Notwithstanding the foregoing, errors, inconsistencies, discrepancies and/or omissions shall not include lack of reference on the <i>Drawings</i> or in the <i>Specifications</i> to labour and/or <i>Products</i> that are required or normally recognized within respective trade practices as being necessary for the complete execution of the <i>Work</i>. The <i>Contractor</i> shall not use subsequent <i>RFIs</i>, issued during execution of the <i>Work</i>, to establish a presumptive change and/or changes in the <i>Work</i> pursuant to Part 6 – CHANGES IN THE WORK."
SC8.4	1.1.5.1	<u>Delete</u> paragraph 1.1.5.1 and <u>replace</u> it with the following: "1 the order of priority of documents, from highest to lowest, shall be: .1 the Supplementary Conditions, .2 the Agreement between the <i>Owner</i> and the <i>Contractor</i>, .3 the letter of award; .4 the Definitions; .5 the General Conditions, .6 <i>Division 1 of the Specifications</i>, .7 technical <i>Specifications</i>, .8 material and finishing schedules, .9 the <i>Drawings</i> .10 <i>Procurement Documents</i> .11 <i>Procurement Response</i>."
SC8.5	1.1.5.6 to 1.1.5.11	<u>Add</u> subparagraphs 1.1.5.6, 1.1.5.7, 1.1.5.8, 1.1.5.9, 1.1.5.10, and 1.1.5.11 as follows: "6 Annotations on the <i>Drawings</i> shall govern over the graphic representation of the <i>Drawings</i>. .7 Finishes in the room finish schedules shall govern over those shown on the <i>Drawings</i>. .8 Schedules of Division 01 – General Requirements of the <i>Specifications</i> shall form part of and be read in conjunction with the technical specification section as listed in the table of contents of the <i>Specifications</i>. .9 Architectural drawings shall have precedence over structural, plumbing,

		mechanical, electrical and landscape drawings insofar as outlining, determining and interpreting conflicts over the required design intent of all architectural layouts and architectural elements of construction, it being understood that the integrity and installation of the systems designed by the <i>Consultant</i> or its sub-<i>Consultants</i> are to remain with each of the applicable drawing disciplines. .10 Any provision establishing a higher standard of safety, reliability, durability, performance or service shall take precedence over a provision establishing a lower standard of safety, reliability, durability, performance or service. .11 Fixturing drawing provided by the <i>Owner</i> shall have precedence over architectural drawings insofar as outlining, determining and interpreting conflicts over the required design intent of all architectural layouts."
SC8.6	1.1.10	<u>Delete</u> the first sentence in paragraph 1.1.10 and <u>replace</u> it with the following: "Contracts, <i>Drawings</i>, <i>Specifications</i>, models, documents and copies thereof furnished by the <i>Contractor</i> or the <i>Owner</i> are and shall remain the property of the <i>Owner</i>, with the exception of the signed contract set belonging to the <i>Contractor</i>." -and- <u>Add</u> the following to the end of paragraph 1.1.10: "The <i>Specifications</i> are divided into divisions and sections for convenience but shall be read as a whole and neither such division nor anything else contained in the <i>Contract Documents</i> will be construed to place responsibility on the <i>Consultant</i> to settle disputes among the <i>Subcontractors</i> and <i>Suppliers</i> in respect to such divisions. The <i>Drawings</i> are, in part, diagrammatic and are intended to convey the scope of the <i>Work</i> and indicate general and appropriate locations, arrangement and sizes of fixtures, equipment and outlets. The <i>Contractor</i> shall obtain more accurate information about the locations, arrangement and sizes from study and coordination of the <i>Drawings</i>, including <i>Shop Drawings</i> and shall become familiar with conditions and spaces affecting these matters before proceeding with the <i>Work</i>. Where site conditions require reasonable minor changes in indicated locations and arrangements, the <i>Contractor</i> shall make such changes at no additional cost to the <i>Owner</i>. Similarly, where known conditions or existing conditions interfere with new installation and require relocation, the <i>Contractor</i> shall include such relocation in the <i>Work</i>. The <i>Contractor</i> shall arrange and install fixtures and equipment in such a way as to conserve as much headroom and space as possible. The schedules are that portion of the <i>Contract Documents</i> wherever located and whenever issued, compiling information of similar content and may consist of drawings, tables and/or lists."
SC8.7	1.1.12 to 1.1.15	<u>Add</u> new paragraphs 1.1.12, 1.1.13, 1.1.14, and 1.1.15 as follows: 1.1.12 The <i>Contractor</i> may obtain, at its own cost, copies of the <i>Contract Documents</i>. 1.1.13 One set of signed and sealed <i>Contract Documents</i> shall be retained by each of the <i>Owner</i> and the <i>Contractor</i>. 1.1.14 The <i>Contractor</i> shall keep one copy of the current <i>Contract Documents</i>, <i>Supplemental Instructions</i>, <i>Contemplated Change Notices</i>, <i>Change Estimates</i>,

		<i>Change Orders, Change Directives</i>, permits and permit <i>Drawings</i>, cash allowance disbursement authorizations (if used), reviewed <i>Shop Drawings, Submittals</i>, reports and records of meetings at the <i>Place of the Work</i>, and all documents and records evidencing that the <i>Project</i> complies with the <i>Excess Soil Regulation</i>, all in good order and available to the <i>Owner</i> and <i>Consultant</i>. 1.1.15 The <i>Contractor</i> shall prepare and maintain current <i>As-Built Drawings</i> which shall consist of the <i>Drawings</i> and <i>Specifications</i> revised by the <i>Contractor</i> during the <i>Work</i>, showing changes to the <i>Drawings</i> and <i>Specifications</i>, which current <i>As-Built Drawings</i> shall be maintained by the <i>Contractor</i> and made available to the <i>Consultant</i> for review with each application for payment. The <i>Consultant</i> reserves the right to retain a reasonable amount for the value of the <i>As-Built Drawings</i> not presented for review."

SC9 GC 1.4 ASSIGNMENT

SC9.1	1.4.1	<u>Delete</u> paragraph 1.4.1 in its entirety and <u>replace</u> it with the following: "The <i>Contractor</i> shall not assign the <i>Contract</i>, or any portion thereof without the prior written consent of the <i>Owner</i>, the granting of which shall be in the <i>Owner's</i> absolute discretion. In the event that the <i>Owner</i> agrees to an assignment of the <i>Contract</i> by the <i>Contractor</i>, such assignment shall not relieve the <i>Contractor</i> from its obligations and liabilities hereunder."
SC9.2	1.4.2	<u>Add</u> a new paragraph 1.4.2 as follows: "The <i>Owner</i> shall have the right, in its absolute discretion, upon delivery of a <i>Notice in Writing</i> to the <i>Contractor</i>, to transfer, novate, or assign this <i>Contract</i> and all of its rights and obligations under this <i>Contract</i>, in part or in whole, to any other partnership, corporation, joint venture, company, or person. Upon any such transfer or assignment the <i>Owner</i> shall not be liable for, and shall be released from, the performance of its obligations under this <i>Contract</i>, such that the <i>Contractor</i>, transferee or other assignee shall perform all of the <i>Owner's</i> obligations under the <i>Contract</i> which arise on and after the date of such assignment, all as fully and to the same extent as if the transferee or assignee had been the original party to the <i>Contract</i> instead of the <i>Owner</i>."

SC10 GC 1.5 CONFIDENTIALITY

SC10.1	GC 1.5	<u>Add</u> new GC 1.5 – CONFIDENTIALITY as follows: "GC 1.5 CONFIDENTIALITY 1.5.1 The <i>Contractor</i> shall take all reasonable precautions to protect, keep confidential, and not to use or disclose, other than as permitted in this <i>Contract</i>, all <i>Confidential Information</i> of the <i>Owner</i>. 1.5.2 The confidentiality obligations in this GC 1.5 shall not apply to <i>Confidential Information</i> that is: .1 required to be disclosed under or pursuant to any relevant law, legislation, statute, by-law, order, court or governmental authority having jurisdiction, as long as the <i>Contractor</i>.

		(i) discloses the minimum amount of <i>Confidential Information</i> required to satisfy the relevant law, legislation, statute, by-law, order, court or governmental authority having jurisdiction; and (ii) before disclosing any information, gives 15 days' <i>Notice in Writing</i> to the <i>Owner</i> and takes all reasonable steps to maintain such <i>Confidential Information</i> in confidence; .2 in the public domain otherwise than as a result of a breach of this <i>Contract</i> or other obligation of confidence; .3 required to be disclosed to the <i>Contractor's</i> employees or to the extent necessary to <i>Subcontractors</i> and <i>Suppliers</i> to enable the <i>Contractor</i> to fulfill its obligations under this <i>Contract</i>; or .4 already known by, or rightfully received, or independently developed by the recipient free of any confidentiality obligation. 1.5.3 The <i>Contractor</i> shall not, without the previous written consent of the <i>Owner</i>, use, publish or disclose to any person nor cause nor permit any of its employees, agents or third parties to use, publish or disclose any <i>Confidential Information</i> obtained from the <i>Owner</i> other than for the performance of the party's duties and obligations under this <i>Contract</i>. 1.5.4 Notwithstanding GC 1.5.3, prior to disclosing or providing access to any <i>Confidential Information</i> to a third party, the <i>Contractor</i> shall seek the written approval of the <i>Owner</i>. Before the <i>Owner</i> provides its consent and access to the <i>Confidential Information</i>, the <i>Contractor</i> will undertake to have such third party sign an agreement causing them to be bound by terms substantially the same as those in this GC 1.5 in a form approved by the <i>Owner</i>. 1.5.5 At the <i>Owner's</i> request, the <i>Contractor</i> shall promptly return to the <i>Owner</i> any <i>Confidential Information</i> of the <i>Owner</i> then in the <i>Contractor's</i> possession or under the <i>Contractor's</i> control, except for <i>Confidential Information</i> necessary to perform the <i>Contractor's</i> duties under this <i>Contract</i>. 1.5.6 If any unauthorized disclosure of, loss of, or inability to account for, <i>Confidential Information</i> occurs, the <i>Contractor</i> shall notify the <i>Owner</i> immediately by <i>Notice in Writing</i>. 1.5.7 If any <i>Confidential Information</i> contains information received in confidence from a third party, the <i>Contractor</i> shall, on request by the <i>Owner</i>, enter into any non-disclosure agreement that the third party may reasonably require on terms no more onerous than those in this <i>Contract</i>."

SC11 GC 1.6 PUBLICITY AND MEDIA

SC11.1	GC 1.6	<u>Add</u> new GC 1.6 – PUBLICITY AND MEDIA as follows: "GC 1.6 PUBLICITY AND MEDIA 1.6.1 The <i>Contractor</i> will not issue any press release, other general publicity announcement, or otherwise disclose any information concerning this <i>Contract</i> or the <i>Project</i> except with the prior written approval of the <i>Owner</i>. Without limiting

		the generality of the foregoing, the <i>Contractor</i> shall obtain prior approval from the <i>Owner</i> before making any information, including <i>Confidential Information</i> , public with regard to this <i>Contract</i> at any time, during or after the term of the <i>Contract</i> . The <i>Contractor</i> will ensure its employees, agents, <i>Subcontractors</i> and <i>Suppliers</i> and other representatives comply with the obligations of this GC 1.6."

SC12 GC 2.2 ROLE OF THE CONSULTANT

SC12.1	2.2.4	<u>Delete</u> GC 2.2.4 in its entirety and <u>replace</u> it with the following: "Upon receipt of an application for payment that satisfies the requirement of a <i>Contractor's Proper Invoice</i>, based on the <i>Consultant's</i> observations and evaluation of the <i>Contractor's</i> application for payment, the <i>Consultant</i> will determine the amounts owing to the <i>Contractor</i> under the <i>Contract</i> and will issue certificates for payment as provided in Article A-5 of the Agreement - PAYMENT, Article A-9 of the Agreement – TIME OF THE ESSENCE, GC 5.3 - PAYMENT, GC 5.4 - SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK, and GC 5.5 - FINAL PAYMENT. If the <i>Consultant</i> determines that the amount payable to the <i>Contractor</i> differs from the amount stated in a <i>Proper Invoice</i>, the <i>Consultant</i> shall deliver its finding to the <i>Owner</i> as provided in GC 5.3.1.1(b) and prepare a draft of the applicable <i>Notice of Non-Payment</i> for the amount in dispute."
SC12.2	2.2.6	In the first sentence of paragraph 2.2.6 <u>delete</u> the words: "Except with respect to GC5.1 — FINANCING INFORMATION REQUIRED OF THE OWNER".
SC12.3	2.2.7	<u>Add</u> the following to the end of paragraph 2.2.7: "All <i>Requests for Information</i> shall be provided to the <i>Owner</i>, the <i>Owner's Representative</i>, and the <i>Consultant</i>. Where a RFI requires a response from the <i>Consultant</i>, the <i>Consultant</i> shall provide its response in writing within 10 <i>Working Days</i>' receipt of an RFI."
SC12.4	2.2.12	<u>Add</u> the following to the end of paragraph 2.2.12: "If, in the opinion of the <i>Contractor</i>, the <i>Supplemental Instruction</i> involves an adjustment in the <i>Contract Price</i> or in the <i>Contract Time</i>, it shall, within ten (10) <i>Working days</i> of receipt of a <i>Supplemental Instruction</i> provide the <i>Consultant</i> with a written notice to that effect. In the event that the <i>Contractor</i> needs additional information to determine whether a <i>Supplemental Instruction</i> involves an adjustment of the <i>Contract Price</i> or in the <i>Contract Time</i>, it may issue a written request to the <i>Consultant</i> seeking such additional information. Following receipt of such information, the <i>Contractor</i> shall, within ten (10) <i>Working days</i> of receipt of such additional information provide the <i>Consultant</i> with the written notice described in the first sentence of this paragraph 2.2.13. Failure to provide written notification within the time stipulated in this paragraph 2.2.12 shall be deemed an acceptance of the <i>Supplemental Instruction</i> by the <i>Contractor</i> without adjustment in the <i>Contract Price</i> or <i>Contract Time</i>."
SC12.5	2.2.19	<u>Add</u> a new paragraph 2.2.19 as follows: "The <i>Consultant's</i> services will be performed solely for the benefit of the <i>Owner</i> and no <i>Contractor</i>, <i>Subcontractor</i>, <i>Supplier</i> or other third party shall have any claim against the <i>Consultant</i> as a result of the performance or non-performance of the <i>Consultant's</i> services. The <i>Contractor</i> shall include this provision in any contracts it makes with its <i>Subcontractors</i>, <i>Suppliers</i> and others and shall require such <i>Subcontractors</i>, <i>Suppliers</i> and others to include the same term in their contracts with sub-<i>Subcontractors</i>, sub-<i>Suppliers</i> and others."

SC13 GC 2.3 REVIEW AND INSPECTION OF THE WORK

SC13.1	2.3.2	<u>Add</u> the following to the end of paragraph 2.3.2: "If the <i>Contractor</i> notifies the <i>Consultant</i> that the <i>Work</i> is ready for testing, review or inspection and subsequent to such notification the <i>Contractor</i> is not prepared for a test, inspection or approval of <i>Work</i> by the <i>Consultant</i> and the <i>Consultant</i> is required to make a subsequent visit, the cost of any such unnecessary visit by the <i>Consultant</i> may be deducted from amounts payable to the <i>Contractor</i>."

SC14 GC 2.4 DEFECTIVE WORK

SC14.1	2.4.1	<u>Add</u> the following to the end of paragraph 2.4.1: "The <i>Contractor</i> shall prioritize the correction of any defective <i>Work</i> which, in the sole discretion of the <i>Owner</i>, adversely affects the day-to-day operation of the <i>Owner</i>. Any defective <i>Work</i> that has been rejected by the <i>Consultant</i> shall be corrected by the <i>Contractor</i> within 5 <i>Working Days</i> of being notified of the defective <i>Work</i>, save and except where the defective <i>Work</i> cannot reasonably be corrected within such time period, in which case the <i>Contractor</i> shall, within that same 5 <i>Working Day</i> period, provide a written remediation plan to the <i>Owner</i> and the <i>Consultant</i> for the prompt correction of the defective <i>Work</i> for the <i>Owner's</i> review and approval. Unless agreed otherwise in writing by the <i>Owner</i>, the <i>Contractor</i> shall complete all corrections to the defective <i>Work</i> within 5 <i>Working Days</i> of the <i>Owner</i> approving the remediation plan."
SC14.2	2.4.4	<u>Add</u> a new paragraph 2.4.4 as follows: "2.4.4 The <i>Contractor</i> shall reimburse the <i>Owner</i> for all <i>Administration Costs</i> associated with the <i>Consultant</i> having to re-attend to inspect defective work in excess of one inspection."
SC14.3	2.4.5 and 2.4.6	<u>Add</u> new paragraphs 2.4.5 and 2.4.6 as follows: "2.4.5 Neither acceptance of the <i>Work</i> by the <i>Consultant</i> or the <i>Owner</i>, nor any failure by the <i>Consultant</i> or the <i>Owner</i> to identify, observe, or warn of defective <i>Work</i> or any deficiency in the <i>Work</i> shall relieve the <i>Contractor</i> from the sole responsibility for rectifying such defect or deficiency at the <i>Contractor's</i> sole cost. 2.4.6 The <i>Contractor</i> shall prepare a <i>QMP</i> in a format approved by the <i>Owner</i>. The <i>Contractor</i> shall implement, monitor and enforce the <i>QMP</i> and report monthly to the <i>Owner</i> and to the <i>Consultant</i>."

SC15 GC 3.1 CONTROL OF THE WORK

SC15.1	3.1.3 and 3.1.4	<u>Add</u> new paragraphs 3.1.3 and 3.1.4 as follows: "3.1.3 The <i>Contractor's</i> representatives and project team as named in the <i>Contractor's</i> original bid for the <i>Contract</i> shall not be changed except for valid reason and with the <i>Owner's</i> written consent. The <i>Owner</i> may reasonably demand a change in specific members of the <i>Contractor's</i> project team at any time.

		3.1.4 Prior to commencing individual procurement, fabrication and construction activities, the <i>Contractor</i> shall verify, at the <i>Place of the Work</i> , all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the <i>Work</i> and shall further carefully compare such field measurements and conditions with the requirements of the <i>Contract Documents</i> . Where dimensions are not included or exact locations are not apparent, the <i>Contractor</i> shall immediately notify the <i>Consultant</i> in writing and obtain written instructions from the <i>Consultant</i> before proceeding with any part of the affected <i>Work</i> ."

SC16 GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

SC16.1	3.2.2.1	<u>Delete</u> subparagraph 3.2.2.1 in its entirety and <u>replace</u> it with "[Intentionally left blank]."
SC16.2	3.2.3.2	<u>Delete</u> subparagraph 3.2.3.2 and <u>replace</u> it with the following: "co-ordinate and schedule the activities and work of <i>Other Contractors</i> , including the work of <i>Other Contractors</i> retained as necessary when a price for a change in the <i>Work</i> cannot be agreed upon, and <i>Owner's</i> own forces with the <i>Work</i> of the <i>Contractor</i> ;"
SC16.3	3.2.3.4	<u>Delete</u> the period at the end of subparagraph 3.2.3.4 and <u>replace</u> it with a semi-colon; -and- <u>Add</u> "and" at the end of subparagraph 3.2.3.4.
SC16.4	3.2.3.5	<u>Add</u> new subparagraph 3.2.3.5 as follows: ".5 Subject to GC 9.4 CONSTRUCTION SAFETY, for the <i>Owner's</i> own forces and for <i>Other Contractors</i> , assume overall responsibility for compliance with all aspects of the applicable Health and Safety legislation of the <i>Place of the Work</i> , including all the responsibilities of the "constructor" under the OHSA."

SC17 GC 3.4 CONSTRUCTION SCHEDULE

SC17.1	3.4.1 to 3.4.6	<u>Delete</u> paragraph 3.4.1 in its entirety, including all subparagraphs, and <u>replace</u> it with the following new paragraphs 3.4.1, 3.4.2, 3.4.3, 3.4.4, 3.4.5 and 3.4.6: "3.4.1 Within 20 <i>Working Days</i> of the issuance of the letter of award by the <i>Owner</i> the <i>Contractor</i> shall submit to the <i>Owner</i> and the <i>Consultant</i> for their approval a draft baseline schedule for the <i>Project</i> that .1 complies with the requirements of Exhibit "2" of the Supplementary Conditions .2 demonstrates that the <i>Work</i> will be performed in conformity with the dates prescribed in Article A-1.3 for the <i>Contract Time</i> and the <i>Contract Documents</i> ; .3 identifies proposed dates for achieving each <i>Milestone</i> ; and .4 is accompanied by a letter from a senior officer of the <i>Contractor</i> certifying that the draft baseline schedule was prepared in collaboration with, and is supported by, the <i>Subcontractors</i> and <i>Suppliers</i> whose activities affect the

		critical path.
		3.4.2 Upon receipt of the <i>Contractor's</i> draft baseline schedule submission, the <i>Owner</i> and the <i>Consultant</i> shall review the submission and either notify the <i>Contractor</i> that the draft baseline schedule is acceptable or provide written comments to the <i>Contractor</i> identifying and explaining how the <i>Contractor's</i> draft baseline schedule submission does not comply with the requirements of GC 3.4.1. If the <i>Owner</i> or the <i>Consultant</i> notify the <i>Contractor</i> that its submission is non-compliant, the <i>Contractor</i> will, within 10 <i>Working Days</i> of receiving such notification, address the non-compliance and resubmit its draft baseline schedule submission to the <i>Owner</i> and the <i>Consultant</i>. The process described in this GC 3.4.2 shall continue until such time as the <i>Contractor</i> delivers a compliant baseline schedule submission, as determined by the <i>Owner</i> and the <i>Consultant</i> acting reasonably. However, the final opportunity for the <i>Contractor</i> to deliver a compliant draft baseline schedule submission, without penalty, shall be with its third application for payment. If, at that time, the <i>Contractor's</i> draft baseline schedule submission still does not comply with the requirements of GC 3.4.1, the <i>Owner</i> may issue a <i>Notice of Non-Payment</i> and deduct from payment to the <i>Contractor</i> a reasonable amount as determined by the <i>Owner</i>, and retain such amount until such time that the <i>Contractor</i> delivers a compliant draft baseline schedule submission that is accepted by the <i>Owner</i>. Until such time that the draft baseline schedule submission is accepted, the <i>Owner</i> may continue to issue <i>Notices of Non-Payment</i> in such reasonable amounts as determined by the <i>Owner</i>. Once the draft baseline schedule is accepted by the <i>Owner</i>, this baseline schedule submission shall become the "Baseline Schedule" that is fixed, shall not be amended. The <i>Baseline Schedule</i> shall be the initial version of the <i>Construction Schedule</i>. 3.4.3 The <i>Contractor</i> shall: .1 provide the expertise and resources, such resources including sufficient staffing and labour, and equipment, as are necessary to maintain or improve progress under the <i>Baseline Schedule</i> or any successor <i>Construction Schedule</i> approved by the <i>Owner</i> pursuant to this GC 3.4; .2 ensure that all <i>Subcontractors</i> and <i>Suppliers</i> are provided with a copy of the <i>Baseline Schedule</i> and any successor <i>Construction Schedule(s)</i> and that they adhere to the <i>Construction Schedule</i>; .3 continuously monitor the progress of the <i>Work</i> relative to the <i>Baseline Schedule</i> and, as part of the <i>Contractor's</i> requirements for a <i>Proper Invoice</i>, provide the <i>Owner</i> with a monthly update to the <i>Construction Schedule</i> that complies with the requirements of Exhibit "2" to the Supplementary Condition, covering all of the baseline activities including the actual start, actual finish and percentage completion of those activities and shall submit, to the <i>Owner</i> for review and approval, any changes made to the <i>Baseline Schedule</i> logic and activity durations; .4 immediately provide <i>Notice in Writing</i> to the <i>Owner</i> and the <i>Consultant</i> of any slippage or potential slippage in the currently approved <i>Milestones</i> in the <i>Construction Schedule</i>; .5 if after applying the expertise and resources required under GC 3.4.3.1, the <i>Contractor</i> forms the opinion that the slippage in schedule reported in GC 3.4.3.4 cannot be recovered by the <i>Contractor</i>, it shall, in the same notice provided under GC 3.4.3.4, indicate to the <i>Consultant</i> and the <i>Owner</i> if the

		<i>Contractor</i> intends to apply for an extension of <i>Contract Time</i> as provided in PART 6 —CHANGES IN THE WORK.
	3.4.4	The <i>Contractor</i> shall not amend the <i>Construction Schedule</i> without the prior written consent of the <i>Owner</i>. Any revisions to the <i>Construction Schedule</i> approved by the <i>Owner</i> shall not be deemed to be an extension of the <i>Contract Time</i> or any <i>Milestone</i>. All requests by the <i>Contractor</i> for a revision to the <i>Construction Schedule</i> that includes an extension to the <i>Contract Time</i> or adjustment to the date of any <i>Milestone</i> must be approved by the <i>Owner</i> through an executed <i>Change Order</i>.
	3.4.5	Without limiting the <i>Contractor's</i> obligations under this GC 3.4, the <i>Contractor</i> shall at each site construction meeting, or every 2 weeks, whichever is shorter, provide to the <i>Owner</i> and the <i>Consultant</i> a 3 week look-ahead schedule indicating the major activities to be undertaken or constructed in such 3 week period. The 3 week look-ahead schedule shall clearly highlight the activities to be undertaken by the <i>Contractor</i>, the <i>Owner</i>, and the <i>Consultant</i> in the upcoming 3 week period, including any impact of the scheduled activities on any occupants adjacent to or near the <i>Place of Work</i>.
	3.4.6	A schedule contingency of 30 days duration, owned by the <i>Owner</i>, shall be deemed to be included in the critical path of the <i>Construction Schedule</i>. This schedule contingency shall be shown in the <i>Construction Schedule</i> and shall not exceed the <i>Contract Time</i>. The <i>Owner</i> may, in its sole discretion, elect to apply the schedule contingency set out in this paragraph 3.4.6 at any time in respect of an <i>Owner</i> initiated <i>Change Order</i>, or upon the occurrence of an event which would otherwise entitle the <i>Contractor</i> to an extension of the <i>Contract Time</i>, which in either case the <i>Contractor</i> is not entitled to additional compensation for time-related impact.

SC18 GC 3.5 SUPERVISION

SC18.1	3.5.2	<u>Delete</u> paragraph 3.5.2 in its entirety and <u>replace</u> it with the following: "The supervisor, and any project manager appointed by the <i>Contractor</i>, shall represent the <i>Contractor</i> at the <i>Place of Work</i> and shall have full authority to act on written instructions given by the <i>Consultant</i> and/or the <i>Owner</i> and the <i>Owner's</i> representative. Instructions given to the supervisor or the project manager shall be deemed to have been given to the <i>Contractor</i> and both the supervisor and any project manager shall have full authority to act on behalf of the <i>Contractor</i> and bind the <i>Contractor</i> in matters related to this <i>Contract</i>."
SC18.2	3.5.3 and 3.5.4	<u>Add</u> new paragraphs 3.5.3 and 3.5.4 as follows: "3.5.3 The <i>Owner</i>, acting reasonably, shall have the right to order the <i>Contractor</i> to remove from the <i>Project</i> any representative or employee of the <i>Contractor</i>, <i>Subcontractors</i> or <i>Suppliers</i> who, in the opinion of the <i>Owner</i>, are a detriment to the <i>Project</i>. The <i>Contractor</i> shall indemnify and save the <i>Owner</i> harmless from any claims, demands, actions, costs, expenses, losses, or damages that may arise or result from the <i>Owner</i> exercising its right under this GC 3.5.3. 3.5.4 Notwithstanding GC 7.1, the <i>Owner</i> shall have the right to immediately, and upon <i>Notice in Writing</i>, terminate the <i>Contract</i> should the <i>Contractor</i> fail to comply with the OHSA."

SC19 GC 3.6 SUBCONTRACTORS AND SUPPLIERS

SC19.1	3.6.1	<u>Add</u> the words "including any warranties and service agreements which extend beyond the term of the <i>Contract</i> " after the words "under subcontract" in the second line in paragraph 3.6.1.
SC19.2	3.6.4	<u>Delete</u> the word "If" at the beginning of the sentence in paragraph 3.6.4 and <u>replace</u> it with "If, following execution of the <i>Contract</i> ,"
SC19.3	3.6.5	<u>Add</u> to the start of the sentence in paragraph 3.6.5 the following: "Subject to GC 3.6.8,"
SC19.4	3.6.7 to 3.6.11	<u>Add</u> new paragraphs 3.6.7, 3.6.8, 3.6.9, 3.6.10, and 3.6.11 as follows: "3.6.7 The <i>Contractor</i> represents and warrants that it has confirmed the availability of its <i>Subcontractors</i> for the <i>Project</i> and, in particular, for the performance of their respective portions of the <i>Work</i> to ensure completion of the <i>Project</i> within the <i>Contract Price</i> and the <i>Contract Time</i>. If the <i>Contractor</i> wants to change a <i>Subcontractor</i> or <i>Supplier</i>, then: .1 the <i>Contractor</i> shall not make such change without prior written approval of the <i>Owner</i>, which approval shall be in the sole discretion of the <i>Owner</i>; .2 the <i>Contractor</i> shall provide the <i>Owner</i> with a copy of the proposed subcontract along with pricing information and a scope of work for the <i>Owner's</i> review and consideration to inform its exercise of discretion; and .3 if such change in <i>Subcontractor</i> is approved by the <i>Owner</i> the <i>Contractor</i> shall not be entitled to an increase in the <i>Contract Price</i> or <i>Contract Time</i> where the <i>Owner</i> approves a change in <i>Subcontractor</i> or <i>Supplier</i>. 3.6.8 Where provided for in the <i>Procurement Documents</i>, the <i>Owner</i> may assign to the <i>Contractor</i>, and the <i>Contractor</i> agrees to accept as a subcontract, any contract procured by the <i>Owner</i> for <i>Work</i> or services required on the <i>Project</i> that has been pre-tendered or pre-negotiated by the <i>Owner</i>. 3.6.9 The <i>Contractor</i> shall ensure that all contracts and written agreements with <i>Subcontractors</i> and <i>Suppliers</i> contain an assignment clause in favour of the <i>Owner</i>. In the event that the <i>Contract</i> is terminated, the <i>Contractor</i> shall promptly assign each of such contracts or written agreements to perform any portion of the <i>Work</i> to the <i>Owner</i>. The assignment shall only be effective after the termination of the <i>Contract</i> by the <i>Owner</i> and shall only be applicable for those subcontract agreements which the <i>Owner</i> accepts by providing a <i>Notice in Writing</i> to the <i>Subcontractor</i> or <i>Supplier</i>, as applicable, and <i>Contractor</i>. The assignment is subject to the prior rights of the surety, if any. 3.6.10 In each of the <i>Contractor's</i> subcontracts with <i>Subcontractors</i> or <i>Suppliers</i> to perform a portion of the <i>Work</i>, the <i>Contractor</i> shall include a term in the subcontract stating that the <i>Subcontractor</i> agrees to an assignment of its subcontract by the <i>Contractor</i> to the <i>Owner</i>. The term in the subcontract shall not be enforceable until the proper termination of the <i>Contract</i> by the <i>Owner</i>. 3.6.11 The <i>Contractor</i> shall provide the <i>Owner</i> with: .1 a copy of any written notices of <i>Adjudication</i> the <i>Contractor</i> receives; .2 notice of the date on which the adjudicator relating to such <i>Adjudication</i>

		receives documents under section 13.11 of the <i>Construction Act</i>; and .3 the adjudicator's determination of the <i>Adjudication</i> under section 13.13 of the <i>Construction Act</i>. The <i>Contractor</i> shall ensure that its contracts with <i>Subcontractors</i> and <i>Suppliers</i> and the contracts with sub-subcontractors (of every tier) contain equivalent obligations to this GC 3.6.11 and the <i>Contractor</i> shall forthwith upon receipt provide to the <i>Owner</i> any notices of <i>Adjudication</i> and related information it receives. The <i>Contractor</i> shall be liable to and indemnify the <i>Owner</i> for any losses, damages, costs, claims and proceedings the <i>Owner</i> incurs, suffers or receives as a result of the <i>Contractor's</i> failure to comply with its obligations under this GC 3.6.11."

SC20 GC 3.7 LABOUR AND PRODUCTS

SC20.1	3.7.1	<u>Add</u> the words, "..., agents, <i>Subcontractors</i> and <i>Suppliers</i> " after the "employees" toward the end of line one in paragraph 3.7.1. -and- <u>Add</u> the following to the end of paragraph 3.7.1: "Without in any way limiting the generality of the foregoing, the <i>Contractor</i> shall prepare and implement the job site rules more particularly described in the <i>Procurement Documents</i>. If no job site rules are described in the <i>Procurement Documents</i>, the <i>Contractor</i> shall draft job site rules for the review and approval of the <i>Owner</i>. Any such job site rules prepared by the <i>Contractor</i> shall be consistent with the <i>Contractors</i> duties and obligations under the OHSa and shall also include provisions making smoking, vaping and the consumption of alcohol, cannabis products, or non-prescription drugs on the <i>Project</i> site the subject of discipline proceedings and/or termination of employment."
SC20.2	3.7.2	<u>Add</u> the following sentence to the end of paragraph 3.7.2: "The <i>Contractor</i> represents and warrants that the <i>Products</i> provided for in accordance with the Contract are not subject to any conditional sales contract and are not subject to any security rights obtained by any third party which may subject any of the <i>Products</i> to seizure and/or removal from the <i>Place of the Work</i>."
SC20.3	3.7.3	<u>Delete</u> paragraph 3.7.3 and <u>replace</u> it with the following: "<i>Products</i> provided shall be new and shall conform to all current applicable specifications of the Canadian Standards Association, Canadian Standards Board or General Standards Board, ASTM, National Building Code, Ontario Building Code, National Fire Prevention Association, the Technical Standards and Safety Authority (also known as TSSA) and all governmental authorities having jurisdiction at the <i>Place of the Work</i>, unless otherwise specified. <i>Products</i> which are not specified shall be of a quality consistent with those specified and their use acceptable to the <i>Consultant</i>. <i>Products</i> brought on to the <i>Place of the Work</i> by the <i>Contractor</i> shall be deemed to be the property of the <i>Owner</i>, but the <i>Owner</i> shall be under no liability for loss thereof or damage thereto arising from any cause whatsoever. The said <i>Product</i> shall be at the sole risk of the <i>Contractor</i>."

SC20.4	3.7.4 to 3.7.7	<u>Add</u> new paragraphs 3.7.4, 3.7.5, 3.7.6, and 3.7.7 as follows: “3.7.4 Upon receipt of a written notice from the <i>Consultant</i>, the <i>Contractor</i> shall dismiss from the <i>Place of the Work</i> tradesmen and labourers whose <i>Work</i> is unsatisfactory to the <i>Consultant</i> or who are considered by the <i>Consultant</i> to be unskilled or otherwise objectionable. 3.7.5 The <i>Contractor</i> shall not employ any persons on the <i>Work</i> whose labour affiliation, or lack thereof, is incompatible with other labour employed in connection with the <i>Work</i>. Any costs arising from <i>Labour Disputes</i>, as a result of the employ of any such person by the <i>Contractor</i>, its <i>Subcontractor</i> or <i>Suppliers</i> shall be the sole expense of the <i>Contractor</i>. 3.7.6 The <i>Contractor</i> shall comply with the <i>General Labour Conditions</i> and shall also cooperate with the <i>Owner</i> and its representatives and shall take all reasonable and necessary actions to maintain stable and harmonious labour relations with respect to the <i>Work</i> at the <i>Place of the Work</i>, including cooperation to attempt to avoid <i>Work</i> stoppages, trade union jurisdictional disputes and other <i>Labour Disputes</i>. 3.7.7 The <i>Contractor</i> is responsible for the safe storage of <i>Products</i> and their protection (including <i>Products</i> supplied by the <i>Owner</i> and other contractors to be installed under the <i>Contract</i>) in such ways as to avoid dangerous conditions or contamination to the <i>Products</i> or other persons or property and in locations satisfactory to the <i>Owner</i> and the <i>Consultant</i>. The <i>Owner</i> shall provide all relevant information on the <i>Products</i> to be supplied by the <i>Owner</i>.”

SC21 GC 3.8 SHOP DRAWINGS

SC21.1	3.8.2	<u>Add</u> the following to the end of the sentence in paragraph 3.8.2: “Prior to the submitting its first application for payment, the <i>Contractor</i> shall prepare a <i>Shop Drawings</i> and <i>Submittals</i> schedule for review and acceptance by the <i>Owner</i> and the <i>Consultant</i>. The draft <i>Shop Drawings</i> and <i>Submittals</i> schedule shall clearly indicate the timing for submission, review, return, and resubmission (if required) of <i>Shop Drawings</i> and <i>Submittals</i>. In preparing the <i>Shop Drawings</i> and <i>Submittals</i> schedule, the <i>Contractor</i> shall comply with the requirements for <i>Shop Drawings</i> submissions stated in Division 01 of the <i>Specifications</i>. Where no schedule for the submission, review, return, and resubmission (if required) of <i>Shop Drawings</i> and <i>Submittals</i> has been agreed upon between the <i>Contractor</i>, the <i>Owner</i>, and the <i>Consultant</i>, the <i>Contractor</i> is estopped from alleging a claim for an extension of <i>Contract Time</i> or an increase to the <i>Contract Price</i> due to a delay by the <i>Owner</i> or the <i>Consultant</i> in reviewing or returning <i>Shop Drawings</i> or <i>Submittals</i>.”
SC21.2	3.8.7	<u>Delete</u> paragraph 3.8.7 and <u>replace</u> it with the following: “The <i>Consultant</i> will review and return <i>Shop Drawings</i> and <i>Submittals</i> in accordance with the schedule agreed upon in GC 3.8.2, or, in the absence of such schedule, within 10 <i>Working Days</i>’ receipt of a <i>Shop Drawing</i> or <i>Submittal</i>. If, for any reason, the <i>Consultant</i> cannot process them within the agreed-upon schedule or within the prescribed time under this GC 3.8.7, the <i>Consultant</i> shall notify the <i>Contractor</i> and they shall meet to review and arrive at a revised schedule for processing such <i>Shop Drawings</i> and <i>Submittals</i> acceptable to the <i>Owner</i>. The <i>Contractor</i> shall update the <i>Shop Drawings</i> and <i>Submittals</i>

		schedule to correspond to changes in the <i>Construction Schedule</i> . Changes in the <i>Contract Price</i> or <i>Contract Time</i> may be made only as otherwise provided in the <i>Contract</i> ."
SC21.3	3.8.8 to 3.8.13	<u>Add</u> new paragraphs 3.8.8, 3.8.9, 3.8.10, 3.8.11, 3.8.12, and 3.8.13 as follows: 3.8.8 The <i>Contractor</i> shall provide <i>Shop Drawings</i> and <i>Submittals</i> in the form specified, or if not specified, as directed by the <i>Consultant</i>. <i>Shop Drawings</i> provided by the <i>Contractor</i> to the <i>Consultant</i> shall indicate by stamp, date and signature of the person responsible for the review that the <i>Contractor</i> has reviewed each one of them. 3.8.9 <i>Shop Drawings</i> which require approval of any legally constituted authority having jurisdiction shall be provided to such authority by the <i>Contractor</i> for the authority's approval. 3.8.10 The <i>Contractor</i> shall provide revised <i>Shop Drawings</i> to correct those which the <i>Consultant</i> rejects as inconsistent with the <i>Contract Documents</i>, unless otherwise directed by the <i>Consultant</i>. The <i>Contractor</i> shall notify the <i>Consultant</i> in writing of any revisions to the <i>Shop Drawings</i> other than those requested by the <i>Consultant</i> 3.8.11 Reviewed <i>Shop Drawings</i> shall not authorize a change in the <i>Contract Price</i> and/or the <i>Contract Time</i>. 3.8.12 The <i>Contractor</i> shall not use the term "by others" on <i>Shop Drawings</i> or other <i>Submittals</i>. The related trade, Subcontractor or Supplier shall be stated. 3.8.13 Certain <i>Specifications</i> sections require the <i>Shop Drawings</i> to bear the seal and signature of a professional engineer. Such professional engineer must be registered in the jurisdiction of the <i>Place of the Work</i> and shall have expertise in the area of practice reflected in the <i>Shop Drawings</i>."

SC22 GC 3.9 USE OF THE WORK

SC22.1		<u>Add</u> new GC 3.9 – USE OF THE WORK as follows: "GC 3.9 USE OF THE WORK 3.9.1 The <i>Contractor</i> shall confine <i>Construction Equipment</i>, <i>Temporary Work</i>, storage of <i>Products</i>, waste products and debris, and operations of employees and <i>Subcontractors</i> to limits indicated by laws, ordinances, permits, or the <i>Contract Documents</i> and shall not unreasonably encumber the <i>Place of the Work</i>. 3.9.2 The <i>Contractor</i> shall not load or permit to be loaded any part of the <i>Work</i> with a weight or force that will endanger the safety of the <i>Work</i>."

SC23 GC 3.10 CUTTING AND REMEDIAL WORK

SC23.1		<u>Add</u> new GC 3.10 – CUTTING AND REMEDIAL WORK as follows:

		“GC 3.10 CUTTING AND REMEDIAL WORK 3.10.1 The <i>Contractor</i> shall perform the cutting and remedial work required to make the affected parts of the <i>Work</i> come together properly. Such cutting and remedial work shall be performed by specialists familiar with the <i>Products</i> affected and shall be performed in a manner to neither damage nor endanger the <i>Work</i>. 3.10.2 The <i>Contractor</i> shall coordinate the <i>Work</i> to ensure all cutting and remedial work required is kept to a minimum.”

SC24 GC 3.11 CLEANUP

SC24.1		<u>Add</u> new GC 3.11 – CLEANUP as follows: “GC 3.11 CLEANUP 3.11.1 The <i>Contractor</i> shall maintain the <i>Work</i> in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the <i>Owner</i> or <i>Other Contractors</i> or their employers. 3.11.2 Before applying for <i>Substantial Performance of the Work</i> as provided in GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK, the <i>Contractor</i> shall remove waste products and debris and shall leave the <i>Place of the Work</i> clean and suitable for use or <i>Occupancy</i> by the <i>Owner</i>. All products, tools, <i>Construction Equipment</i> and <i>Temporary Work</i> not required for the performance of any remaining <i>Work</i> shall be removed by the <i>Contractor</i>. 3.11.3 As a condition precedent to final payment in accordance with GC 5.5 – FINAL PAYMENT, the <i>Contractor</i> shall remove any remaining products, tools, <i>Construction Equipment</i>, <i>Temporary Work</i>, waste products and debris from the <i>Place of the Work</i>, to the satisfaction of the <i>Owner</i>. 3.11.4 Cleanup during construction and the final cleaning of the <i>Place of the Work</i> is further specified in Division 01 of the <i>Specifications</i>. 3.11.5 In the event that the <i>Contractor</i> fails to remove waste and debris as provided in this GC 3.11, then the <i>Owner</i> or the <i>Consultant</i>, may give the <i>Contractor</i> 24 hours’ written notice to meet its obligations respecting clean up. Should the <i>Contractor</i> fail to meet its obligations pursuant to this GC 3.11 within the 24 hour period next following delivery of the notice, the <i>Owner</i> may remove such waste and debris and deduct from payments otherwise due to the <i>Contractor</i>, the <i>Owner’s</i> costs for such clean up, including a reasonable markup for administration.”

SC25 GC 3.12 CONTRACTOR STANDARD OF CARE

SC25.1		<u>Add</u> new GC 3.12 – CONTRACTOR STANDARD OF CARE as follows: “GC 3.12 CONTRACTOR STANDARD OF CARE

		3.12.1 In performing this <i>Contract</i>, the <i>Contractor</i> shall exercise the degree of care, skill and diligence that would normally be exercised by an experienced, skilled and prudent contractor supplying similar services for similar projects in a first class and expeditious manner. The <i>Contractor</i> acknowledges and agrees that, throughout this <i>Contract</i>, the <i>Contractor's</i> obligations, duties and responsibilities shall be judged, evaluated and interpreted in accordance with this standard. The <i>Contractor</i> shall exercise the same standard of care in respect of any <i>Products</i>, personnel or procedures which it may recommend to the <i>Owner</i> or employ on the <i>Project</i>. 3.12.2 The <i>Contractor</i> further represents, covenants and warrants to the <i>Owner</i> that: .1 the personnel it assigns to the <i>Project</i> are appropriately experienced; .2 the <i>Contractor</i>, its <i>Subcontractors</i>, and <i>Suppliers</i> have sufficient staff of qualified and competent personnel to replace their respective appointed representatives, subject to the <i>Owner's</i> approval, in the event of death, incapacity, removal or resignation; .3 the <i>Contractor</i>, its agents, employees, representatives, <i>Subcontractors</i> and <i>Suppliers</i>, have the necessary training, licenses, and certifications required or necessary to perform the <i>Work</i>; and .4 there are no pending, threatened or anticipated claims, liabilities or contingent liabilities that would have a material effect on the financial ability of the <i>Contractor</i> to perform its work under the <i>Contract</i>."

SC26 GC 3.13 CONTRACTOR USE OF PERMANENT EQUIPMENT OR SYSTEMS

SC26.1		<u>Add</u> new GC 3.13 – CONTRACTOR USE OF PERMANENT EQUIPMENT OR SYSTEMS as follows: "GC 3.13 CONTRACTOR USE OF PERMANENT EQUIPMENT OR SYSTEMS 3.13.1 With the prior written approval of the <i>Owner</i>, the <i>Contractor</i> may make use of elements of the mechanical and electrical systems or equipment comprising a permanent part of the <i>Work</i> for the purpose of providing heat or power to the <i>Project</i> during the final stages of construction. In such event, and before the issuance of the certificate of <i>Substantial Performance of the Work</i>, the <i>Contractor</i> shall clean and make good, to the satisfaction of the <i>Consultant</i>, such systems and equipment as it had been permitted to use. The <i>Contractor</i> shall pay any and all costs associated with such use, cleaning and making good. 3.13.2 Where the <i>Owner</i> has provided its consent under GC 3.13.1, or where the <i>Project</i> has obtained full or partial <i>Occupancy</i> prior to <i>Ready-for-Takeover</i>, the warranty for such mechanical or electrical systems, or equipment, shall continue to provide for its commencement at <i>Ready-for-Takeover</i>. Prior to its use, and as a condition precedent to the <i>Owner</i> providing its consent under GC 3.13.1, the <i>Contractor</i> shall obtain, from the <i>Subcontractor</i>, the manufacturer or the <i>Supplier</i> of the systems or equipment to be used, a confirmation from such <i>Subcontractor</i>, manufacturer or <i>Supplier</i> that the warranty on such systems or equipment begins on the date of <i>Ready-for-Takeover</i> and is not impaired in scope or reduced in time by virtue of the <i>Contractor's</i> use of such systems or equipment. Should the <i>Contractor</i> fail to obtain such written confirmation from the <i>Subcontractor</i>, the manufacturer or <i>Supplier</i>, the <i>Contractor</i> shall be responsible for the cost of purchasing an extended warranty to

		bridge the time period from commencement of the use of the system(s) and/or equipment to <i>Ready-for-Takeover</i> . If the <i>Contractor</i> fails to obtain an extended warranty, then the <i>Owner</i> may obtain an extended warranty and charge back the cost to the <i>Contractor</i> ."

SC27 GC 3.14 ENVIRONMENTAL PROGRAMS

SC27.1		<u>Add</u> new GC 3.14 as follows: "GC 3.14 ENVIRONMENTAL PROGRAMS 3.14.1 In carrying out the <i>Work</i> under this <i>Contract</i>, the <i>Contractor</i> shall comply with all the requirements of the <i>Environmental Programs</i>."

SC28 GC 3.15 PERMIT MANAGEMENT

SC28.1		<u>Add</u> new GC 3.15 – PERMIT MANAGEMENT as follows: "GC 3.15 PERMIT MANAGEMENT 3.15.1 The <i>Owner</i> or the <i>Consultant</i> shall e-mail the building permit file or files to the <i>Contractor</i>, and the <i>Contractor</i> shall be solely responsible for, and shall bear the entire cost of, the prompt printing and distribution of sufficient copies of the building permit(s) to allow for the performance of the <i>Work</i> in accordance with the <i>Contract</i>. 3.15.2 When requested by the <i>Consultant</i> or the <i>Owner</i>, the <i>Contractor</i> shall compile and organize all documentation required to attain <i>Occupancy</i> and submit an electronic copy of such documentation to the <i>Consultant</i>. The <i>Consultant</i> shall review the documentation submitted by the <i>Contractor</i> for the purposes of the <i>Consultant</i> preparing a compliance letter for obtaining <i>Occupancy</i>. The <i>Contractor</i> shall provide any outstanding documentation within 5 <i>Working Days</i> of the <i>Consultant</i> advising the <i>Contractor</i> of any missing documentation."

SC29 GC 3.16 EXCESS SOIL MANAGEMENT

SC29.1		<u>Add</u> new GC 3.16 – EXCESS SOIL MANAGEMENT as follows: "GC 3.16 EXCESS SOIL MANAGEMENT 3.16.1 The <i>Contractor</i> shall be solely responsible for the proper management of all <i>Excess Soil</i> at the <i>Place of the Work</i> and for performance of the <i>Work</i> in compliance with the rules, regulations and practices required by the <i>Excess Soil Regulation</i> until such time as <i>Ready-for-Takeover</i> is achieved. Without restricting the generality of the previous sentence, the <i>Contractor's</i> responsibility under this GC 3.16 includes the designation, transportation, tracking, temporary and/or final placement, record keeping, and reporting of all <i>Excess Soil</i> in connection with the <i>Work</i> all in compliance with the <i>Excess Soil Regulation</i>. 3.16.2 The <i>Contractor</i> shall indemnify and save harmless the <i>Owner</i>, their agents, officers, directors, administrators, governors, employees, consultants, successors and

		assigns from and against the consequences of any and all infractions committed by the <i>Contractor</i> , or those for whom it is responsible at law, under the <i>Excess Soil Regulation</i> , or any environmental protection legislation, including the payment of legal fees and disbursements on a substantial indemnity basis. Such indemnity shall apply to the extent to which the <i>Owner</i> is not covered by insurance."

SC30 GC 4.1 CASH ALLOWANCES

SC30.1	4.1.3	<u>Delete</u> the period at the end of the sentence in paragraph 4.1.3 and <u>replace</u> it with the following: "by either a <i>Supplemental Instruction</i> or (if applicable) a fully executed cash allowance disbursement authorization."

SC31 GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

SC31.1		<u>Delete</u> GC5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER in its entirety and <u>replace</u> it with "[Intentionally left blank]". -and- <u>Delete</u> all additional references throughout the <i>Contract</i> to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER.

SC32 GC 5.2 APPLICATIONS FOR PAYMENT

SC32.1	5.2.1	<u>Delete</u> paragraph 5.2.1 and <u>replace</u> it with the following: "5.2.1 On a <i>Working Day</i> that is not more than 10 days prior to the end of each <i>Payment Period</i> , a representative of the <i>Contractor</i> , the <i>Owner</i> , and the <i>Consultant</i> shall attend a meeting to discuss and review the <i>Work</i> completed during the <i>Payment Period</i> , including quantities, if applicable (the " Pre-Invoice Submission Meeting "). The <i>Contractor</i> shall bring with it to the <i>Pre-Invoice Submission Meeting</i> the following: .1 a draft of its anticipated application for payment for the applicable <i>Payment Period</i> ; .2 the schedule of values submitted in accordance with GC 5.2.4, and approved by the <i>Consultant</i> in accordance with GC 5.2.5; .3 <i>Subcontractor</i> and <i>Supplier</i> invoices and supporting materials; .4 receipts for reimbursable expenses (where expressly permitted by the <i>Contract</i> , if at all); .5 accounts and records documenting the cost of performing the <i>Work</i> attributable to any <i>Change Order</i> or <i>Change Directive</i> ; .6 any visual documentation (photos, videos, diagrams) evidencing the progress of the <i>Work</i> ; and

		.7 any other documents reasonably required by the <i>Contract Documents</i> , the <i>Owner</i> or <i>Consultant</i> ."
SC32.2	5.2.2	<u>Delete</u> paragraph 5.2.2 and <u>replace</u> it with the following: "5.2.2 Within 5 days following the <i>Pre-Invoice Submission Meeting</i>, the <i>Contractor</i> shall deliver to the <i>Owner</i>, with a copy to the <i>Consultant</i>, its application for payment that complies with the requirements of GC 5.2.6 for <i>Work</i> performed during a <i>Payment Period</i> (the "Proper Invoice Submission Date"), provided that if the 5th day following the <i>Pre-Invoice Submission Meeting</i> falls on a calendar day that is not <i>Working Day</i>, the <i>Proper Invoice Submission Date</i> shall be deemed to fall on the next <i>Working Day</i>. However, the following shall apply to the delivery of all <i>Contractor</i> applications for payment: .1 If the <i>Contractor</i> fails to deliver its application for payment, at the interval prescribed in GC 5.2.2, subject to written approval by the <i>Owner</i>, the <i>Contractor</i> shall not be entitled to submit its application for payment until the next prescribed interval. Should the <i>Owner</i> decide to accept an application for payment submitted after the applicable <i>Proper Invoice Submission Date</i> (which the <i>Owner</i> is under no obligation to do), such acceptance shall not be construed as a waiver of any of the <i>Owner's</i> rights, or as a waiver or release of the <i>Contractor's</i> obligations to strictly comply with the requirements prescribed in this GC 5.2 – APPLICATIONS FOR PAYMENT; .2 If an application for payment is delivered by the <i>Contractor</i> to the <i>Owner</i> on a day that is prior to an eligible <i>Proper Invoice Submission Date</i>, the application for payment will not be considered or reviewed by the <i>Owner</i> or the <i>Consultant</i> until the earliest eligible <i>Proper Invoice Submission Date</i> as identified in GC 5.2.2, at which point the application for payment will be deemed to have been received by the <i>Owner</i> and the <i>Consultant</i> for the purpose of review and evaluation; .3 Notwithstanding any other provision of this <i>Contract</i>, the <i>Contractor</i> shall not deliver an application for payment for consideration as a <i>Proper Invoice</i> by the <i>Owner</i>, during the <i>Restricted Period</i>; .4 The <i>Owner</i> and the <i>Contractor</i> hereby consent to the giving and receiving of <i>Proper Invoices</i> electronically and in accordance with the requirements of this GC 5.2 – APPLICATIONS FOR PAYMENTS."
SC32.3	5.2.3	<u>Add</u> the words "and incorporated into the <i>Work</i>" after "<i>Products</i> delivered to the <i>Place of the Work</i>" in paragraph 5.2.3. -and- <u>Add</u> the following to the end of paragraph 5.2.3: "For certainty, the amount claimed shall not include any amount for: .1 deposits, down payments, or any other form of advance payments, paid (or to be paid) by the <i>Contractor</i>, <i>Subcontractors</i> or <i>Suppliers</i> for <i>Products</i>; and .2 <i>Products</i> delivered to the <i>Place of the Work</i> unless the <i>Products</i> are free and clear of all security interest, liens, and other claims of third parties and the

		<i>Products have been incorporated into the Work."</i>
SC32.4	5.2.4	<u>Delete</u> the words "the <i>Consultant</i>, at least 15 days" in paragraph 5.2.4 and <u>replace</u> them with "the <i>Owner</i> and the <i>Consultant</i>, at least 30 days". -and- <u>Add</u> the following to the end of paragraph 5.2.4: "Such statement of values shall include a line item for the <i>Contractor's</i> allocation for "general conditions" and as subsections of "general conditions" the <i>Contractor</i> shall identify: .1 its allocation for the preparation and approval by the <i>Owner</i> of the <i>Baseline Schedule</i> required by GC3.4, which shall be calculated as follows: .1 where the <i>Contract Price</i> is \$2,000,000 or less, the lesser of \$10,000 or 5% of the total amount allocated by the <i>Contractor</i> to general conditions; .2 where the <i>Contract Price</i> is greater than \$2,000,000, the sum of \$20,000; .2 its allocation for the delivery of complete record <i>As-Built Drawings</i> required by GC 5.4.4.2, which shall be in the amount of 1% of the <i>Contract Price</i>, provided that such amount shall in no case be less than Five Thousand Dollars (\$5,000) or more than Fifty Thousand Dollars (\$50,000)."
SC32.5	5.2.5	In paragraph 5.2.5 <u>add</u> the words "or the <i>Owner</i> " after the word " <i>Consultant</i> ".
SC32.6	5.2.6	<u>Delete</u> paragraph 5.2.6 and <u>replace</u> it with the following: "5.2.6 Each application for payment submitted pursuant to GC 5.2.2 shall: .1 be in a form prescribed, or otherwise approved in writing, by the <i>Owner</i>; .2 include all of the requirements for a <i>Proper Invoice</i> prescribed by the <i>Construction Act</i> and this <i>Contract</i>; .3 be delivered to the <i>Owner</i> and to the <i>Consultant</i> in the same manner as a <i>Notice in Writing</i>; and .4 unless otherwise directed in writing by the <i>Owner</i>, be delivered to the <i>Owner's</i> representative listed in Article A-6."
SC32.7	5.2.8	<u>Delete</u> paragraph 5.2.8 and replace it with the following: "Any <i>Products</i> delivered to the <i>Place of the Work</i> but not yet incorporated into the <i>Work</i> shall remain at the risk of the <i>Contractor</i> notwithstanding the title has passed to the <i>Owner</i> pursuant to GC 14.3 OWNERSHIP OF MATERIALS."
SC32.8	5.2.9	<u>Add</u> a new paragraph 5.2.9 as follows: "5.2.9 Upon receipt of an application for payment submitted for payment by the <i>Contractor</i> in accordance with GC 5.2 - APPLICATIONS FOR PAYMENT, the <i>Owner</i> and the <i>Consultant</i> will assess whether all of the requirements for a

		<i>Proper Invoice</i> are satisfied and, if the application for payment does not meet the requirements, the <i>Owner</i> or the <i>Consultant</i>, as applicable, will return the application for payment to the <i>Contractor</i> with reasons setting out why the application for payment does not meet the requirements for a <i>Proper Invoice</i> and what is required to address the deficiency within 7 days of receipt and the <i>Contractor</i> may resubmit the application for payment with all required information within 3 <i>Working Days</i> of the <i>Contractor's</i> receipt of the <i>Owner's</i> or <i>Consultant's</i> reasons. For clarity, .1 if an application for payment does not include all of the requirements for a <i>Proper Invoice</i> required by GC 5.2.6.2, it shall not be considered a "Proper Invoice" for the purposes of the <i>Construction Act</i> and the <i>Owner</i> shall have no obligation to make a payment and the time periods set out in GC 5.3 - PAYMENTS and in Section 6.4 of the <i>Construction Act</i> shall not apply until the <i>Contractor</i> has submitted an application for payment that includes all information required by GC 5.2.6.2; .2 if the <i>Contractor</i> fails, refuses, or neglects to resubmits its application for payment within 3 <i>Working Days</i> after it is returned in accordance with this GC 5.2.9, the <i>Contractor</i> shall be deemed to have failed to deliver its application for payment and GC 5.2.2.1 shall apply; .3 where the <i>Contractor</i> disagrees with the <i>Owner's</i> or the <i>Consultant's</i> assessment that some of the of the requirements for a <i>Proper Invoice</i> required by GC 5.2.6.2 are missing from its application for payment, nothing in this GC 5.2.9 shall prevent the <i>Contractor</i> from resubmitting the same application for payment without any additional or new information; and .4 the <i>Owner</i> reserves the right, in its sole, absolute and unfettered discretion, to waive an error or minor irregularity in any application for payment delivered by the <i>Contractor</i> for the purposes of deeming an application for payment a "Proper Invoice" within the meaning of the <i>Construction Act</i>, but the <i>Owner</i> shall be under no obligation to exercise this right."

SC33 GC 5.3 PAYMENT

SC33.1	5.3.1	<u>Delete</u> paragraph 5.3.1 in its entirety and <u>replace</u> it with the following: "5.3.1 After receipt by the <i>Owner</i> and the <i>Consultant</i> of an application for payment submitted by the <i>Contractor</i> in accordance with GC 5.2 - APPLICATIONS FOR PAYMENT: .1 the <i>Consultant</i> will either: (a) issue to the <i>Owner</i> with a copy to the <i>Contractor</i>, a certificate for payment in the amount applied for in the <i>Proper Invoice</i>, or (b) issue to the <i>Owner</i>, with a copy to the <i>Contractor</i>, a certificate for payment for an amount determined by the <i>Consultant</i> to be properly due to the <i>Contractor</i> after applying any credits, withheld amounts or other set-offs which the <i>Consultant</i> has determined that the <i>Owner</i> is entitled to notwithstanding any notice of dispute or disagreement that the

		<i>Contractor</i> may have served, along with the <i>Consultant's</i> reasons why an amount other than what is claimed in the <i>Proper Invoice</i> is properly due to the <i>Contractor</i>, which finding the <i>Owner</i> may accept or amend prior to the <i>Owner</i> issuing a <i>Notice of Non-Payment</i>, if any, in accordance with GC 5.3.2; .2 the <i>Owner</i> shall make payment to the <i>Contractor</i>, on account as provided in Article A-5, (a) in the amount stated in the certificate for payment, or (b) in the amount stated in the certificate for payment less such amount stated in the <i>Owner's Notice of Non-Payment</i> issued pursuant to GC 5.3.2, on the 28th day after receipt of a <i>Proper Invoice</i>, unless such 28th day lands on a day that is other than a <i>Working Day</i>, in which case payment shall be made on the next <i>Working Day</i> after such 28th day."
SC33.2	5.3.2 to 5.3.5	<u>Add</u> new paragraphs 5.3.2, 5.3.3, 5.3.4, and 5.3.5 as follows: "5.3.2 In the event that the application for payment delivered by the <i>Contractor</i> pursuant to GC 5.2 – APPLICATIONS FOR PAYMENT does not include the requirements for a <i>Proper Invoice</i> or if the <i>Owner</i> disputes the amount claimed as payable in the <i>Proper Invoice</i>, then the <i>Owner</i> shall within 14 calendar days of receipt of the application for payment, issue a <i>Notice of Non-Payment</i> (Form 1.1). 5.3.3 Where the <i>Owner</i> has delivered a <i>Notice of Non-Payment</i>, as specified under GC 5.3.2, the <i>Owner</i> and the <i>Contractor</i> shall first engage in good faith negotiations to resolve the dispute. If within 5 days following the issuance of a <i>Notice of Non-Payment</i>, despite good faith efforts by both parties with the assistance of the <i>Consultant</i>, the <i>Owner</i> and the <i>Contractor</i> cannot resolve the dispute, either party may commence an <i>Adjudication</i> in accordance with the procedures set out in the <i>Construction Act</i>. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.3.1.2. 5.3.4 Provided that the <i>Owner</i> complies with its obligations under the <i>Construction Act</i>, and subject to any interim determination of an adjudicator in accordance with any <i>Adjudication</i> and, where applicable, a final determination made in accordance with the dispute resolution processes prescribed by this <i>Contract</i>, the <i>Owner</i> shall be entitled to claim in a <i>Notice of Non-Payment</i> a right to deduct from or, set off against, any payment of the <i>Contract Price</i>: .1 any amount expended by the <i>Owner</i> in exercising the <i>Owner's</i> rights under this Contract to perform any of the <i>Contractor's</i> obligations that the <i>Contractor</i> has failed to perform; .2 any damages, costs or expenses (including, without limitation, <i>Administration Costs</i> and reasonable legal fees and expenses) incurred by the <i>Owner</i> as a result of the failure of the <i>Contractor</i> to perform any of its obligations under the <i>Contract</i> or under the <i>Construction Act</i>; .3 any other amount owing from the <i>Contractor</i> to the <i>Owner</i> under this <i>Contract</i>.

		5.3.5 The <i>Contractor</i> represents, warrants, and covenants to the <i>Owner</i> that it is familiar with its prompt payment and trust obligations under <i>the Construction Act</i> and will take all required steps and measures to ensure that it complies with the applicable prompt payment and trust provisions under <i>the Construction Act</i> including, without limitation, section 8.1 of <i>the Construction Act</i>. Evidence of the <i>Contractor's</i> compliance under this GC 5.3.5 will be made available to the <i>Owner</i> within 5 <i>Working Days</i> following receipt by the <i>Contractor</i> of a <i>Notice in Writing</i> making such request."

SC34 GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

SC34.1		Delete GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK in its entirety and <u>replace</u> it with the following: “GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK 5.4.1 When the <i>Contractor</i> considers that <i>Substantial Performance of the Work</i> has been achieved, the <i>Contractor</i> shall prepare and submit to the <i>Consultant</i> and the <i>Owner</i> a comprehensive list of items to be completed or corrected and apply for a review by the <i>Consultant</i> and the <i>Owner</i> to establish <i>Substantial Performance of the Work</i>. Failure to include an item on the list does not alter the responsibility of the <i>Contractor</i> to complete the <i>Contract</i>. 5.4.2 No later than 10 days after receipt of the <i>Contractor's</i> list and application, the <i>Consultant</i> will complete a review of the <i>Project</i> to verify the validity of the application. No later than 7 days after completing the review, the <i>Consultant</i> will notify the <i>Contractor</i> whether the <i>Project</i> has attained <i>Substantial Performance of the Work</i> and fix the date of <i>Substantial Performance of the Work</i> in a certificate which shall meet the requirements of the <i>Construction Act</i> for a 'certificate of substantial performance'. 5.4.3 Within 7 days of receiving a signed copy of the certificate of substantial performance (as described in GC 5.4.2), the <i>Contractor</i> shall publish a copy of such certificate in the Daily Commercial News and deliver suitable evidence of such publication to the <i>Consultant</i> and the <i>Owner</i>. If the <i>Contractor</i> fails to publish the certificate and deliver evidence of same to the <i>Owner</i> and the <i>Consultant</i>, the <i>Owner</i> may publish the certificate and back-charge the <i>Contractor</i> its reasonable costs for doing so. 5.4.4 The <i>Contractor</i> acknowledges that the <i>Submittals</i> described in this GC 5.4.4 are critical to the <i>Owner's</i> use, <i>Occupancy</i> and maintenance of the <i>Project</i> and agrees to deliver such <i>Submittals</i> to the <i>Owner</i> within 30 days of the issuance of the certificate of <i>Substantial Performance of the Work</i>: .1 submit to the <i>Consultant</i>, with its application for payment, all written guarantees, warranties, certificates, testing and balancing reports, distribution system diagrams, <i>Shop Drawings</i>, maintenance and operating instructions, spare parts, maintenance manuals and materials and any other materials or documentation required by the <i>Contract</i>, except for <i>As-Built Drawings</i>; .2 with respect to <i>As-Built Drawings</i>, the <i>Contractor</i> shall submit to the

		<i>Consultant:</i> (a) full and complete <i>As-Built Drawings</i> in an electronic format acceptable to the <i>Consultant</i>, as described in the Joint Best Practice Statement – As-Built and Record Drawing issued jointly by the Ontario Association of Architects and the Ontario General Contractors Association on October 21, 2010; and (b) where specified as a requirement in the <i>Contract Documents</i>, full and complete as-built building information model (BIM) in IFC and RVT formats. The <i>Contractor</i> shall update the as-designed models to reflect all the site revisions due to change notices, site instructions and addenda. Laser scan or 360 video verification shall also be provided to validate the as-built condition. The verification shall be conducted prior to services being enclosed by walls, ceilings, or flooring. The as-built model shall incorporate all the built elements including but not limited to architectural, structural, mechanical, plumbing, electrical, lighting, civil, fire protection, IT and communications, vertical transportation, audio-visual, security and landscape; If the <i>Submittals</i> are not delivered in the required form or within the timeframe as set out in this GC 5.4.4, the <i>Owner</i> shall be at liberty to set-off from amounts otherwise payable to the <i>Contractor</i> an amount which is equal to 1% of the <i>Contract Price</i>, provided that such amount shall in no case be less than Five Thousand Dollars (\$5,000) or more than Fifty Thousand Dollars (\$50,000), until such time as the <i>Contractor</i> complies with its obligation to deliver full and complete record or <i>As-Built Drawings</i>, as required by the <i>Contract Documents</i>. Should the <i>Contractor</i> fail to deliver the record or <i>As-Built Drawings</i> and the as-built BIM model within such 30 day period, the <i>Owner</i> shall provide notice of its set-off in accordance with the <i>Construction Act</i>, and be at liberty to apply such set-off funds to retain and pay a third party to prepare the <i>As-Built Drawings</i> and/or as-built BIM model.
	5.4.5	After publication of the certificate of the <i>Substantial Performance of the Work</i>, the <i>Contractor</i> may submit an application for payment of the <i>Construction Act</i> holdback amount, which application for payment shall: .1 include all of the requirements listed in EXHIBIT "1" - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE, as applicable to the application for payment of the holdback amount; and .2 include a statement that the <i>Contractor</i> has not received any written notices of lien or any claims for liens from any <i>Subcontractor</i>.
	5.4.6	After the receipt of a complete application for payment of the <i>Construction Act</i> holdback amount from the <i>Contractor</i>, the <i>Consultant</i> will issue a certificate for payment of the holdback amount, provided that such amount is subject to and will only become due and payable in accordance with GC 5.4.5 and the <i>Construction Act</i>. Should the <i>Contractor</i> fail to provide any of the documents required as part of its application for payment of the <i>Construction Act</i> holdback amount, the <i>Owner</i> shall be entitled to publish a <i>Notice of Non-Payment</i> of holdback in accordance with GC 5.4.7.3 below, and to set-off from amounts otherwise payable to the <i>Contractor</i> an amount which is equal to 1% of the <i>Contract Price</i>, provided that such amount shall in no case be less than Five Thousand Dollars (\$5,000) or more than Fifty Thousand Dollars (\$50,000), until such time as the <i>Contractor</i>

		complies with its obligation under GC 5.4.4. 5.4.7 The <i>Construction Act</i> holdback amount shall become due and payable the day immediately following the expiration of the holdback period prescribed by the <i>Construction Act</i>, subject to the occurrence of any of the following: .1 the preservation of a lien in respect of the <i>Project</i> that has not been satisfied, discharged or otherwise provided for in accordance with the <i>Construction Act</i>; .2 receipt by the <i>Owner</i> of a written notice of lien that has not been satisfied, discharged or otherwise provided for in accordance with the <i>Construction Act</i>; or .3 prior to the expiry of 40 days following the publication of the certificate of <i>Substantial Performance of the Work</i>, the <i>Owner</i> publishes a <i>Notice of Non-Payment</i> of holdback in accordance with the <i>Construction Act</i>, setting out the amount of holdback that will not be paid, which may include non-payment to secure the correction of deficiencies and/or the completion of the <i>Work</i>. 5.4.8 For the release of <i>Construction Act</i> holdback on subcontract work which is 100% complete prior to the release of holdback contemplated under GC 5.4.5, the <i>Contractor</i> may make application to the <i>Owner</i> and the <i>Consultant</i> by written request for a review by the <i>Consultant</i> to determine the date of completion of the subcontract and shall submit such supporting material as the <i>Consultant</i> may in its discretion require, including: .1 Description of the scope of <i>Work</i> included in the subcontract. .2 Declaration of Last Supply by the <i>Subcontractor</i> as prescribed in subsection 31(5) of the <i>Construction Act</i> (Form 7). .3 Certificate of Completion of Subcontract as prescribed in subsection 33(1) of the <i>Construction Act</i> (Form 10). .4 Workplace Safety & Insurance Board clearance certificate for the <i>Contractor</i>, the <i>Subcontractor</i> concerned, and any other <i>Subcontractors</i> and <i>Suppliers</i> who have provided any services to the <i>Subcontractor</i>. .5 Statutory declaration by an officer of the <i>Subcontractor</i> in the form CCDC Document 9B - 2001. .6 <i>Contractor's</i> written acknowledgement to the <i>Owner</i> that the requirements of the <i>Contract Documents</i> will not be altered by early release of the <i>Construction Act</i> holdback of the completed subcontracts. .7 Confirmation by the bonding company that it has been notified of the intent to claim early release of holdback and does not object. .8 sufficient evidence to the <i>Owner's</i> reasonable satisfaction that, as of the date of the <i>Contractor's</i> application, no claims for lien have been preserved against the <i>Place of the Work</i> that have not been vacated by the posting of security, discharged, or otherwise addressed in accordance with GC 14.7 – CONSTRUCTION LIENS.”

		5.4.9 Starting on the second <i>Anniversary</i> that follows the day on which section 26 of the <i>Act Update</i> comes into force, and subject to section 31 of the <i>Act Update</i> (section 87.4 of the <i>Construction Act</i>), the following amendment applies: .1 the phrase “the day immediately following” is <u>deleted</u> from GC 5.4.7 and is replaced with “no later than 14 days”.

SC35 GC 5.5 FINAL PAYMENT

SC35.1	5.5.1	<u>Delete</u> paragraph 5.5.1 and <u>replace</u> it with the following: “5.5.1 When <i>Ready-for-Takeover</i> has been achieved in accordance with GC 12.1 READY-FOR-TAKEOVER, the <i>Contractor</i> considers the <i>Work</i> is complete, and after the <i>Contractor</i>, the <i>Owner</i>, and the <i>Consultant</i> have attended a <i>Pre-Invoice Submission Meeting</i> analogous to the requirement in GC 5.2.1, the <i>Contractor</i> may submit an application for final payment to the <i>Owner</i> and to the <i>Consultant</i>, which application for payment shall: .1 include all of the requirements set out in GC 5.2.6, including without limitation those requirements listed in EXHIBIT “1” - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE that are specific to an application for final payment; and .2 if applicable, (a) a certificate from the <i>Consultant</i> or written confirmation from the <i>Owner</i> that the deficiencies or incomplete <i>Work</i> waived by the <i>Owner</i> pursuant to GC 12.1.2 have been fully rectified as of the date of the <i>Contractor’s</i> application for final payment, and/or (b) written confirmation, signed by the <i>Owner</i> and the <i>Contractor</i>, that the <i>Contract Price</i> has been reduced by a specified amount in exchange for the <i>Owner</i> releasing the <i>Contractor</i> of its obligation to rectify the certain outstanding deficiencies and/or incomplete <i>Work</i> waived by the <i>Owner</i> pursuant to GC 12.1.2, as detailed in such written confirmation.”
SC35.2	5.5.2	<u>Delete</u> paragraph 5.5.2 and <u>replace</u> it with the following: “5.5.2 After receipt by the <i>Owner</i> and the <i>Consultant</i> of an application for payment, that is a <i>Proper Invoice</i>, submitted by the <i>Contractor</i> in accordance with GC 5.5.1: .1 the <i>Consultant</i> will either: (a) issue to the <i>Owner</i> with a copy to the <i>Contractor</i>, a certificate for final payment in the amount applied for in the <i>Proper Invoice</i>, or (b) issue to the <i>Owner</i>, with a copy to the <i>Contractor</i>, a certificate for payment for an amount determined by the <i>Consultant</i> to be properly due to the <i>Contractor</i> after applying any credits, withheld amounts, or other set-offs which the <i>Consultant</i> has determined that the <i>Owner</i> is entitled to notwithstanding any notice of dispute or disagreement that the <i>Contractor</i> may have served, along with the <i>Consultant’s</i> reasons why an amount other than what is claimed in the <i>Proper Invoice</i> is properly due to the <i>Contractor</i>, which finding the <i>Owner</i> may accept or amend prior to the <i>Owner</i> issuing a <i>Notice of Non-Payment</i>, if any, in accordance with GC 5.5.3;

		.2 the <i>Owner</i> shall make payment to the <i>Contractor</i> on account as provided in Article A-5 PAYMENT, (a) in the amount stated in the certificate for payment, or (b) in the amount stated in the certificate for payment less such amount stated in the <i>Owner's Notice of Non-Payment</i> issued pursuant to GC 5.5.3, on the 28th calendar day after receipt of a <i>Proper Invoice</i>, unless such 28th calendar day lands on a day that is other than a <i>Working Day</i>, in which case payment shall be made on the next <i>Working Day</i> after such 28th day."
SC35.3	5.5.3	<u>Delete</u> paragraph 5.5.3 in its entirety and <u>replace</u> it with the following: "In the event that the application for final payment delivered by the <i>Contractor</i> does not include the requirements of GC 5.5.1 (including the requirements for a <i>Proper Invoice</i>) or where the <i>Owner</i> disputes the amount claimed as payable in the <i>Proper Invoice</i>, then the <i>Owner</i> shall within 14 calendar days of receipt of the application for payment, issue a <i>Notice of Non-Payment</i>. Where the <i>Owner</i> has delivered a <i>Notice of Non-Payment</i>, as specified under this GC 5.5.3, the <i>Owner</i> and the <i>Contractor</i> shall first engage in good faith negotiations to resolve the dispute. If within five (5) calendar days following the issuance of a <i>Notice of Non-Payment</i>, despite good faith efforts by both parties with the assistance of the <i>Consultant</i>, the <i>Owner</i> and the <i>Contractor</i> cannot resolve the dispute, either party may commence an <i>Adjudication</i> in accordance with the procedures set out in the <i>Construction Act</i>. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.5.2."
SC35.4	5.5.4	<u>Delete</u> paragraph 5.5.4 in its entirety and <u>replace</u> it with the following: "The amounts disputed and described under the <i>Notice of Non-Payment</i> shall be held by the <i>Owner</i> until all disputed portions of the <i>Proper Invoice</i> for final payment have been resolved pursuant to PART 8 – DISPUTE RESOLUTION. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.5.1."

SC36 GC 5.6 DEFERRED WORK

SC36.1	5.6.2 and 5.6.3	<u>Add</u> new paragraphs 5.6.2 and 5.6.3 as follows: "5.6.2 In the event of deficiencies or delays in the performance of the <i>Work</i> (including but not limited to the <i>Contractor's</i> failure to submit certificates, reports, diagrams, or other documentation required by the <i>Contract Documents</i>) or where the <i>Contractor</i> has failed, refused, or neglected to make timely payment to its <i>Subcontractor(s)</i> and/or <i>Supplier(s)</i> that the <i>Contractor</i> fails or refuses to address upon receiving notice of same in accordance with the requirements of the <i>Contract</i>, then the <i>Owner</i> may, without limiting the remedies available to it under this <i>Contract</i> and subject to the <i>Owner's</i> requirement to issue a <i>Notice of Non-Payment</i> under the <i>Construction Act</i>, retain and set off as against any payments that would otherwise be owing to the <i>Contractor</i>, the <i>Owner's Direct Costs</i> and <i>Administration Costs</i> to rectify such deficiencies or delays, or such amount as to protect the <i>Owner</i> from any potential liability arising from the <i>Contractor's</i> non-payment to its <i>Subcontractor(s)</i> or <i>Supplier(s)</i> as determined by the <i>Consultant</i>, or if the <i>Consultant</i> is unable to provide a determination, in an amount reasonably

		determined by the <i>Owner</i>. 5.6.3 In addition to any rights the <i>Owner</i> has pursuant to the <i>Construction Act</i> and subject to the <i>Owner's</i> requirement to issue a <i>Notice of Non-Payment</i> under the <i>Construction Act</i>, if a lien is registered or an action commenced against the <i>Owner</i>, the <i>Owner</i> shall have the right to withhold from any money otherwise due to the <i>Contractor</i>, the full amount claimed in the lien action plus an additional amount sufficient to satisfy all of the <i>Owner's</i> expenses relating to such lien action, including legal and consulting costs. These funds, less expenses incurred, shall be released to the <i>Contractor</i> upon the full discharge of all liens and dismissal of all actions against the <i>Owner</i>."

SC37 GC 5.8 METHOD OF PAYMENT

SC37.1		<u>Add</u> new GC 5.8 – METHOD OF PAYMENT as follows: "GC 5.8 METHOD OF PAYMENT 5.8.1 The <i>Owner</i> may, at its own discretion, issue payment to both the <i>Contractor</i> and <i>Subcontractor</i> in a single cheque."

SC38 GC 6.1 CHANGES

SC38.1	6.1.1.2	<u>Add</u> the words "or <i>Change Directive</i> " to the end of the sentence in paragraph 6.1.1.2.
SC38.2	6.1.2	<u>Delete</u> the words "<i>Change Order</i> or a <i>Change Directive</i>" in paragraph 6.1.2 and <u>replace</u> them with the following: "signed <i>Change Order</i> in the form attached to the Supplementary Conditions as Appendix 1 or a signed <i>Change Directive</i>. This requirement is of the essence of the <i>Contract</i> and it is the express intention of the parties that any claims by the <i>Contractor</i> for a change in the <i>Contract Price</i> and/or <i>Contract Time</i> shall be barred unless there has been strict compliance with PART 6 CHANGES IN THE WORK. No verbal dealings between the parties and no implied acceptance of alternations or additions to the <i>Work</i> and no claims that the <i>Owner</i> has been unjustly enriched by any alteration or addition to the <i>Work</i>, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for an increase to the <i>Contract Price</i> or an extension of the <i>Contract Time</i>."
SC38.3	6.1.3 and 6.1.4	<u>Add</u> new paragraphs 6.1.3 and 6.1.4 as follows: "6.1.3 Notwithstanding any other provision of this <i>Contract</i>, there shall be no adjustment to the <i>Contract Price</i> or to the <i>Contract Time</i> where the change in the <i>Work</i> arises due to (a) the <i>Contractor</i> failing to properly direct, manage, supervise, and/or coordinate the overall construction means, methods, techniques, sequences or procedures used to undertake the <i>Work</i>, or (b) the <i>Contractor</i> failing to properly sequence and coordinate the various parts of the <i>Work</i>, including the <i>Work</i> of <i>Subcontractors</i>, <i>Suppliers</i>, and <i>Other Contractors</i> so as to not interfere, interrupt, obstruct, delay or otherwise affect the efficient and expeditious performance of the <i>Work</i>. For certainty, any changes in the <i>Work</i> arising under the circumstances described in this GC 6.1.3 are deemed to be included in the <i>Contract Price</i>, and the <i>Owner</i> shall be entitled to reject any claims for changes to the <i>Contract Price</i> or the <i>Contract Time</i> arising therefrom.

		6.1.4 Save and except where the <i>Owner</i> determines that a <i>Change Order</i>, or a portion thereof, will be valued and paid for as a lump sum in accordance with GC 6.2.3.1 (in which case all supporting documentation must be submitted to and approved by the <i>Owner</i> prior to the <i>Contractor</i> commencing performance of the change, or the applicable lump sum portion thereof), all supporting documentation for <i>Change Orders</i> and <i>Change Directives</i> must be submitted by the <i>Contractor</i> to the <i>Owner</i>, with a copy to the <i>Consultant</i>, within 30 calendar days following completion of the <i>Work</i> prescribed in the <i>Change Order</i> or <i>Change Directive</i>, as certified by the <i>Consultant</i>. Upon the expiry of the deadline prescribed by this GC 6.1.4, the <i>Contractor</i> is deemed to have delivered all relevant materials for the <i>Owner's</i> evaluation of the <i>Contractor's</i> total claim for an adjustment to the <i>Contract Price</i> and/or <i>Contract Time</i>, and no further documents may be submitted to the <i>Owner</i>, unless, in its sole and absolute discretion, the <i>Owner</i> agrees in writing to waive or extend the timing for the submission of the <i>Contractor's</i> supporting documentation. If the <i>Owner</i> has not received any of the prescribed supporting documentation prior to the deadline, the <i>Contractor</i> shall be deemed to have waived its right to receive compensation or an extension of the <i>Contract Time</i> for the <i>Work</i> described in the <i>Change Order</i> or <i>Change Directive</i>."

SC39 GC 6.2 CHANGE ORDER

SC39.1	6.2.1	<u>Delete</u> paragraph 6.2.1 and <u>replace</u> it with the following: "6.2.1 The following shall apply to changes in the <i>Work</i> and changes to the <i>Contract Time</i> for the <i>Work</i>: .1 When a change in the <i>Work</i> or a change in the <i>Contract Time</i> for the <i>Work</i> is proposed by the <i>Owner</i> or pursuant to the requirements of the <i>Contract</i>, the <i>Owner</i> must initiate the process for a <i>Change Order</i> or <i>Change Directive</i>: (a) the <i>Consultant</i> shall provide the <i>Contractor</i> with a written description of the proposed change in the <i>Work</i>; (b) within 5 <i>Working Days</i> of receiving the <i>Consultant's</i> notice described above, the <i>Contractor</i> shall notify the <i>Consultant</i>, with a copy to the <i>Owner</i>, if, as a result of the proposed or required change, it will claim an adjustment to the <i>Contract Price</i> or the <i>Contract Time</i> and shall include with such notice a written explanation, including anticipated costing information, describing the impact on the <i>Contract Time</i> and/or <i>Contract Price</i>; (c) if the <i>Owner</i> decides to proceed, or must proceed pursuant to the terms of the <i>Contract</i>, with the proposed change, the <i>Consultant</i> shall issue a <i>Contemplated Change Notice</i> to the <i>Contractor</i> describing the proposed scope of the change and the method (or combination of methods) described in GC 6.2.3 to be used for evaluating the change in the <i>Contract Price</i>, if any, arising from the proposed change; and (d) the <i>Contractor</i> shall, as soon as practicable and in any event within 10 <i>Working Days</i> after receipt of a <i>Contemplated Change Notice</i> or such longer period as the parties may agree acting reasonably, present to the <i>Consultant</i>, with a copy to the <i>Owner</i>, a detailed breakdown, estimate, and

		other information (a "Change Estimate") that can be reasonably evaluated having regard to the scope of the change prescribed by the <i>Consultant</i> in the <i>Contemplated Change Notice</i>, which <i>Change Estimate</i> shall include the following information: (i) where the <i>Contemplated Change Notice</i> prescribes that a lump sum estimate is required for all or part of the change, in accordance with GC 6.2.3.1, a proposed lump sum adjustment to the <i>Contract Price</i> and a detailed summary of the time, materials and <i>Products</i> to be expended by the <i>Contractor</i> and each <i>Subcontractor</i> and <i>Supplier</i> to perform the change; (ii) where the <i>Contemplated Change Notice</i> prescribes that unit prices shall apply to all or part of the change, in accordance with GC 6.2.3.2, a summary of the quantities of <i>Product(s)</i> required to complete the change and the impact on the <i>Contract Price</i> relying on the unit prices prescribed by the <i>Contract Documents</i> or, where no unit prices are prescribed, proposed unit rates for each <i>Product</i> to be used to perform the change; (iii) where the <i>Contemplated Change Notice</i> prescribes that time and material costs shall apply for all or part of the change, in accordance with GC 6.2.3.3, a detailed estimate of the <i>Direct Costs</i> to be expended by the <i>Contractor</i> and each <i>Subcontractor</i> to perform the change; (iv) sufficient information to demonstrate that the markup portion of any <i>Change Estimate</i> has been calculated in accordance with GC 6.2.4 and that no markup has been applied to <i>Wage Rates</i>; (v) <i>Subcontractor</i> and <i>Supplier</i> quotations, receipts, and vouchers; (vi) identification of any additional bonding costs, in accordance with GC 6.2.5; (vii) identification and evidence of the commercially reasonable steps the <i>Contractor</i> has taken (or will take) to minimize any increase to the <i>Contract Price</i> and to maximize a reduction in the <i>Contract Price</i>, including the use of competitive quotes or tenders; (viii) a description of the steps the <i>Contractor</i> will take to implement the change, including such detail as may be necessary in the circumstances or that is expressly requested in the <i>Contemplated Change Notice</i>, which may include a schedule for the performance of the change, a draft updated <i>Construction Schedule</i> (including proposed adjustment(s) to the <i>Contract Time</i>, if any), staging plan, contact list, description of roles and responsibilities; (ix) a description of the steps the <i>Contractor</i> has taken (or will take) to mitigate the impact of the change on the <i>Contract Price</i> and the <i>Contract Time</i>; (x) identification of any permits, licenses, or approvals, if any, that must be obtained to perform the contemplated change; and

		(xi) shall be limited only to such time, material and <i>Products</i> that would not have otherwise been incurred in the delivery of the <i>Project</i>. (e) As soon as practicable following receipt of a <i>Change Estimate</i>, but in any event within the next 15 <i>Working Days</i>, the <i>Owner</i> shall evaluate the <i>Change Estimate</i> and may (i) accept the <i>Change Estimate</i> as presented by issuing a <i>Change Order</i> through the <i>Consultant</i>, (ii) request additional information from the <i>Contractor</i> to supplement the <i>Change Estimate</i>, (iii) negotiate adjustments to the <i>Change Estimate</i> and accept the revised <i>Change Estimate</i> by issuing a <i>Change Order</i> through the <i>Consultant</i>, (iv) direct the <i>Consultant</i> to issue a <i>Change Directive</i>, following which GC 6.3 CHANGE DIRECTIVE shall apply to the proposed change; and/or (iv) deliver notification to the <i>Contractor</i> that the <i>Owner</i> has withdrawn the <i>Contemplated Change Notice</i>. During such evaluation period (including any extension thereof reasonably agreed upon by the parties) the <i>Owner</i> and the <i>Contractor</i> shall use good faith efforts to exchange information, data, and strategies, in an effort to implement the proposed change as expeditiously as possible, while mitigating the impacts, if any, on the <i>Contract Time</i> and <i>Contract Price</i>. (f) If the <i>Owner</i> does not issue a <i>Change Order</i> or <i>Change Directive</i> through the <i>Consultant</i> during the evaluation period described in GC 6.2.1.1(e), including any extension thereof, the <i>Contemplated Change Notice</i> shall be deemed to be withdrawn. .2 When a change in the <i>Work</i> or a change in the <i>Contract Time</i> for the <i>Work</i> is proposed by the <i>Contractor</i>, (a) the <i>Contractor</i> shall deliver to the <i>Owner</i> and the <i>Consultant</i> a <i>Notice in Writing</i> that sets out: (i) sufficient details of the proposed change so as to enable the <i>Owner</i> and the <i>Consultant</i> to conduct a preliminary evaluation of the proposed change, including anticipated costing information, describing the impact, if any, on the <i>Contract Time</i> and/or <i>Contract Price</i>; (ii) the reasons for the <i>Contractor's</i> proposed change, including reference to any applicable provisions of the <i>Contract</i> prompting proposed change; and (iii) any time constraints that may influence the cost, cost savings, or impact on the <i>Contract Time</i> of the proposed change, including an estimate of the latest possible date for the issuance of the <i>Contemplated Change Notice</i>.

		(b) If the <i>Owner</i> elects, in its sole discretion and without obligation, to consider the change proposed by the <i>Contractor</i>, the <i>Owner</i> may direct that the <i>Consultant</i> issue a <i>Contemplated Change Notice</i> and the procedure in GC 6.2.1.1(c) to GC 6.2.1.1(f) shall apply.
SC39.2	6.2.3 to 6.2.5	<u>Add</u> new paragraphs 6.2.3, 6.2.4, and 6.2.5 as follows: "6.2.3 The value of a change shall be determined in one or more of the following methods as prescribed by the <i>Owner</i> and identified in the <i>Contemplated Change Notice</i> issued by the <i>Consultant</i> in accordance with GC 6.2.1.1(c): .1 (Lump Sum) by estimate and acceptance of a lump sum, which shall include as part of the lump sum the permitted markup(s) for changes in the <i>Work</i> set out in GC 6.2.4 and shall exclude the application of markup to <i>Wage Rates</i>. .2 (Unit Prices) by unit prices established in the <i>Contract Documents</i> or subsequently agreed upon. Unit prices shall include the permitted markup for changes in the <i>Work</i> set out in GC 6.2.4 and exclude the application of mark up to <i>Wage Rates</i>, and shall be the total cost to the <i>Owner</i>. Adjustment to the <i>Contract Price</i> shall be based on a net quantity difference from the original quantity. .3 (Time and Material Costs) by the amount, net of all credits, expended that specifically relate to and are directly attributable to the implementation of the changes in the <i>Work</i> and that would not have otherwise been incurred in the delivery of the <i>Project</i>: (a) by a <i>Subcontractor</i> (or <i>Supplier</i>) (i) the <i>Direct Costs</i> (without mark-up) incurred by the <i>Subcontractor</i> (or <i>Supplier</i>) directly to perform the change, plus (ii) the <i>Subcontractor's</i> (or <i>Supplier's</i>) permitted mark-up for changes in the <i>Work</i> set out in GC 6.2.4 which applies to the <i>Subcontractor's</i> (or <i>Supplier's</i>) <i>Direct Costs</i> (excluding <i>Wage Rates</i>) only; and (b) by the <i>Contractor</i> (i) the <i>Direct Costs</i> (without mark-up) incurred by the <i>Contractor</i> directly to perform the change, plus (iii) the <i>Contractor's</i> permitted mark-up(s) for changes in the <i>Work</i> set out in GC 6.2.4, which applies to the <i>Contractor's Direct Costs</i> (excluding <i>Wage Rates</i>) only. For certainty, no markup shall be applied to <i>Wage Rates</i>. 6.2.4 The permitted markup set out in this GC 6.2.4, to be identified and included in any <i>Change Estimate</i>, is intended to cover all profit, general expenses, and overhead costs to be incurred by the <i>Contractor</i>, <i>Subcontractors</i>, and <i>Suppliers</i>, in relation to a proposed change including, but not limited to, all <i>Project</i>

		personnel costs (including but not limited to, administration, estimating, scheduling, supervision, <i>Subcontractor</i> and <i>Supplier</i> coordination, project management), general cleanup, small tools, <i>As-Built Drawings</i>, warranties, job safety costs, parking, and all fees, costs, burdens, and expenses related to the processing and the performance of the change specified in a <i>Contemplated Change Notice</i>. Without limiting the generality of the foregoing, the markups are intended to compensate the <i>Contractor</i> for all costs that are not <i>Direct Costs</i>. The following markups (for overhead, profit, and general expenses combined) and only such markups are permitted for any change under GC 6.1 OWNER'S RIGHT TO MAKE CHANGES: .1 <i>Contractor's</i> markup on the <i>Direct Costs</i> (excluding <i>Wage Rates</i>) incurred directly by the <i>Contractor</i> shall be 10% of such <i>Direct Costs</i>; .2 <i>Subcontractor's</i> (or <i>Supplier's</i>) markup on the <i>Direct Costs</i> (excluding <i>Wage Rates</i>) incurred directly by the <i>Subcontractor</i> (or <i>Supplier</i>) shall be a maximum of 10% of such <i>Direct Costs</i>; and .3 <i>Contractor's</i> markup on the <i>Direct Costs</i> (excluding <i>Wage Rates</i>) incurred directly by a <i>Subcontractor</i> or <i>Supplier</i> (<u>excluding</u> the <i>Subcontractor's</i> or <i>Supplier's</i> markup specified in GC 6.2.4.2) shall be 7.5% of such <i>Direct Costs</i>. For certainty, no markup shall be applied to <i>Wage Rates</i>. 6.2.5 Notwithstanding anything in this GC 6.2 CHANGE ORDER, the <i>Contractor</i> may claim additional costs for bonding and insurance required <u>to</u> ~~by~~ carried by the <i>Contractor</i> under GC 11.1 in its application for a change in the <i>Contract Price</i>, without markup, provided that documentation is provided to the <i>Owner</i> to substantiate and verify the additional costs incurred or to be incurred in accordance with GC 11.1.5 and GC 11.1.5. Supporting documentation shall include, but not be limited to, written verification of a new certificate of insurance or bond identifying the variance in cost. The <i>Owner</i>, in its sole discretion, will determine whether the documentation is sufficient to warrant and pay for additional costs for bonding and/or insurance. If approved by the <i>Owner</i>, additional costs for bonding and/or insurance may be claimed by the <i>Contractor</i> as a separate item on a <i>Change Order</i> or in the <i>Contractor's</i> application for release of holdback."

SC40 GC 6.3 CHANGE DIRECTIVE

SC40.1	6.3.1	<u>Add</u> the following to the end of paragraph 6.3.1: "The <i>Owner</i> may make minor changes to the <i>Work</i> by issuing a <i>Change Directive</i>. Such minor changes will not require an adjustment to the <i>Contract Price</i> or the <i>Contract Time</i>, if such minor change is within the general scope of the <i>Work</i> and consistent with the intent of the <i>Contract Documents</i>."
SC40.2	6.3.3	<u>Delete</u> paragraph 6.3.3 and <u>replace</u> it with the words "Intentionally deleted".
SC40.3	6.3.6	<u>Delete</u> paragraph 6.3.6 in its entirety, including all subparagraphs and <u>replace</u> it with the following: "6.3.6 The adjustment in the <i>Contract Price</i> for a change carried out by way of a <i>Change</i>

		<i>Directive</i> shall be determined on the basis of the cost of the <i>Contractor's</i> actual expenditures and savings attributable to the <i>Change Directive</i>, valued in accordance with GC 6.2.3.3 and as follows: .1 If the change results in a net increase in the <i>Contractor's</i> cost, the <i>Contract Price</i> shall be increased by the amount of the net increase in the <i>Contractor's</i> cost, including the <i>Contractor's</i> markup established in accordance with GC 6.2.4. .2 If the change results in a net decrease in the <i>Contractor's</i> cost, the <i>Contract Price</i> shall be decreased by the amount of the net decrease in the <i>Contractor's</i> cost, without adjustment for the <i>Contractor's</i> markup on the net decrease to the <i>Contract Price</i> established in accordance with GC 6.2.4."
SC40.4	6.3.7	<u>Delete</u> the preamble in paragraph 6.3.7 and <u>replace</u> it with the following: "The cost of performing the work attributable to the <i>Change Directive</i> shall be limited to the actual <i>Direct Costs</i> incurred by the <i>Contractor</i>, its <i>Subcontractor(s)</i> or <i>Supplier(s)</i>, as applicable, to the extent such expenditures specifically relate to and are directly attributable to the implementation of the <i>Change Directive</i>, and that would not have otherwise been incurred in the delivery of the <i>Project</i>. "<i>Direct Costs</i>" in this <i>Contract</i>, subject to the limitations set out in GC 6.3.14 and GC 6.3.15, refer to the aggregate total, without duplication, of the following amounts as paid or incurred in the performance of the <i>Work</i>:"
SC40.5	6.3.7.1	<u>Delete</u> paragraph 6.3.7.1 in its entirety, and <u>replace</u> it with the following: "labour and personnel costs incurred by the <i>Contractor</i> applying the wages and related costs set out in the <i>Wage Rates</i> for: (1) trade labour in the direct employ of the <i>Contractor</i>; (2) the <i>Contractor's</i> personnel when stationed full-time at the field office; or (3) the <i>Contractor's</i> personnel engaged at shops or on the road, in expediting the production or transportation of <i>Products</i> or <i>Construction Equipment</i>."
SC40.6	6.3.7.7	<u>Delete</u> the words "described in paragraph 6.3.7.1" and <u>replace</u> them with "approved by the <i>Owner</i> in writing and in advance of any such expenses being incurred" in paragraph 6.3.7.7.
SC40.7	6.3.7.9	Add the following at the end of the sentence in paragraph 6.3.7.9: "...when specifically requested by the <i>Owner</i> or as directed by the <i>Consultant</i>".
SC40.8	6.3.7.10	<u>Add</u> the following at the end of the sentence in paragraph 6.3.7.10: "... provided that they are not caused by negligent acts or omissions of the <i>Contractor</i>".
SC40.9	6.3.7.12	<u>Delete</u> paragraph 6.3.7.12 in its entirety and <u>replace</u> it with "[Intentionally blank]."
SC40.10	6.3.7.13	<u>Delete</u> subparagraph 6.3.7.13 in its entirety and <u>replace</u> it with "[Intentionally blank]."
SC40.11	6.3.7.14	<u>Add</u> to the beginning of paragraph 6.3.7.14 as follows: "subject to GC 10,".
SC40.12	6.3.7.15	<u>Delete</u> subparagraph 6.3.7.15 in its entirety and <u>replace</u> it with "[Intentionally blank]."

SC40.13	6.3.7.17	<u>Delete</u> subparagraph 6.3.7.17 in its entirety and <u>replace</u> it with “[Intentionally blank].”
SC40.14	6.3.11	<u>Delete</u> paragraph 6.3.11 and <u>replace</u> with the following: “Pending determination of the value of a <i>Change Directive</i> , the value of the work performed as a result of the <i>Change Directive</i> is not eligible to be included in progress payments except by way of a <i>Change Order</i> .”
SC40.15	6.3.14	<u>Add</u> new paragraph 6.3.14 as follows: “6.3.14 For certainty, <i>Direct Costs</i> , when incurred by the <i>Contractor</i> , its <i>Subcontractors</i> or <i>Suppliers</i> , do not include: .1 head office salaries and benefits and all other overhead or general expenses or any other items identified in GC 6.2.4 as being covered by the permitted markups listed in GC 6.2.4; .2 capital expenses and interest on capital; .3 general clean-up, except where the performance of the <i>Work</i> in the <i>Change Directive</i> causes specific additional clean-up requirements; .4 wages paid for field supervision of <i>Subcontractors</i> ; .5 rentals, or other expenses that exceed the rates that are standard in the locality of the <i>Place of the Work</i> that are otherwise deemed unreasonable by the <i>Consultant</i> ; .6 any costs or expenses attributable to the negligence, improper <i>Work</i> , deficiencies, or breaches of contract by the <i>Contractor</i> or any <i>Subcontractor</i> , <i>Supplier</i> , or any sub-subcontractor at any tier; .7 any cost of quality assurance, such as inspection and testing services, charges levied by authorities, and any legal fees unless any such costs or fees are pre-approved in writing by the <i>Owner</i> ; and .8 financing costs.”
SC40.16	6.3.15	<u>Add</u> new paragraph 6.3.15 as follows: “6.3.15 Any cost fee, charge, or expense incurred by the <i>Contractor</i> in the performance of a change that is not expressly identified as a <i>Direct Cost</i> under this <i>Contract</i> is presumptively non-compensable. Any uncertainty or ambiguity as to whether a cost, fee, charge, or expense incurred by a <i>Contractor</i> as part of a change is an eligible <i>Direct Cost</i> shall be submitted to the <i>Consultant</i> for a determination in accordance with GC 8.1.1 and will be further subject to the dispute resolution process established in PART 8 DISPUTE RESOLUTION.”

SC41 GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

SC41.1	6.4.1	<u>Delete</u> paragraph 6.4.1 and <u>replace</u> it with the following: “6.4.1 Having regard to the amount of time between the <i>Owner</i> issuing the <i>Procurement</i>

		<i>Documents</i> and the closing date of the procurement, as well as any requirement for proponents to attend a tour of the <i>Place of the Work</i> during the procurement process, the <i>Contractor</i> confirms that, prior to submitting its <i>Procurement Response</i>, it carefully investigated the current conditions at the <i>Place of the Work</i>, and applied to that investigation the degree of care and skill described in GC 3.15.1. If the <i>Contractor</i> has failed, neglected, or refused to conduct such careful investigation, it is deemed to assume all risk of conditions or circumstances now existing or arising in the course of the <i>Work</i> which could make the <i>Work</i> more expensive or more difficult to perform than was contemplated at the time the Contract was executed. No claim by the <i>Contractor</i> will be entertained in connection with conditions which could reasonably have been ascertained by such investigation or other due diligence undertaken prior to the execution of the <i>Contract</i>."
SC41.2	6.4.2	<u>Add</u> a new first sentence to paragraph 6.4.2 which reads as follows: "6.4.2 Having regard to the <i>Contractor's</i> obligation to investigate the <i>Place of the Work</i> under GC 6.4.1, if the <i>Contractor</i> believes that the conditions of the <i>Place of the Work</i> differ materially from those reasonably anticipated to exist and generally recognized as inherent in construction activities of similar projects, differ materially from those indicated in the <i>Contract Documents</i>, or were concealed from discovery notwithstanding the conduct of the investigation described in GC 6.4.1, then the <i>Contractor</i> shall deliver a <i>Notice in Writing</i> to the <i>Owner</i> and <i>Consultant</i> no later than five (5) <i>Working Days</i> after the first observation of such conditions by the <i>Contractor</i> or its <i>Subcontractor</i> or <i>Supplier</i>. No adjustment to the <i>Contract Price</i> or extension of <i>Contract Time</i> shall be made for unknown or discovered conditions unless <i>Notice in Writing</i> is delivered in accordance with this GC 6.4.2." -and- In the existing second sentence of paragraph 6.4.2, in the second line, following the word "materially", <u>add</u> the words "or were concealed from discovery notwithstanding the conduct of the investigation described in GC 6.4.1."
SC41.3	6.4.3	<u>Delete</u> paragraph 6.4.3 and <u>replace</u> with the following: "6.4.3 If the <i>Consultant</i> makes a finding pursuant to GC 6.4.2 that no change in the <i>Contract Price</i> or the <i>Contract Time</i> is justified, the <i>Consultant</i> shall report in writing the reasons for this finding to the <i>Owner</i> and the <i>Contractor</i>."

SC42 GC 6.5 DELAYS

SC42.1	6.5.1	<u>Delete</u> paragraph 6.5.1 and <u>replace</u> it with the following: "6.5.1 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by the <i>Owner</i>, the <i>Consultant</i>, or anyone employed or engaged by them directly or indirectly, contrary to the provisions of the <i>Contract Documents</i>, and if the <i>Contractor</i> can demonstrate that the critical path shall be impacted by the delay given the logic presented in the most recent <i>Construction Schedule</i>, then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Consultant</i> may recommend in consultation with the <i>Contractor</i>. Subject to the <i>Contractor's</i> obligation to mitigate costs, which includes providing a <i>Schedule Recovery Plan</i> for <i>Owner</i> review and approval prior to implementation, the <i>Contractor</i> shall be reimbursed by the <i>Owner</i> for reasonable <i>Direct Costs</i> directly flowing from the extension of the <i>Contract Time</i>, but excluding

		any consequential, indirect or special damages, markup, and excluding any claims for loss of profit or opportunity.”
SC42.2	6.5.2	<u>Delete</u> paragraph 6.5.2 and <u>replace</u> it with the following: “6.5.2 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by a stop work order issued by a court or other public authority and providing that such order was issued on account of a direct breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes by the <i>Owner</i>, the <i>Owner's</i> other contractor(s), or the <i>Consultant</i>, and relating to the <i>Work</i> or the <i>Place of the Work</i>, and if the <i>Contractor</i> can demonstrate that the critical path shall be impacted by the delay given the logic presented in the most recent <i>Construction Schedule</i>, then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Consultant</i> may recommend in consultation with the <i>Contractor</i>. Subject to the <i>Contractor's</i> obligation to mitigate costs and to provide a <i>Schedule Recovery Plan</i> for Owner review and approval prior to implementation, the <i>Contractor</i> shall be reimbursed by the <i>Owner</i> for reasonable <i>Direct Costs</i> directly flowing from extension of the <i>Contract Time</i>, but excluding any consequential, indirect or special damages, markup, and excluding any claims for loss of profit or opportunity.”
SC42.3	6.5.3	<u>Delete</u> paragraph 6.5.3 and <u>replace</u> it with the following: “6.5.3 If the performance of the <i>Work</i> or the performance of any other obligation(s) of a party to this <i>Contract</i> is delayed by <i>Force Majeure</i>, then the <i>Contractor</i> shall provide and implement a <i>Schedule Recovery Plan</i> and the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Consultant</i> in consultation with the <i>Owner</i> and the <i>Contractor</i> shall agree. The extension of time shall not be less than the time lost as a result of the <i>Force Majeure</i> event causing the delay, unless the <i>Contractor</i> agrees to a shorter extension. Neither party shall be entitled to payment for its costs or reimbursement of its expenses incurred by such delays. Upon reaching agreement on the extension of the <i>Contract Time</i> attributable to the <i>Force Majeure</i> event, the <i>Owner</i> and the <i>Contractor</i> shall execute a <i>Change Order</i> issued by the <i>Consultant</i> indicating the length of the extension to the <i>Contract Time</i> and confirming that there are no costs payable by either party to the other for the extension of <i>Contract Time</i>. .1 Notwithstanding the foregoing, the <i>Owner</i>, through the <i>Consultant</i>, may issue a <i>Change Directive</i> requiring the <i>Contractor</i> to undertake those specific actions identified in the <i>Change Directive</i> as the <i>Contractor</i> can reasonably and safely initiate to remove or relieve either the <i>Force Majeure</i> or its direct or indirect effects on the <i>Project</i>, in which case the <i>Contract Price</i> will be adjusted in accordance with GC 6.3.7. If the <i>Contractor</i> fails within the time period specified in the <i>Change Directive</i> to take such action, then the <i>Owner</i> may, at its sole and absolute discretion and after it has given written notice to the <i>Contractor</i>, take some or all of such actions to partially or wholly remove or relieve such <i>Force Majeure</i> or its direct or indirect effects, and thereafter require the <i>Contractor</i> to resume the performance of the <i>Work</i>.”
SC42.4	6.5.4	<u>Delete</u> paragraph 6.5.4 and <u>replace</u> it with the following: “6.5.4 No extension of the <i>Contract Time</i> shall be made for delay (under GC 6.5.1, 6.5.2, or 6.5.3) and no additional compensation will be paid (under GC 6.5.1 or 6.5.2) unless <i>Notice in Writing</i> of the cause of the delay is given by the <i>Contractor</i> to the <i>Owner</i> and to the <i>Consultant</i> not later than 5 <i>Working Days</i> after commencement of the delay. In the case of a continuing cause of delay only one <i>Notice in Writing</i>

		shall be necessary. For the <i>Notice in Writing</i> to be valid under this GC 6.5.4 it must include specific details about: .1 the cause of the delay; .2 the impact the delay will have on the <i>Contract Time</i>, as demonstrated through an analysis of the critical path based on the logic presented in the most recent <i>Construction Schedule</i>, and details of the extension of time being requested; .3 the likely effect the delay will have on payment, if any; and .4 mitigation efforts, if any, undertaken by the <i>Contractor</i> or, where no mitigation efforts have been undertaken by the <i>Contractor</i>, the reasons why mitigation is either not possible or has not been undertaken by the <i>Contractor</i>. Compliance with the notice requirements of this GC 6.5.4 does not entitle the <i>Contractor</i> to an extension of the <i>Contract Time</i> and/or adjustment to the <i>Contract Price</i>, but merely preserves the <i>Contractor's</i> right to seek an extension of the <i>Contract Time</i> and/or an adjustment to the <i>Contract Price</i>."
SC42.5	6.5.6 to 6.5.11	<u>Add</u> new paragraphs 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10 and 6.5.11 as follows: "6.5.6 If the <i>Consultant</i>, in consultation with the <i>Contractor</i> determines that the <i>Contractor</i> is delayed in performance of the <i>Work</i>, or any part thereof, by the <i>Contractor's</i> inaction, or by delay or inaction of anyone employed or engaged by the <i>Contractor</i> directly or indirectly, and that the delay is recoverable through acceleration or other mitigation efforts of the <i>Contractor</i>: .1 The <i>Consultant</i> will promptly give <i>Notice in Writing</i> of such determination to the <i>Owner</i> and the <i>Contractor</i>. .2 The <i>Contractor</i> shall accelerate the <i>Work</i> as required to meet the <i>Contract Time</i> prescribed in the <i>Construction Schedule</i> in place at the time of the <i>Consultant's</i> determination. .3 The <i>Contractor</i> shall promptly provide to the <i>Owner</i> and the <i>Consultant</i> and implement a written a <i>Schedule Recovery Plan</i>. .4 The <i>Contractor</i> shall not be entitled to receive payment for any costs incurred to accelerate the <i>Work</i> in accordance with this GC 6.5.6. 6.5.7 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by any act, omission, or negligence of the <i>Contractor</i> or of any person or entity employed or engaged directly or indirectly by the <i>Contractor</i>, including any <i>Subcontractor(s)</i> or <i>Supplier(s)</i>, or by any cause within the <i>Contractor's</i> control, and it is determined by the <i>Consultant</i> that such delay will result in having to extend the <i>Contract Time</i>, then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Consultant</i> may decide in consultation with the <i>Contractor</i>. As time is of the essence in this <i>Contract</i>, the <i>Owner</i> may incur additional <i>Administration Costs</i> and expenses if the <i>Contractor</i> has not completed the <i>Work</i> within the <i>Contract Time</i>. The <i>Owner</i> shall be reimbursed by the <i>Contractor</i> for all reasonable costs and damages incurred by the <i>Owner</i> as the result of such delay, including the <i>Owner's Administration Costs</i> and all services required by the <i>Owner</i> from the <i>Consultant</i> as a result of such delay by the <i>Contractor</i> including the cost of the <i>Consultant's</i> services during the period between the date prescribed in Article A-

		1.3 for attaining <i>Ready-for-Takeover</i> and the date that <i>Ready-for-Takeover</i> is actually achieved by the <i>Contractor</i>. The <i>Contractor</i> shall provide and implement a <i>Schedule Recovery Plan</i> for Owner.
	6.5.8	The <i>Contractor</i> shall be responsible for the care, maintenance and protection of the <i>Work</i> in the event of any suspension of construction as a result of the delay described in GC 6.5.1, 6.5.2, 6.5.3, or 6.5.7. If such suspension arises due to delay event described in GC 6.5.1, 6.5.2, or 6.5.3, the <i>Contractor</i> shall be reimbursed by the <i>Owner</i> for the <i>Direct Costs</i> only incurred by the <i>Contractor</i> directly attributed to such protection, but excluding markup and the costs of the <i>Contractor's</i> head office personnel, for such care, maintenance and protection. The <i>Contractor's</i> entitlement to costs pursuant to this GC 6.5.8, if any, shall be in addition to amounts, if any, to which the <i>Contractor</i> is entitled pursuant to GC 6.5.1 or GC 6.5.2. No costs shall be payable to the <i>Contractor</i> under this GC 6.5.8 where the suspension arises due to a delay event described in GC 6.5.7.
	6.5.9	Without limiting the obligations of the <i>Contractor</i> described in GC3.2 or GC9.4, the <i>Owner</i> may, by <i>Notice in Writing</i>, direct the <i>Contractor</i> to stop the <i>Work</i> where the <i>Owner</i> reasonably determines that there is an imminent risk to the safety of persons or property at the <i>Place of the Work</i>. In the event that the <i>Contractor</i> receives such notice, it shall immediately stop the <i>Work</i> and secure the <i>Place of the Work</i>. The <i>Contractor</i> shall not be entitled to an extension of the Contract Time or to an increase in the <i>Contract Price</i> unless the resulting delay, if any, would entitle the <i>Contractor</i> to an extension of the Contract Time or the reimbursement of the <i>Contractor's</i> costs as provided in GC 6.5.1.

SC43 GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

SC43.1	6.6.1	<u>Add</u> the following to the end of paragraph 6.6.1: "Any such <i>Notice in Writing</i> must be provided to the <i>Owner</i> and the <i>Consultant</i> no later than 5 <i>Working Days</i> after the <i>Contractor</i> became aware, or should reasonably have become aware, of the commencement of the event or series of events giving rise to a claim. If the <i>Contractor</i> fails to comply with the notice requirements of this GC 6.6.1, the <i>Owner</i> will not be liable in connection with any such claim by the <i>Contractor</i>; and the <i>Contractor</i> will be absolutely barred from making any claim against the <i>Owner</i>, arising out of or in connection with the event or series of events giving rise to a claim."

SC44 GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, STOP THE WORK OR TERMINATE THE CONTRACT

SC44.1	7.1.2	<u>Delete</u> paragraph 7.1.2 in its entirety and <u>replace</u> it with the following: "7.1.2 If the <i>Contractor</i>: .1 neglects to perform the <i>Work</i> properly, .2 fails or neglects to maintain the latest <i>Construction Schedule</i>, or to provide an updated <i>Construction Schedule</i> as requested by the <i>Owner</i> in accordance with GC 3.4, .3 fails to make payment to its <i>Subcontractors</i> and <i>Suppliers</i> on a timely basis,

		or .4 fails to comply the requirements of this <i>Contract</i>, the <i>Owner</i> may, without prejudice to any other right or remedy the <i>Owner</i> may have, give the <i>Contractor</i> a <i>Notice in Writing</i>, containing particulars of the default including references to applicable provisions of the <i>Contract</i>, that the <i>Contractor</i> is in default of the <i>Contractor's</i> contractual obligations and instruct the <i>Contractor</i> to correct the default in 5 <i>Working Days</i> immediately following the receipt of such <i>Notice in Writing</i>."
SC44.2	7.1.4.2	Delete subparagraph 7.1.4.2 and <u>replace</u> it with the following new subparagraphs 7.1.4.2 and 7.1.4.3: .2 terminate the <i>Contractor's</i> right to continue with the <i>Work</i> in whole or in part (and where the termination relates to the whole of the remaining <i>Work</i>, the <i>Owner</i> shall also publish a notice of termination (Form 8) in accordance with the <i>Construction Act</i>; or .3 terminate the <i>Contract</i>, and publish a notice of termination (Form 8) in accordance with the <i>Construction Act</i>."
SC44.3	7.1.5.3	In subparagraph 7.1.5.3, after the word "including" in the first line, <u>add</u> the words "the <i>Owner's Administration Costs</i> and".
SC44.4	7.1.7 to 7.1.10	<u>Add</u> new paragraphs 7.1.7, 7.1.8, 7.1.9, and 7.1.10 as follows: "7.1.7 The <i>Owner</i> may, in its absolute discretion, terminate the <i>Contractor</i> at any time and for any no reason upon 30 days' <i>Notice in Writing</i>. 7.1.8 Upon termination of the <i>Contractor</i> in accordance with GC 7.1.7 and subject to amounts that may be withheld in accordance with GC 5.3.4, the <i>Owner</i> will pay for services rendered by the <i>Contractor</i> up to the effective date of termination, and the reasonable <i>Direct Costs</i> associated with termination, including the costs of demobilization, losses sustained on <i>Products</i> and construction machinery and equipment. The <i>Contractor</i> shall not be entitled to any recovery for any special, indirect or consequential losses, markup, lost profits or loss of opportunity. 7.1.9 The <i>Owner</i> may suspend <i>Work</i> at any time for any reason and without cause upon giving the <i>Contractor</i> 10 days' <i>Notice in Writing</i> to that effect. In such event, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed to the date of suspension and be compensated for all reasonable <i>Direct Costs</i> incurred arising from the suspension, but in no event shall the <i>Contractor</i> be entitled to be compensated for any indirect, special, or consequential losses, markup, or damages incurred. 7.1.10 In the case of either a termination of the <i>Contract</i> or a suspension of the <i>Work</i>, the <i>Contractor</i> shall use its best commercial efforts to mitigate the financial consequences to the <i>Owner</i> arising out of the termination or suspension, as the case may be."

SC45 GC 7.2 CONTRACTOR'S RIGHT TO STOP THE WORK OR TERMINATE THE CONTRACT

SC45.1	7.2.1	<u>Delete</u> the period at the end of the sentence in paragraph 7.2.1 and <u>replace</u> it with "and

		within 5 <i>Working Days</i> publish a notice of termination (Form 8) in accordance with the <i>Construction Act</i> ".
SC45.2	7.2.2	<u>Delete</u> paragraph 7.2.2 and <u>replace</u> it with the following: "7.2.2 If the <i>Work</i> is suspended or otherwise delayed for a period of 40 consecutive <i>Working Days</i> or more under a stop work order issued by a court or other public authority on account of a breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes directly by the <i>Owner</i> , the <i>Owner's</i> other contractor(s), and relating to the <i>Work</i> or the <i>Place of the Work</i> , the <i>Contractor</i> may, without prejudice to any other right or remedy the <i>Contractor</i> may have, terminate the <i>Contract</i> by giving the <i>Owner Notice in Writing</i> to that effect."
SC45.3	7.2.3.1	<u>Delete</u> paragraph 7.2.3.1 and <u>replace</u> it with "Intentionally left blank".
SC45.4	7.2.3.3	<u>Delete</u> paragraph 7.2.3.3 and <u>replace</u> it with the following: ".3 The <i>Owner</i> fails to pay the <i>Contractor</i> when due the amounts certified by the <i>Consultant</i> (except where the <i>Owner</i> has issued a <i>Notice of Non-Payment</i> or otherwise has a <i>bona fide</i> claim for setoff) or awarded by <i>Adjudication</i> , arbitration, or a court; or"
SC45.5	7.2.3.4	<u>Delete</u> the words ", except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER," in subparagraph 7.2.3.4.
SC45.6	7.2.4	<u>Add</u> the following to the end of paragraph 7.2.4: "If the default cannot be corrected within five <i>Working Days</i> , the <i>Owner</i> shall be deemed to have cured the default if it: .1 commences correction of the default within the specified time; .2 provides the <i>Contractor</i> with an acceptable schedule for such correction; and .3 completes the correction in accordance with such schedule."
SC45.7	7.2.5	<u>Delete</u> GC 7.2.5 in its entirety and <u>replace</u> it with the following: "7.2.5 If the <i>Contractor</i> terminates the <i>Contract</i> under the conditions described in this GC 7.2, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed to the date of termination. The <i>Contractor</i> shall also be entitled to recover the reasonable <i>Direct Costs</i> associated with termination, including the costs of demobilization, losses sustained on <i>Products</i> and construction machinery and equipment. The <i>Contractor</i> shall not be entitled to any recovery for any special, indirect or consequential losses, markup, or damages incurred.

SC46 GC 8.1 AUTHORITY OF THE CONSULTANT

SC46.1	8.1.1	<u>Delete</u> the word "Differences" at the beginning of paragraph 8.1.1 and <u>replace</u> it with the following: "Save and except where the <i>Contractor</i> has given an undertaking, in accordance with the <i>Construction Act</i> , to refer a dispute to <i>Adjudication</i> , disputes [...]."

SC47 GC 8.2 ADJUDICATION

SC47.1	8.2.2 to 8.2.6	<u>Add</u> new paragraphs 8.2.2, 8.2.3, 8.2.4, 8.2.5, and 8.2.6 as follows: “8.2.2 Save and except where the <i>Contractor</i> has given an undertaking prescribed by the <i>Construction Act</i> to refer a dispute to <i>Adjudication</i>, prior to delivering a notice of <i>Adjudication</i>, the parties agree to first address all disputes with at least one in-person meeting with the <i>Owner’s</i> representative, the <i>Consultant’s</i> representative, and the <i>Contractor’s</i> representative. The parties agree that such steps will be taken to resolve any disputes in a timely and cost-effective manner. 8.2.3 The following procedures shall apply to any <i>Adjudications</i> the parties engage in under the <i>Construction Act</i>: .1 any hearings shall be held in the offices of the <i>Owner</i>, or, if such offices are unavailable, another venue as the parties may agree and which is acceptable to the adjudicator; .2 the <i>Adjudication</i> shall be conducted in English; .3 each party may be represented by counsel throughout an <i>Adjudication</i>; .4 there shall not be any oral communications with respect to issues in dispute that are the subject of an <i>Adjudication</i> between a party and the adjudicator unless it is made in the presence of both parties or their legal representatives; and .5 a copy of all written communications between the adjudicator and a party shall be given to the other party at the same time. 8.2.4 Any documents or information disclosed by the parties during an <i>Adjudication</i> are confidential and the parties shall not use such documents or information for any purpose other than the <i>Adjudication</i> in which they are disclosed and shall not disclose such documents and information to any third party, unless otherwise required by law, save and except the adjudicator. 8.2.5 In respect of any claim or dispute, if the <i>Contractor</i> fails to comply with any of the notice requirements set out in the <i>Contract Documents</i> then the Contractor shall be barred from advancing such claim(s) or dispute(s) and shall have no entitlement whatsoever in respect of such claim(s) or dispute(s) (including to an increase in payment under the <i>Contract</i>, or an extension of <i>Contract Time</i>) and by failing to comply with the notice requirements waives the right to make any such claim(s) or dispute(s) in an <i>Adjudication</i> or in any other form of dispute resolution available under this <i>Contract</i> or at law. This GC 8.2.5 shall operate conclusively as an estoppel and bar in the event such claims or disputes are brought in an <i>Adjudication</i> or other form of dispute resolution and the <i>Owner</i> may rely on this GC 8.2.5 as a complete defence to any such claims or disputes. 8.2.6 The parties hereby acknowledge and agree, .1 that counterclaims, claims of set-off or the exercise or use of other contractual rights that permit the <i>Owner</i> to withhold, deduct or retain from monies otherwise owed to the <i>Contractor</i> under the <i>Contract</i> may be

		referred to, and included as part of, <i>Adjudications</i> under the <i>Construction Act</i> ;
	.2	that disputes related to the termination or abandonment of the <i>Contract</i> , as well as any disputes that arise or are advanced following the termination or abandonment of the <i>Contract</i> , shall not be referred to <i>Adjudication</i> under the <i>Construction Act</i> ;
	.3	that notice(s) of <i>Adjudication</i> , with respect to any dispute or claim relating to the <i>Project</i> , shall not be given, and no <i>Adjudication</i> shall be commenced following <i>Ready-for-Takeover</i> , abandonment, or termination of the <i>Contract</i> ;
	.4	that any <i>Adjudication</i> between the <i>Contractor</i> and a <i>Subcontractor</i> or a <i>Supplier</i> that relates to an <i>Adjudication</i> between the <i>Owner</i> and the <i>Contractor</i> shall be joined together to be adjudicated by a single adjudicator, provided that the adjudicator agrees to do so, and the <i>Contractor</i> shall include a provision in each of its subcontracts that contain an equivalent obligation to this GC 8.2.6.4; and
	.5	that, other than where the <i>Contractor</i> is obliged to commence an <i>Adjudication</i> pursuant to an undertaking under the <i>Construction Act</i> , neither the <i>Owner</i> nor the <i>Contractor</i> shall commence an <i>Adjudication</i> during the <i>Restricted Period</i> ."

SC48 GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

SC48.1	8.3.1	<u>Add</u> the following words after the words "Construction Industry Disputes" in the second line in paragraph 8.3.1: "...(the " Rules "), subject to amendments to the Rules described in Appendix 2 to these Supplementary Conditions..."
SC48.2	8.3.4	<u>Add</u> the following words to the beginning of the second sentence in paragraph 8.3.4: "Subject to any amendments to the <i>Rules</i> ,".
SC48.3	8.3.6	<u>Delete</u> paragraph 8.3.6 and <u>replace</u> it with the following: "8.3.6 By giving <i>Notice in Writing</i> to the other party, not later than 20 <i>Working Days</i> after the date of termination of the mediated negotiations under GC 8.3.5, either party may refer the dispute to be finally resolved by arbitration under the latest edition of the Rules, subject to any amendments to the <i>Rules</i> . The arbitration shall be conducted pursuant to the <i>Arbitration Act</i> , S.O. 1991, c.17, as amended. Unless either party gives the notice contemplated by this GC 8.3.6, there shall be no arbitration of any such dispute."
SC48.4	8.3.7	<u>Replace</u> the number "10" in line 1 of paragraph 8.3.7 with the number "20".
SC48.5	8.3.9	<u>Add</u> a new paragraph 8.3.9 as follows: "8.3.9 Within five days of receipt of a <i>Notice in Writing</i> given pursuant to GC 8.3.6, the <i>Owner</i> or the <i>Contractor</i> may give the <i>Consultant</i> a written notice containing:

		.1 a copy of <i>Notice in Writing</i>; .2 a copy of Supplementary Condition 8.3.9 of this <i>Contract</i>; .3 any claims or issues which the <i>Contractor</i> or the Owner, as the case may be, wishes to raise in relation to the <i>Consultant</i> arising out of the issues in dispute in the arbitration."
SC48.6	8.3.10	<u>Add</u> a new paragraph 8.3.10 as follows: "8.3.10 The <i>Owner</i> and the <i>Contractor</i> agree that, if provided for in an agreement between the <i>Owner</i> and the <i>Consultant</i>, the <i>Consultant</i> may, in accordance with the requirements of such agreement, become a full party to the arbitration following delivery of the <i>Notice in Writing</i> delivered pursuant to GC 8.3.9."
SC48.7	8.3.11	<u>Add</u> a new paragraph 8.3.11 as follows: "8.3.11 If the <i>Consultant</i> becomes a party to the arbitration, the <i>Consultant</i> may participate in the appointment of the arbitrator and, notwithstanding the <i>Rules</i>, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the responding party receives a copy of the notice of arbitration."
SC48.8	8.3.12	<u>Add</u> a new paragraph 8.3.12 as follows: "8.3.12 The arbitrator in the arbitration of which the <i>Consultant</i> become a full party may: .1 on application of the <i>Owner</i> or the <i>Contractor</i> determine whether the <i>Consultant</i> is entitled to be a party to the arbitration, and; .2 make any procedural order considered necessary to facilitate the addition of the <i>Consultant</i> as a party to the arbitration."
SC48.9	8.3.13	<u>Add</u> a new paragraph 8.3.13 as follows: "8.3.13 The option to provide <i>Notice in Writing</i> in accordance with GC 8.3.9 shall apply <i>mutatis mutandis</i> to written notice to be given by the <i>Consultant</i> to any sub-consultant."
SC48.10	8.3.14	<u>Add</u> a new paragraph 8.3.14 as follows: "8.3.14 In the event of notice of arbitration given by the <i>Consultant</i> to a sub-consultant, the sub-consultant, to extent possible, is deemed to be bound by the arbitration proceeding."
SC48.11	8.3.15	<u>Add</u> a new paragraph 8.3.15 as follows: "8.3.15 The parties agree that the periods for notice provided in this PART 8 DISPUTE RESOLUTION only are to be construed liberally. The parties further agree that neither will take advantage of an inadvertent failure by the other to give one or more of the notices provided by the said PART 8."

SC49 GC 8.4 RETENTION OF RIGHTS

SC49.1	8.4.2	<u>Renumber</u> paragraph 8.4.2 as paragraph 8.4.2.1 and <u>add</u> new paragraph 8.4.2.2 as follows: “8.4.2.2 If the <i>Owner</i> gives the notice in writing described in GC 8.3.6 to have a dispute resolved by arbitration, the <i>Contractor</i> agrees that this GC 8.4.2.2 shall be construed as a formal consent to the stay of any lien proceedings until an award is rendered in the arbitration or such dispute as otherwise resolved between the parties. In no event shall the <i>Contractor</i> be deprived of its right to enforce its lien against the <i>Project</i> should the <i>Owner</i> fail to satisfy any arbitral award against it in full on the dispute in respect of which the lien proceedings were commenced. Provided nothing in this GC 8.4.2.2 shall prevent the <i>Contractor</i> from taking the steps required by the <i>Construction Act</i> to preserve and/or perfect a lien to which it may be entitled.”

SC50 GC 9.1 PROTECTION OF WORK AND PROPERTY

SC50.1	9.1.1.1	<u>Add</u> the following words at the end of subparagraph 9.1.1.1: “...which the <i>Contractor</i> could not reasonably have discovered applying the standard of care described in GC 3.12.1;”
SC50.2	9.1.5	<u>Add</u> a new paragraph 9.1.5 as follows: “9.1.5 Without in any way limiting the <i>Contractor’s</i> obligations under this GC 9.1, should the <i>Contractor</i> or any Subcontractor or Supplier cause loss or damage to trees or other plantings, whether owned by the <i>Owner</i> or third parties, the <i>Contractor</i> shall be liable for the replacement cost of the trees or other plantings damaged, including the cost of any arborist or other <i>Consultant</i>, and such costs may be deducted by the <i>Owner</i> from amounts otherwise owing to the <i>Contractor</i>.”

SC51 GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

SC51.1	9.2.1	<u>Add</u> the following to the end of paragraph 9.2.1: “For the purposes of GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES, <i>Excess Soil</i> shall not be considered a ‘toxic and hazardous substance’.”
SC51.2	9.2.5.5	<u>Add</u> new subparagraph 9.2.5.5 as follows: “.5 In addition to the steps described in GC 9.2.5.3, take any further steps it deems necessary to mitigate or stabilize any conditions resulting from encountering toxic or hazardous substances or materials.”
SC51.3	9.2.6	<u>Add</u> the following to paragraph 9.2.6 after the word “responsible” in line two: “...or whether any toxic or hazardous substances or materials already at the <i>Place of the Work</i> (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the <i>Contractor</i> or anyone for whom the <i>Contractor</i> is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the

		environment, or material damage to the property of the <i>Owner</i> or others,”
SC51.4	9.2.8	<u>Add</u> the following after the word “responsible” in line two of paragraph 9.2.8: “...or that any toxic or hazardous substances or materials already at the <i>Place of the Work</i> (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the <i>Contractor</i> or anyone for whom the <i>Contractor</i> is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the <i>Owner</i> or others,...”.
SC51.5	9.2.10 and 9.2.11	<u>Add</u> new paragraphs 9.2.10 and 9.2.11 as follows: “9.2.10 Without limiting its other obligations under this GC9.2, the <i>Contractor</i> acknowledges that its obligations under the Contract include compliance with the Environmental Programs, including, but not limited to, the Asbestos Abatement Program. The <i>Contractor</i> acknowledges that the <i>Owner</i> may suffer loss and damage should the <i>Contractor</i> fail to comply with the Environmental Programs and agrees to indemnify and hold harmless the <i>Owner</i> with respect to any loss or damage to which the <i>Owner</i> is exposed by the <i>Contractor's</i> failure to comply. The <i>Contractor</i> expressly agrees that such loss and damage shall be included within the scope of the <i>Contractor's</i> indemnity described in GC 13.1.1 of the General Conditions. The <i>Contractor</i> acknowledges that should it fail to comply with the Environmental Programs, such failure will constitute a failure to comply with the Contract to a substantial degree within the meaning of GC 7.1.2. 9.2.11 No less than 48 hours prior to the commencement of the <i>Work</i> by the <i>Contractor</i> or any of its <i>Subcontractors</i>, the <i>Contractor</i> shall provide to the <i>Owner</i> an “Asbestos Awareness Training Form”, confirming that each worker at the <i>Place of the Work</i>, including supervisory personnel, (for purposes of this paragraph, a “Worker”) has received asbestos-carrying material awareness training to enable the Contractor to meet its obligations under the <i>Environmental Programs</i>, including the <i>OHSA</i>, all as set out in the <i>Contract</i>. The <i>Owner</i> reserves the right, by <i>Notice in Writing</i>, to require the <i>Workers</i> to attend asbestos awareness training provided by the <i>Owner</i>. The cost of such <i>Worker</i> training, whether provided by the <i>Owner</i> or others, shall be borne by the <i>Contractor</i>.

SC52 GC 9.4 CONSTRUCTION SAFETY

SC52.1	9.4.1	<u>Delete</u> paragraph 9.4.1 in its entirety and <u>replace</u> it with the following: “9.4.1 The <i>Contractor</i> shall be solely responsible for construction safety at the <i>Place of the Work</i> and for compliance with the rules, regulations and practices required by the <i>OHSA</i>, including but not limited to those of the “constructor” and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the <i>Work</i>. The <i>Contractor</i> acknowledges that it has read and will abide by the <i>Owner's</i> rules, procedures and requirements with respect to the <i>Place of Work</i>.”
SC52.2	9.4.2	<u>Add</u> the following words after “and the <i>Contractor</i> in paragraph 9.4.2: “, <i>Subcontractors</i>, and <i>Suppliers</i>”.

SC52.3	9.4.3	<u>Add</u> the following words after “and the <i>Contractor</i> in paragraph 9.4.3: “, <i>Subcontractors</i> , and <i>Suppliers</i> ”.
SC52.4	9.4.4	<u>Delete</u> paragraph 9.4.4 in its entirety and <u>replace</u> it with “[Intentionally blank].”
SC52.5	9.4.5	<u>Delete</u> paragraph 9.4.5 in its entirety and <u>replace</u> it with the following: “9.4.5 Prior to the commencement of the <i>Work</i> , the <i>Contractor</i> shall submit to the <i>Owner</i> : .1 a current WSIB clearance certificate; .2 copies of the <i>Contractor</i> ’s insurance policies having application to the <i>Project</i> or certificates of insurance, at the option of the <i>Owner</i> ; .3 documentation of the <i>Contractor</i> ’s in-house safety-related programs; and .4 a copy of the Notice of <i>Project</i> filed with the Ministry of Labour naming itself as “constructor” under the <i>OHSA</i> .”
SC52.6	9.4.6 to 9.4.9	<u>Add</u> new paragraphs 9.4.6, 9.4.7, 9.4.8, and 9.4.9 as follows: “9.4.6 The <i>Contractor</i> shall indemnify and save harmless the <i>Owner</i> , its agents, officers, directors, employees, <i>Consultants</i> , successors and assigns from and against the consequences of any and all safety infractions committed by the <i>Contractor</i> under <i>OHSA</i> , including the payment of legal fees and disbursements on a solicitor and client basis. Such indemnity shall apply to the extent to which the <i>Owner</i> is not covered by insurance, provided that the indemnity contained in this paragraph shall be limited to costs and damages resulting directly from such infractions and shall not extend to any consequential, indirect or special damages. 9.4.7 The <i>Owner</i> undertakes to include in its contracts with other contractors and/or in its instructions to its own forces the requirement that the other contractor or own forces, as the case may be, will comply with directions and instructions from the <i>Contractor</i> with respect to occupational health and safety and related matters. The text of such instruction is attached to the Supplementary Conditions as Appendix 3.”

SC53 GC 9.5 MOULD

SC53.1	9.5.3.3	<u>Delete</u> subparagraph 9.5.3.3 in its entirety and <u>replace</u> it with the following: “9.5.3.3 Extend the <i>Contract</i> Time for such reasonable time as the <i>Consultant</i> may recommend on consultation with the <i>Contractor</i> and the <i>Owner</i> . If, in the opinion of the <i>Consultant</i> , the <i>Contractor</i> has been delayed in performing the <i>Work</i> and/or has incurred additional costs under GC 9.5.1.2, the <i>Owner</i> shall reimburse the <i>Contractor</i> for the <i>Direct</i> Costs incurred as a result of the delay and as a result of taking those steps, and...”

SC54 GC 10.1 TAXES AND DUTIES

SC54.1	10.1.2	<u>Add</u> the following sentence at the end of paragraph 10.1.2: “For greater certainty, the <i>Contractor</i> shall not be entitled to any mark up for overhead or profit on any increase in such taxes and duties and the <i>Owner</i> shall not be entitled to any credit relating to mark up for overhead or profit on any decrease in such taxes. Subject to the <i>Owner’s</i> approval, the <i>Owner</i> shall pay for taxes and customs duties upon its receipt of written proof of payment of taxes and customs duties and that the <i>Contractor</i> has used reasonable commercial efforts to mitigate the impact of the taxes, tariffs and customs duties. The <i>Contract</i> shall not be entitled to any recovery for any special, indirect or consequential losses, markup, or damages incurred.”
SC54.2	10.1.3 to 10.1.7	<u>Add</u> new paragraphs 10.1.3, 10.1.4, 10.1.5, 10.1.6 and 10.1.7 as follows: “10.1.3 Where an exemption or a recovery of sales taxes, customs duties, excise taxes or <i>Value Added Taxes</i> is applicable to the <i>Contract</i>, the <i>Contractor</i> shall, at the request of the <i>Owner</i> or the <i>Owner’s</i> representative, 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 <i>Owner</i>. The <i>Contractor</i> agrees to endorse over the <i>Owner</i> any cheques received from the federal or provincial governments, or any other taxing authority, as may be required to give effect to this GC 10.1.3. 10.1.4 The <i>Contractor</i> shall maintain accurate records tabulating equipment, material and component costs reflecting the taxes, customs duties, excise taxes and <i>Value Added Taxes</i> paid. 10.1.5 Any refund of taxes, including without limitation, any government sales tax, customs duty, excise tax or <i>Value Added Tax</i>, whether or not paid, which is found to be inapplicable or for which exemption may be obtained, is the sole and exclusive property of the <i>Owner</i>. The <i>Contractor</i> agrees to cooperate with the <i>Owner</i> and to obtain from all <i>Subcontractors</i> and <i>Suppliers</i> cooperation with the <i>Owner</i> in the application for any refund of any taxes, which cooperation shall include, but not be limited to, making or concurring in the making of an application for any such refund or exemption and providing to the <i>Owner</i> copies, or where required, originals of records, invoices, purchase orders and other documentation necessary to support such applications or exemptions or refunds. All such refunds shall either be paid to the <i>Owner</i>, or shall be a credit to the <i>Owner</i> against the <i>Contract Price</i>, in the <i>Owner’s</i> discretion. 10.1.6 Customs duties penalties, or any other penalty, fine or assessment levied against the <i>Contractor</i> shall not be treated as a tax or customs duty for purposes of this GC 10.1. 10.1.7 The <i>Contractor</i> shall prepare a written plan (“Tariff Mitigation Plan”) that sets out the following information: .1 a list of <i>Products</i> that become the subject of a change in taxes and duties after the time of bid closing; .2 whether the <i>Products</i> that are subject to a change in taxes and duties after the time of bid closing have been procured as of the date of the <i>Tariff Mitigation Plan</i>;

		.3 for <i>Products</i> subject to a change in taxes and duties after the time of bid closing, to notify the <i>Owner</i> and the <i>Consultant</i> whether these <i>Products</i> can be substituted or alternatively sourced so to avoid the change in taxes and duties; .4 a list of <i>Products</i> that are anticipated to be subject to a future change in taxes and duties and the anticipated implementation date of this change; .5 the anticipated cost of associated with the change in taxes and duties for <i>Products</i>; .6 any proposed substitutions for the <i>Owner</i> and the <i>Consultant's</i> review and approval (including cost, any impact on the <i>Contract Time</i> and the different parts of the <i>Work</i>, any requirement for Canadian certification, and <i>Product</i> data); and .7 the anticipated cost of any associated or proposed mitigation measures (e.g., storage costs and transport costs) for the <i>Owner</i> and <i>Consultant's</i> review and approval."

SC55 GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

SC55.1	10.2.3	<u>Add</u> the following sentence to the end of paragraph 10.2.3: "Without limiting the generality of this GC 10.2.3, the <i>Contractor</i> is responsible for procuring, and, as a part of the <i>Contract Price</i>, paying for, all permits, approvals and disposal fees, costs and expenses as required by the <i>Excess Soil Regulation</i> for the performance of the <i>Work</i>."
SC55.2	10.2.5	<u>Add</u> the words, "Subject to GC 3.15.1" to the beginning of paragraph 10.2.5. -and- <u>Add</u> the following to the end of the second sentence of paragraph 10.2.5: "...and no further <i>Work</i> on the affected components of the <i>Contract</i> shall proceed until these changes to the <i>Contract Documents</i> have been obtained by the <i>Contractor</i> from the <i>Consultant</i>." -and- <u>Add</u> the following sentence to the end of paragraph 10.2.5: "The <i>Contractor</i> shall notify the Chief Building Official or the registered code agency where applicable, of the readiness, substantial completion, and completion of the stages of construction set out in the Ontario Building Code. The <i>Contractor</i> shall be present at each site inspection by an inspector or registered code agency as applicable under the Ontario Building Code."
SC55.3	10.2.6	<u>Add</u> the following sentence to the end of paragraph 10.2.6: "In the event the <i>Owner</i> suffers loss or damage as a result of the <i>Contractor's</i> failure to comply with GC 10.2.5, and notwithstanding any limitations described in GC 13.1.1, the

		<i>Contractor</i> agrees to indemnify and to hold harmless the <i>Owner</i> and the <i>Consultant</i> from and against any claims, demands, losses, costs, damages, actions, suits or proceedings resulting from such failure by the <i>Contractor</i> ."
SC55.4	10.2.7	<u>Add</u> the words " which changes were not, or could not have reasonably been known to the <i>Owner</i> or to the <i>Contractor</i> , as applicable, at the time the <i>Contractor</i> submitted its <i>Procurement Response</i> and which changes did not arise as a result of a public emergency or other <i>Force Majeure</i> event" to the second line of paragraph 10.2.7, after the words "authorities having jurisdiction".
SC55.5	10.2.8	<u>Add</u> a new paragraph 10.2.8 as follows: "10.2.8 The <i>Contractor</i> acknowledges and agrees that it shall at all times comply with OAHS Code of Ethics and the commitments set out in all <i>Owner</i> policies (available on OAHS's website) including the following: .1 In the performance of the <i>Work</i>, the <i>Contractor</i> shall at all times comply with the <i>Accessibility for Ontarians with Disabilities Act</i>, 2005, and all regulations made thereunder ("AODA"). Without limiting the generality of the foregoing, the <i>Contractor</i> shall have in place all accessibility plans, policies, practices and procedures required by AODA and shall ensure that all personnel of the <i>Contractor</i> engaged in performing the <i>Work</i>, including without limitation those personnel of the <i>Contractor</i> who may deal with members of the public or other third parties on behalf of the <i>Owner</i>, have received all training required by AODA. The <i>Owner</i> shall have the right, upon request, to inspect and obtain copies of the accessibility plans, policies, practices and procedures maintained by the <i>Contractor</i> in relation to AODA, as well as reasonable evidence that personnel of the <i>Contractor</i> performing the <i>Work</i> have received all training required by AODA. In delivering the <i>Work</i>, the <i>Contractor</i> shall provide information and communications in accessible formats and with communication supports, upon request by the <i>Owner</i>, members of the public or other third parties, in accordance with the requirements of AODA. .2 The <i>Contractor</i> shall familiarize itself with Ministry of Labour Guidelines for Contractors found at: https://www.labour.gov.on.ca/english/hs/pubs/constructor/"

SC56 GC 10.4 WORKERS' COMPENSATION

SC56.1	10.4.1	<u>Delete</u> paragraph 10.4.1 and <u>replace</u> it with the following: "Prior to commencing the <i>Work</i>, and with each application for payment thereafter, the <i>Contractor</i> shall provide a Clearance Certificate from WSIB."

SC57 GC 11.1 INSURANCE

SC57.1	11.1.0	<u>Add</u> new paragraph 11.1.0 as follows: "11.1.0 Subject to any other provision of this <i>Contract</i>, a claim by the <i>Contractor</i> for an increase to the insurance premium required pursuant to this GC 11.1 will be

		conditional upon the <i>Owner's</i> receipt of an updated certificate of insurance. Any claim by the <i>Contractor</i> for an increase as described under this GC 11.1.0, including as a part of a <i>Change Order</i> or <i>Change Directive</i> , may only occur once every three months. For clarity, a request by the <i>Contractor</i> under this GC 11.1.0 may occur at a frequency longer than three months but shall not occur any less than every three months."
SC57.2	11.1	Where the <i>Contractor's</i> proposed <i>Contract Price</i> in its <i>Procurement Response</i> is \$5,000,000 or more, <u>delete</u> paragraph 11.1 in its entirety and <u>replace</u> it with the following: "11.1.1 Without restricting the generality of GC13.1 – INDEMNIFICATION, the <i>Owner</i> shall provide, maintain and pay for insurance coverage against "all risks" of physical loss or damage to the <i>Work</i> including materials and supplies on site but excluding machinery, equipment, tools and temporary structures or facilities used in carrying out the <i>Work</i>, all on a full replacement value basis and subject to normal insurance policy exclusions. Such insurance shall include the <i>Consultant</i>, the <i>Contractor</i> and all <i>Subcontractors</i> as additional insureds as their respective interests may appear and will be maintained in full force until the date of issuance of the certificate of <i>Substantial Performance of the Work</i>. Regardless of the actual deductible amount in the policy, all losses shall be adjusted as though such deductible were (\$10,000) and the <i>Contractor</i> will be solely responsible for losses below this amount. The <i>Contractor</i> may provide at its own expense such additional insurance as it may desire to protect itself with respect to damage not otherwise covered. 11.1.2 The <i>Owner</i> shall provide and pay for Comprehensive General Liability insurance (known as "Wrap Up Liability") in form and terms satisfactory to the <i>Owner</i> with a limit of not less than \$10 million per occurrence for bodily injury, death and damage to property, including loss of use thereof. Such policy shall include provisions for blanket contractual liability, cross liability and products and completed operations liability. The policy shall be maintained continuously in full force until the date issuance of the certificate of <i>Substantial Performance of the Work</i>, except for the coverage referred to above as products and completed operations liability which shall run for a further 24 months from the date of issuance of the certificate of <i>Substantial Performance of the Work</i>. Such insurances will include the <i>Consultant</i> (but not with respect to professional liability), the <i>Contractor</i> and all <i>Subcontractors</i> as additional insureds and shall include a waiver of subrogation rights by the insurer against any insured. 11.1.3 The <i>Contractor</i> shall provide "all risks" <i>Contractors'</i> equipment insurance covering construction machinery and equipment used by the <i>Contractor</i> for the performance of the <i>Work</i>, including boiler insurance on temporary boilers and pressure vessels, and such insurance shall be in a form acceptable to the <i>Owner</i> and shall not allow subrogation claims by the insurer against the <i>Owner</i>. The Policies shall be endorsed to provide the <i>Owner</i> with not less than fifteen (15) days' written notice in advance of cancellation, change or amendment restricting coverage. Subject to satisfactory proof of financial capability by the <i>Contractor</i> for self-insurance, the <i>Owner</i> agrees to waive the equipment insurance requirement. 11.1.4 The <i>Contractor</i> will be responsible for arranging satisfactory liability insurance covering owned or non-owned licensed vehicles, aircraft or watercraft used directly or indirectly in the performance of the <i>Work</i> in form and limits acceptable to the <i>Owner</i> and shall provide satisfactory evidence of coverage to the <i>Owner</i> prior to commencement of the <i>Work</i>.

		11.1.5 In the event of a loss, the <i>Contractor</i> shall immediately proceed to restore the <i>Work</i> without awaiting the determination of the amount recoverable or the payment of any monies under the policy of insurance. The <i>Contractor</i> shall be entitled to a reasonable extension of <i>Contract Time</i> to the extent that the critical path of the construction schedule is affected, but damage to the <i>Work</i> shall not otherwise diminish its obligations under the <i>Contract</i>. 11.1.6 All occurrences and claims shall be reported immediately in writing to the <i>Owner</i> providing at least the following particulars: .1 date, time and location of occurrence; .2 cause and description of circumstances; .3 estimate of loss or damage; and .4 names and telephone numbers of persons to contact.”

SC58 GC 12.1 READY-FOR-TAKEOVER

SC58.1	12.1.1	<u>Delete</u> paragraph 12.1.1 in its entirety and <u>replace</u> it with the following: “12.1.1 <i>Ready-for-Takeover</i> shall be achieved when all of the following has occurred, as verified and approved by the <i>Owner</i>: .1 <i>Substantial Performance of the Work</i> has been achieved, as certified by the <i>Consultant</i>; .2 a permit for <i>Occupancy</i> has been obtained from the authorities having jurisdiction; .3 final cleaning and waste removal, as required by the <i>Contract Documents</i>; .4 the <i>Contractor</i> has delivered to the <i>Consultant</i> and the <i>Owner</i> all inspection certificates from authorities having jurisdiction with respect to any component of the <i>Work</i> which has been completed; .5 subject only to GC 12.1.2, the entire <i>Work</i> has been completed to the requirements of the <i>Contract Documents</i>, including completion of all items on the punch list prepared for achieving <i>Substantial Performance of the Work</i> and the <i>Work</i> is being used for its intended purpose, and is so certified by the <i>Consultant</i>; .6 subject only to GC 12.1.2, the <i>Contractor</i> has submitted to the <i>Owner</i> and the <i>Consultant</i> in a collated and organized matter, all written guarantees, warranties, certificates, testing and balancing reports, distribution system diagrams, <i>Shop Drawings</i>, maintenance and operating instructions, spare parts, maintenance manuals and any other materials or documentation required by the <i>Contract Documents</i> not submitted to the <i>Owner</i> pursuant to GC 5.4.4; .7 subject only to GC 12.1.2, all <i>Products</i>, systems and components of the

		<i>Project</i> have been commissioned and certified for operation and accepted by the <i>Owner</i> and <i>Consultant</i>; .8 subject only to GC 12.1.2, the <i>Contractor</i> has submitted to the <i>Owner</i> and the <i>Consultant</i> full and complete <i>As-Built Drawings</i> and <i>Specifications</i> revised by the <i>Contractor</i> to reflect the as-built state of the <i>Work</i>, clearly showing changes to the <i>Drawings</i> and <i>Specifications</i> from the original <i>Contract Documents</i>, all of which have been approved by the <i>Owner</i> acting reasonably.”
SC58.2	12.1.2	<u>Delete</u> paragraph 12.1.2 in its entirety and <u>replace</u> it with the following: “12.1.2 The <i>Owner</i> may, in its sole, absolute, and unfettered discretion, waive in writing compliance with a requirement, or a part thereof, for achieving <i>Ready-for-Takeover</i> set out in GC 12.1.1.5 to 12.1.1.8 (inclusive). Where the <i>Owner</i> exercises the discretion afforded under this GC 12.1.2, the <i>Contractor</i> shall be required to comply with GC 5.5.1.2 as part of its application for final payment and the <i>Owner</i> and the <i>Contractor</i>, in consultation with the <i>Consultant</i>, shall establish a reasonable date for completing the <i>Work</i>.”
SC58.3	12.1.3	<u>Delete</u> paragraph 12.1.3 in its entirety and <u>replace</u> it with the following: “12.1.3 When the <i>Contractor</i> considers that the <i>Work</i> is <i>Ready-for-Takeover</i>, it shall submit a written application to the <i>Owner</i> and the <i>Consultant</i> for review.”
SC58.4	12.1.4	<u>Delete</u> paragraph 12.1.4 and <u>replace</u> it with the following: “12.1.4 The <i>Consultant</i> and the <i>Owner</i> will review the <i>Work</i> and the requirements of GC 12.1.1 to verify the validity of the <i>Contractor’s</i> application and will promptly, and in any event, no later than 10 <i>Working Days</i> after receipt of the <i>Contractor’s</i> application: .1 advise the <i>Contractor</i> in writing that <i>Ready-for-Takeover</i> has not been achieved and give reasons why; or .2 the <i>Owner</i> shall verify and approve that <i>Ready-for-Takeover</i> has been achieved and the <i>Consultant</i> shall certify and confirm in writing to the <i>Owner</i> and the <i>Contractor</i> the date the <i>Ready-for-Takeover</i> was achieved. Such certification by the <i>Consultant</i>, for all intents and purposes, shall be equivalent to certification of “Total Performance of the <i>Work</i>”.”
SC58.5	12.1.5	<u>Delete</u> paragraph 12.1.5 in its entirety and <u>replace</u> it with the following: “12.1.5 Following the confirmation of the date of <i>Ready-for-Takeover</i> by the <i>Consultant</i> and as confirmed by the <i>Owner</i>, the <i>Contractor</i> may submit a final application for payment in accordance with GC 5.5 – FINAL PAYMENT.”
SC58.6	12.1.6	<u>Delete</u> paragraph 12.1.6 in its entirety and <u>replace</u> it with “[Intentionally left blank].”

SC59 GC 12.2 EARLY OCCUPANCY BY THE OWNER

SC59.1		<u>Delete</u> GC 12.2 – EARLY OCCUPANCY BY THE OWNER in its entirety and <u>replace</u> it with the following: “GC 12.2 USE AND EARLY OCCUPANCY BY THE OWNER 12.2.1 Without any limitation to any other right of the Owner herein, the <i>Owner</i> reserves the right to take possession of and use for any intended purpose any portion or all of the undelivered portion of the <i>Project</i> even though the <i>Work</i> may not have reached Substantial Performance of the <i>Work</i>, provided that such taking possession and use will not interfere, in any material way, with the progress of the <i>Work</i>. The taking of possession or use of any such portion of the <i>Project</i> shall: not: .1 be deemed to be the Owner’s acknowledgement or acceptance of the <i>Work</i> or <i>Project</i>; .2 relieve or limit the <i>Contractor</i> or its surety of any of its obligations under the Contract or liability that has arisen, or may arise, from the performance of the <i>Work</i>; .3 waive the Owner’s right to charge the Contractor liquidated damages in accordance with the Contract; or .4 affect the warranty period or the warranties set out in the Contract. 12.2.2 Whether the <i>Project</i> contemplates <i>Work</i> by way of renovations in buildings which will be in use or be occupied during the course of the <i>Work</i> or where the <i>Project</i> involves <i>Work</i> that is adjacent to a structure which is in use or is occupied, the <i>Contractor</i>, without in any way limiting its responsibilities under this <i>Contract</i>, shall take all reasonable steps to avoid interference with fire exits, building access and egress, continuity of electric power and all other utilities, to suppress dust and noise and to avoid conditions likely to propagate mould or fungus of any kind and all other steps reasonably necessary to promote and maintain the safety and comfort of the users and occupants of such structures or adjacent structures.”

SC60 GC 12.3 WARRANTY

SC60.1	12.3.1	<u>Add</u> the following sentence to the end of paragraph 12.3.1: “Where the <i>Contractor</i> has been permitted to make use of permanent equipment or systems, as provided in GC3.14, prior to the <i>Contractor</i> achieving <i>Ready-for-Takeover</i>, the <i>Contractor</i> shall at the time of the <i>Contractor</i>’s application for certification of <i>Ready-for-Takeover</i> replace (<i>i.e.</i> top-up) all consumables related to such permanent equipment or systems, and such permanent equipment or system shall be subject to the same warranty as described in this GC12.3 and shall be judged, for purposes of assessing compliance with the warranty, as though the equipment or system was new, clean and unused by the <i>Contractor</i>, except for normal commissioning and startup activities, prior to the date of <i>Ready-for-Takeover</i>.”
SC60.2	12.3.2	<u>Add</u> the words “Subject to GC 3.12.1,” at the beginning of paragraph 12.3.2.

SC60.3	12.3.3	<u>Delete</u> paragraph 12.3.3 in its entirety and <u>replace</u> it with the following: "The <i>Owner</i> shall promptly give the <i>Contractor</i> <i>Notice in Writing</i> of: .1 observed defects and deficiencies which occur during the one-year warranty period; and .2 any latent defects which could not have been reasonably discovered until after the expiry of the one-year warranty period."
SC60.4	12.3.4	<u>Add</u> the following sentence to the end of paragraph 12.3.4: "The <i>Contractor</i> shall also correct promptly, at the <i>Contractor's</i> expense, latent defects or deficiencies in the <i>Work</i> which could not have been reasonably discovered until after the one-year warranty period."
SC60.5	12.3.6	<u>Add</u> the following to the end of the second sentence in paragraph 12.3.6: ", shall commence no earlier than the date <i>Ready-for-Takeover</i> occurs, and shall not require any confirmation, execution, acknowledgment or other action by the <i>Owner</i> to be effective as of the date of <i>Ready-for-Takeover</i>."
SC60.6	12.3.7 to 12.3.10	<u>Add</u> new paragraphs 12.3.7, 12.3.8, 12.3.9, and 12.3.10 as follows: "12.3.7 Where required by the <i>Contract Documents</i>, provide a maintenance bond as security for the performance of the <i>Contractor's</i> warranty obligations set out in GC 12.3 – WARRANTY. 12.3.8 The <i>Contractor</i> shall assign to the <i>Owner</i> all warranties, guarantees or other obligations for <i>Work</i>, services or <i>Products</i> performed or supplied by any <i>Subcontractor</i>, <i>Supplier</i> or other person in connection with the <i>Work</i> and such assignment shall be with the consent of the assigning party where required by law or by the terms of that party's contract. Such assignment shall be in addition to, and shall in no way limit, the warranty rights of the <i>Owner</i> under the <i>Contract Documents</i>. Until the expiry of the relevant warranty periods enforceable against the <i>Contractor</i>, the <i>Owner</i> shall have in its custody all warranties, guarantees and other obligations to third parties respecting the <i>Work</i>. 12.3.9 The <i>Contractor</i> shall provide to the <i>Owner</i>, consolidated in a binder, fully and properly completed and signed copies of all warranties and guarantees required by the <i>Contract Documents</i>, containing: .1 the proper legal name of the <i>Owner</i>; .2 the proper name and address of the <i>Project</i>; .3 the date the warranty commences, which shall be at the date of <i>Ready-for-Takeover</i> unless otherwise agreed upon by the <i>Owner</i> in writing; .4 a clear definition of what is being warranted and/or guaranteed as required by the <i>Contract Documents</i>; and .5 the signature and seal of the company issuing the warranty. 12.3.10 The <i>Contractor</i> shall commence or correct any deficiency within 2 <i>Working Days</i>

		after receiving a notice from the <i>Owner</i> or the <i>Consultant</i> , and shall complete the <i>Work</i> as expeditiously as possible, except in the case where the deficiency prevents maintaining security or where basic systems essential to the ongoing business of the <i>Owner</i> and/or its tenants cannot be maintained operational as designed. In those circumstances all necessary corrections and/or installations of temporary replacements shall be carried out immediately as an emergency service. Should the <i>Contractor</i> fail to provide this emergency service within 8 hours of a request being made during the normal business hours of the <i>Contractor</i> , the <i>Owner</i> is authorized to carry out all necessary repairs or replacements at the <i>Contractor's</i> expense."

SC61 GC 13.1 INDEMNIFICATION

SC61.1	13.1.1 to 13.1.4	Delete paragraphs 13.1.1 through 13.1.6 in their entirety and <u>replace</u> them with the following: "13.1.1 The <i>Contractor</i> shall indemnify and hold harmless the <i>Owner</i> and the <i>Consultant</i>, their agents, employees and assigns from and against all claims, demands, damages, losses, expenses, costs, including legal fees, actions, suits or proceedings by whomsoever made, brought or prosecuted in any manner, arising out of, resulting from or attributable to the <i>Contractor's</i> or any Subcontractor's performance or non-performance of the Contract, regardless of whether or not caused in part by a party indemnified hereunder. It is expressly understood that the <i>Contractor</i> will save harmless the <i>Owner</i> from all claims made by any party other than the <i>Contractor</i> itself, financial or otherwise, relating to labour and materials furnished by the <i>Contractor</i> or by others for the <i>Work</i>. 13.1.2 It is the intention of the parties that the <i>Consultant</i>, its officers, agents, partners, employees, directors and insurers, as well as any <i>Subconsultants</i>, or other <i>Consultants</i> retained with respect to the <i>Project</i>, and their officers, agents, partners, employees, directors and insurers, is to benefit from the indemnification and hold harmless provisions of GC 13.1.1. 13.1.3 The <i>Owner</i> shall indemnify and hold harmless the <i>Contractor</i>, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the <i>Contractor's</i> performance of the Contract which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the <i>Place of the Work</i>. 13.1.4 Notwithstanding the provisions of GC1.1 - CONTRACT DOCUMENTS, GC 1.1.6, GC13.1 - INDEMNIFICATION shall govern over the provisions of GC 1.3.1 of GC1.3 – RIGHTS AND REMEDIES."

SC62 GC 13.2 WAIVER OF CLAIMS

SC62.1	13.2.1 to 13.2.2	<u>Delete</u> paragraphs 13.2.1 through 13.2.10 and <u>replace</u> them with the following: "13.2.1 As of the date of the final certificate for payment, the <i>Owner</i> expressly waives and releases the <i>Contractor</i> from all claims against the <i>Contractor</i> including without limitation those that might arise from negligence or breach of contract by the <i>Contractor</i> except for one or more of the following:

		.1 those made in writing prior to the date of the final certificate for payment and still unsettled; .2 those arising from the provisions of GC12.3 – WARRANTY or GC13.1 – INDEMNIFICATION; .3 those arising from GC9.2 – TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS and arising from the <i>Contractor</i> bringing or introducing any toxic or hazardous substances and materials to the <i>Place of the Work</i> after the <i>Contractor</i> commences the Work; .4 those made by <i>Notice in Writing</i> within a period of six years from the date of <i>Substantial Performance of the Work</i> as set out in the certificate of <i>Substantial Performance of the Work</i>, or within such shorter period as may be prescribed in any limitation statute of the province or territory of the <i>Place of the Work</i> and arising from any liability of the <i>Contractor</i> for damages resulting from the <i>Contractor's</i> performance of the <i>Contract</i> with respect to substantial defects or deficiencies in the <i>Work</i> for which the <i>Contractor</i> is proven responsible. As used herein, "substantial defects or deficiencies" means those defects or deficiencies in the <i>Work</i> where the reasonable cost of repair of such defects or deficiencies exceeds: .1 for a <i>Contract Price</i> of \$2,000,000 or less, the sum of \$50,000, before GST; .2 for a <i>Contract Price</i> of \$2,000,000 or more, the sum of \$100,000, before GST. 13.2.2 As of the date of certificate of <i>Substantial Performance of the Work</i>, the <i>Contractor</i> expressly waives and releases the <i>Owner</i> from all claims which it has or reasonably ought to have knowledge of that could be advanced against the <i>Owner</i> including without limitation those that might arise from the negligence or breach of contract by the <i>Owner</i> except: .1 those made in writing prior to the <i>Contractor's</i> application for final payment and still unsettled; and .2 those arising from the provisions of GC9.2 – TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS or GC10.3 – PATENT FEES."

SC63 PART 14 OTHER PROVISIONS

SC63.1	14.1	<u>Add</u> new GC 14.1 CONTRACT SECURITY as follows: "GC 14.1 CONTRACT SECURITY 14.1.1 Where the <i>Contract Price</i> is greater than \$500,000.00 (excluding HST), prior to commencement of the <i>Work</i>, the <i>Contractor</i> shall furnish a performance bond in favour of the <i>Owner</i>, covering the faithful performance of the <i>Contract</i>, including the payment obligations arising there under, made upon the form prescribed by <i>the Construction Act</i> (Form 32) and issued by such surety company(ies) licensed under the <i>Insurance Act</i> to write surety and fidelity insurance and are approved by the <i>Owner</i>. The bond shall be for fifty per cent (50%) of the <i>Contract Price</i> or such greater amount as may be specified in the <i>Contract Documents</i>.

		14.1.2 Where the <i>Contract Price</i> is greater than \$500,000.00 (excluding HST), prior to commencement of the <i>Work</i>, the <i>Contractor</i> shall furnish a labour and material payment bond in favour of the <i>Owner</i> that extends protection to <i>Subcontractors</i> and <i>Suppliers</i> in the form prescribed by <i>the Construction Act</i> (Form 31) and issued by such surety company(ies) licensed under the <i>Insurance Act</i> to write surety and fidelity insurance and are approved by the <i>Owner</i>. The bond shall be for fifty per cent (50%) of the <i>Contract Price</i> or such greater amount as may be specified in the <i>Contract Documents</i>. 14.1.3 The <i>Contractor</i> represents and warrants that it has provided its surety with a copy of the Contract prior to the issuance of such bonds. 14.1.4 It is the intention of the Contract that the performance bond shall be applicable to all of the <i>Contractor's</i> obligations under this Contract and, wherever a performance bond is provided with language which conflicts with this intention, it shall be deemed to be amended to comply. 14.1.5 The <i>Contractor</i> shall extend both the performance bond and labour and material bond obtained in accordance with GC 14.1.1, 14.1.2, 14.1.3, and 14.1.4 in the event of a delay dispute with the <i>Owner</i>. 14.1.6 Notwithstanding any other provision of this <i>Contract</i>, a claim by the <i>Contractor</i> for an increase to the <i>Contract Price</i> as a result of an increase in the premiums for the bonds required under this GC 14.1 will be conditional upon the <i>Owner's</i> receipt of (a) an updated copy of the applicable bond (or a rider to the applicable bond) showing the increase in the value of the bond, and (b) an invoice, voucher, or other request for payment from the applicable surety company showing the amount of increase to the premiums. Any claim by the <i>Contractor</i> for an increase to the <i>Contract Price</i> as described under this GC 14.1.6, including as a part of any <i>Change Order</i> or <i>Change Directive</i>, may only occur once during each 3-month period for the duration of the <i>Project</i>."
SC63.2	14.2	<u>Add</u> new GC 14.2 GENERAL LABOUR CONDITIONS as follows: "GC 14.2 GENERAL LABOUR CONDITIONS 14.2.1 Any part of the <i>Work</i> performed by the <i>Contractor</i> on behalf of the <i>Owner</i> that falls under the provisions of the current provincial agreement covering construction work in the industrial, commercial and institutional sector of the construction industry in the Province of Ontario between the Carpenters' Employer Bargaining Agency and the Carpenters' District Council of Ontario, United Brotherhood of Carpenters and Joiners of America, and its affiliated locals, including Carpenters Local 27 and Carpenters Local 675, (the "<i>Carpenters ICI Collective Agreement</i>") shall be performed by employees covered by the <i>Carpenters ICI Collective Agreement</i>. 14.2.2 General contractors working on projects at all OAHS sites with a value below One Hundred Thousand (\$100,000) and above Five Million (\$5,000,000) must be bound to the provincial agreement between the Carpenters' Employer Bargaining Agency and the Carpenters' District Council of Ontario, United Brotherhood of Carpenters and Joiners of America, and its affiliated locals, including Carpenters Local 27 and Carpenters Local 675. 14.2.3 These <i>General Labour Conditions</i> shall apply to each <i>Subcontractor</i> and the

		<i>Contractor</i> shall include these <i>General Labour Conditions</i>, with necessary changes, in each of its contracts with <i>Subcontractors</i> for any part of the <i>Project</i>. 14.2.4 The <i>Contractor</i> shall indemnify and save the <i>Owner</i> harmless from and against all loss, claim, expense or damage suffered by the <i>Owner</i> arising from the failure of the <i>Contractor</i> or any <i>Subcontractor</i> to comply with the requirements of these <i>General Labour Conditions</i> and agrees that the <i>Owner</i> may set-off against the <i>Contractor's</i> payables an amount equal to said loss, claim, expense. This indemnity is in addition to, and not limited by, the indemnity of the <i>Contractor</i> in GC13.1 – INDEMNIFICATION.”
SC63.3	14.3	<u>Add</u> new GC 14.3 OWNERSHIP OF MATERIALS as follows: “GC 14.3 OWNERSHIP OF MATERIALS 14.3.1 Unless otherwise specified, all materials existing at the <i>Place of the Work</i> at the time of execution of the Contract shall remain the property of the <i>Owner</i>. All <i>Work</i>, <i>Products</i> and materials delivered by the <i>Contractor</i> which form part of the <i>Work</i> shall be considered the property of the <i>Owner</i> but the <i>Contractor</i> shall remove all surplus or rejected materials as its property when notified in writing to do so by the <i>Consultant</i>.”
SC63.4	14.4	<u>Add</u> new GC14.4 CONTRACTOR DISCHARGE OF LIABILITIES as follows: “GC 14.4 CONTRACTOR DISCHARGE OF LIABILITIES 14.4.1 In addition to the obligations assumed by the <i>Contractor</i> pursuant to GC3.6, the <i>Contractor</i> agrees to discharge all liabilities incurred by it for labour, materials, services, <i>Subcontractors</i> and <i>Products</i>, used or reasonably required for use in the performance of the <i>Work</i>, on the date upon which each such liability becomes due. 14.4.2 The <i>Contractor</i> shall cause every <i>Subcontractor</i> and <i>Supplier</i> engaged in the performance of the <i>Work</i> to discharge all liabilities incurred by them for labour, materials, services and <i>Products</i> used or reasonably required for use in the performance of the <i>Work</i>. <i>Workmen</i> employed by a <i>Subcontractor</i> or <i>Supplier</i> shall be paid in full at intervals not less frequently than required by the governing law and all liabilities of the <i>Subcontractors</i> and <i>Suppliers</i> shall be discharged on the date upon which each becomes due. At the request of the <i>Owner</i>, the <i>Contractor</i> shall furnish the <i>Owner</i> with satisfactory evidence that its liabilities and those of its <i>Subcontractors</i> and <i>Suppliers</i> have been discharged.”
SC63.5	14.5	<u>Add</u> new GC 14.5 AS-BUILT DRAWINGS as follows: “GC 14.5 AS-BUILT DRAWINGS 14.5.1 Unless otherwise provided in the <i>Contract Documents</i>, the <i>Contractor</i> shall prepare <i>As-Built Drawings</i> and provide them to the <i>Consultant</i> for review. 14.5.2 The <i>Contractor</i> will conduct an initial review and prepare a punch list, or a list of deficiencies in accordance with the Ontario Association of Architects/Ontario General Contractors’ Association Document 100. The <i>Contractor's</i> punch list or deficiency list will include a complete list of all the items identified in the <i>Contract</i> that the <i>Contractor</i> and <i>Subcontractors</i> identify as incomplete or deficient in any way. Each area outlined on the <i>Contractor's</i> punch list should be effectively

		identified such that the <i>Consultant</i> can reference the punch list during their review of the <i>Work</i>. 14.5.3 The <i>Contractor</i> and the <i>Consultant</i> shall conduct a joint review when deemed appropriate for the status of the completion of the <i>Work</i>. Such review may include the entire design team and commissioning agent to agree on the nature of the deficient <i>Work</i> listed in the <i>Contractor's</i> punch list and the values to be retained for completion. 14.5.4 The <i>Contractor</i> shall submit the punch list to the <i>Consultant</i> as an electronic file in a format agreeable to both parties. 14.5.5 The <i>Contractor</i> will receive and manage the consolidated deficiency list (that includes the <i>Contractor's</i> punch list and the <i>Consultant's</i> deficiency list) from the <i>Consultant</i> and promptly rectify the deficiencies and advise the <i>Consultant</i> when the deficient <i>Work</i> has been completed. 14.5.6 The <i>Contractor</i> will generate a list of timelines and remaining items to be completed for approval by the <i>Consultant</i>, commissioning agent and the <i>Owner</i>. The <i>Contractor</i> is responsible to maintain and manage the consolidated deficiency list. 14.5.7 The <i>Contractor</i> will conduct a final review and check off the remaining items. Further reviews are dependent on the <i>Contractor</i>. The <i>Consultant</i> will value items by mutual agreement with the <i>Owner</i> that cannot be performed to the satisfaction of the <i>Contract</i> and the <i>Consultant</i> will issue credit change orders or zero cost change orders to remove those items from the <i>Contract</i>."
SC63.6	14.6	<u>Add</u> new GC 14.6 DAILY REPORTS/DAILY LOGS as follows: "GC 14.6 REPORTS AND LOGS 14.6.1 The <i>Contractor</i> shall cause its supervisor, or such competent person as he or she may delegate, to prepare a written daily log or diary reporting on weather conditions, <i>work force</i> of the <i>Contractor</i>, <i>Subcontractors</i>, <i>Suppliers</i> and any other forces on site and also record the general nature of <i>Project</i> activities. Such log or diary shall also include any extraordinary or emergency events which may occur and also the identities of any persons who visit the site who are not part of the day-to- day <i>work force</i>. 14.6.2 The <i>Contractor</i> shall also maintain written daily records, either at its head office or at the <i>Place of the Work</i>, recording staffing, labour and material resourcing on the <i>Project</i>, and records documenting the activities of the <i>Contractor</i> in connection with the <i>Construction Schedule</i>, and comparing that resourcing to the resourcing anticipated when the most recent version of the <i>Construction Schedule</i> was prepared pursuant to GC3.4. 14.6.3 Unless otherwise provided pursuant to this <i>Contract</i> the <i>Contractor</i> shall provide a written monthly report to the <i>Owner</i> and the <i>Consultant</i> no later than the 7th day of each month to report on the prior month's activities. The monthly report shall include: .1 an executive summary; .2 an overview report on the state of the <i>Project</i>, including copies of the daily

		log and current photographs of the <i>Project</i>; .3 report on the <i>QMP</i>; .4 organizational changes; .5 health and safety updates applicable to the <i>Project</i>; .6 cashflow projection; .7 updated logs for <i>Change Orders, Change Directives, Request for Information and Submittals</i>; .8 a list of potential risks and associated mitigation measures and critical issues requiring dates for which decisions are required and by whom; .9 proposed or anticipated changes to the <i>Work</i> of which the <i>Contractor</i> is aware, and their expected impacts on the <i>Project</i>; .10 claims, liens, or anticipated claims of which the <i>Contractor</i> is aware, being claims against the <i>Contractor</i>, the <i>Owner</i> or the <i>Project</i>; .11 copies of any correspondence not already copied to the <i>Owner</i>; .12 updated Gant chart and updated <i>Subcontractor</i> manpower monthly histogram for the duration of the <i>Project</i>; .13 provide details of recovery efforts undertaken by the <i>Contractor</i> to mitigate variances on the <i>Construction Schedule</i>; and .14 a <i>Contractor, Subcontractor</i> and <i>Supplier</i> manpower monthly histogram for the duration of the <i>Project</i>. 14.6.4 Upon request by the <i>Owner</i> or the <i>Consultant</i>, the <i>Contractor</i> shall make available for inspection and copying all of the records generated pursuant to this GC14.6 along with any other routine <i>Project</i> records ordinarily maintained by the <i>Contractor</i>."
SC63.7	14.7	<u>Add</u> new GC 14.7 CONSTRUCTION LIENS as follows: "GC 14.7 CONSTRUCTION LIENS 14.7.1 In the event that a claim for lien is registered against the title to the <i>Project</i> by a <i>Subcontractor</i> or <i>Supplier</i>, and provided the <i>Owner</i> has paid all amounts properly owing under the <i>Contract</i>, the <i>Contractor</i> shall, at its own expense: .1 within 7 days of receipt of a notice of lien, ensure that any and all claims for lien and certificates of action are discharged, released, or vacated by the posting of security or otherwise; and .2 in the case of written notices of lien, ensure that such notices are withdrawn, in writing. 14.7.2 In the event that the <i>Contractor</i> fails to conform with the requirements of GC 14.7.1 the <i>Owner</i> may fulfill those requirements without <i>Notice In Writing</i> to the

		<i>Contractor</i> and set off and deduct from any amount owing to the <i>Contractor</i>, all costs and associated expenses, including the costs of posting security and all legal fees and disbursements associated with discharging or vacating the claim for lien or certificate of action and defending the action. If there is no amount owing by the <i>Owner</i> to the <i>Contractor</i>, then the <i>Contractor</i> shall reimburse the <i>Owner</i> for all of the said costs and associated expenses, including the <i>Owner's</i> reasonable legal expenses. 14.7.3 In the event that any <i>Subcontractor</i> or <i>Supplier</i> registers any claim for lien with respect to all or part of the <i>Place of Work</i>, the <i>Owner</i> shall have the right to withhold, in addition to the statutory holdback, the full amount of said claim for lien plus either: (a) \$250,000 if the claim for lien is in excess of \$1,000,000 or (b) 25% of the value of the claim for lien and to bring a motion to vacate the registration of said claim for lien and any associated certificate of action in respect of that lien, in accordance with Section 44 of <i>the Construction Act</i>, by paying into court as security the amount withheld. 14.7.4 Section 20(1) of <i>the Construction Act</i> does not apply to this <i>Contract</i> and no general lien arises under or in respect of the <i>Work</i>, such that all liens shall arise and expire on a lot-by-lot basis. 14.7.5 Nothing in this GC 14.7 serves to preclude the <i>Contractor</i> from preserving and perfecting its lien in the event of non-payment by the <i>Owner</i>."
SC63.8	14.8	Add new GC14.8 NEUTRAL APPOINTING AUTHORITY as follows: "GC 14.8 NEUTRAL APPOINTING AUTHORITY 14.8.1 For purposes of the Rules for Mediation and Arbitration of Construction Disputes CCDC 40, the term "neutral appointing authority", as used in both the Rules for Mediation of CCDC2 Construction Disputes and the Rules for Arbitration of CCDC2 Construction Disputes shall mean the "Appointing Committee" at ADR Chambers presiding at the time notice of the dispute is given pursuant to the Contract."
SC63.9	14.9	Add new GC 14.9 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT as follows: GC 14.9 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT "14.9.1 Throughout the term of this <i>Contract</i>, and for a period of 7 years thereafter, the <i>Owner</i> and the <i>Contractor</i> will protect the confidentiality of all proprietary and <i>Confidential Information</i> of the other that is disclosed to it and will protect such information with the same standard of care as such party would use to protect the confidentiality of its own proprietary and <i>Confidential Information</i> which shall be, at a minimum, a reasonable standard, and, in any event, each party shall protect the confidentiality of all such proprietary and <i>Confidential Information</i> as may be required by law, including, without limitation, as may be required under the <i>Freedom of Information and Protection of Privacy Act</i>. 14.9.2 Notwithstanding the obligations of the <i>Owner</i> described in paragraph 14.9.1, the <i>Contractor</i> acknowledges that the <i>Owner</i> is subject to the <i>Freedom of Information and Protection of Privacy Act</i>, as amended, and may be required to release, in whole or in part, this <i>Contract</i> and any other documents or information in the <i>Owner's</i> possession or control that relate to this <i>Contract</i>."

SC63.10	14.10	<u>Add</u> new GC 14.10 AUDIT as follows: “GC 14.10 AUDIT 14.10.1 For 7 years following the expiry or termination of this <i>Contract</i>, the <i>Contractor</i> shall maintain and retain complete and accurate records and documents pertaining to this <i>Contract</i> and the furnishing of the <i>Work</i> including all necessary records to substantiate all charges and payments under this <i>Contract</i> and that the <i>Work</i> was completed in accordance with the <i>Contract</i> and the applicable law. During the term of this <i>Contract</i> and for seven years after the term, the <i>Contractor</i> shall permit and assist the <i>Owner</i> in conducting audits of the operations of the <i>Contractor</i> to verify all charges and payments under this <i>Contract</i> and that the <i>Work</i> was completed in accordance with the <i>Contract</i> and with applicable law. The <i>Owner</i> shall provide the <i>Contractor</i> with at least 10 <i>Working Days</i>’ prior notice of its requirement for such an audit. If any such audit or inspection, reveals the payments paid by the <i>Owner</i> to be incorrect, so that such error resulted in an overpayment by the <i>Owner</i> equal to or greater than three percent of <i>Contract Price</i> required to be paid by the <i>Owner</i> in accordance with this <i>Contract</i>; or reveals any breach, violation or non-performance by the <i>Contractor</i> of any term, condition, representation, warranty or covenant contained in this <i>Contract</i>, then the <i>Contractor</i> shall (in addition to forthwith reimbursing the <i>Owner</i> for any overpayment) pay all costs incurred by the <i>Owner</i> with respect to any audit(s) and/or inspection(s) that uncovered such error, including the costs of any internal and external auditors, accountants and associates of the <i>Owner</i> directly involved with such process.”

END OF SUPPLEMENTARY CONDITIONS TO CCDC 2-2020

APPENDIX 1

Amendment to Rules for Mediation and Arbitration of Construction Disputes (CCDC-40, 2018) (the "Rules")

The Rules assume the use of the Standard Construction Documents CCDC 2-2020 for a Stipulated Price Contract, including the Agreement, Definitions, General Conditions and any amendments or supplementary conditions, if there are any. This Amendment supersedes, replaces or amends the Rules, as the case may be, as outlined below.

1. RULES FOR MEDIATION

- 1.1 Additional Parties. Amend clause 3.1 by deleting the words "At any time prior to" and replacing them with "No later than 20 Working Days prior to".
- 1.2 Communications. Delete clauses 4.1 and 4.2 and replace them with the following:

"4.1 Written notices and other communications among and between the Parties and the Mediator shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier during normal business hours or if sent during normal business hours by e-mail during the transmission of which no indication of failure of receipt is communicated to the sender, and addressed as set out in Article 6.1 of the Contract or, in the case of the Mediator or any Additional Party, addressed as directed by such party. Such notices and other communications will be deemed to be received by the addressee on the next Working Day if sent by e-mail after normal business hours or if sent by overnight commercial courier. An address for a Party or the Mediator may be changed by delivering a written notice to such effect to the other Parties and the Mediator setting out the new address in accordance with this clause 4.1."
- 1.3 Appointment of Mediator. Delete clause 5.1 and replace it with the following:

"5.1 By Agreement. Where a party desires the appointment of a Project Mediator and gives a notice in writing to that effect, such notice shall include the names of two qualified individuals who are prepared to act as mediator, ranked in order of preference. Within five Working days of receiving such a notice, the other party shall deliver a responding notice including the names of two qualified individuals who are prepared to act as mediator, ranked in order of preference. From the names submitted by the parties, the parties shall unanimously appoint a mediator."
- 1.4 Appointment of Mediator. Amend clause 5.2, by deleting the words "a judge" and replace it with "an associate judge or judge".
- 1.5 Appointment of Mediator. Delete clause 5.4 and replace it with the following:

"5.4 When the Mediator has been appointed, whether pursuant to clause 5.1 or clause 5.2, the Parties and the Mediator shall enter into an agreement in writing pursuant to which the terms and conditions of the engagement of the Mediator shall be set out. Such agreement shall include an undertaking by the Mediator to carry out the mediation pursuant to these Rules and such agreement shall specifically set out the undertaking of the Mediator and the Parties as to "Confidentiality" (Clause 14.1) "Costs of the Mediation" (Clause 12) and "Privileged Process" (Clause 14.2)."
- 1.6 Time and Place of Mediation. Amend clause 7.1 by adding the following sentence to the end of the clause: "However, the Parties by agreement, and not the Mediator, will set the duration of the initial mediation session (e.g., half-day, 1-day, 2-days, etc.). Only where the Parties cannot reach agreement within a reasonable time shall the Mediator determine the duration of the initial mediation session."

- 1.7 Representation. Amend clause 8.1 by deleting the words “or are readily available for consultation”.
- 1.8 Right of Withdrawal. Amend clause 11.1 by deleting the words “, and the Mediator,”.
- 1.9 Privileged Process. Amend clause 14.1 by adding the following to the end of the paragraph: “The Parties, their legal counsel and any other person(s) present during the mediation session, including the Mediator, shall keep confidential all matters and documents disclosed during the mediation except where the disclosure is necessary for implementation of any agreement reached or is required by law.”

2. RULES FOR ARBITRATION

- 2.1 Additional Parties. Amend clause 3.1 by adding the following to the end of the sentence: “, or such Additional Party or Additional Parties are compelled to join the arbitration by court order.”
- 2.2 Additional Parties. Amend clause 3.2 by deleting the words “At any time prior to” and replacing them with “No later than 60 Working Days prior to”.
- 2.3 Communications. Delete clauses 4.1 and 4.2 and replace them with the following:
- “4.1 Written notices and other communications among and between the Parties and the Arbitrator shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier during normal business hours or if sent during normal business hours by e-mail during the transmission of which no indication of failure of receipt is communicated to the sender, and addressed as set out in Article 6.1 of the Contract or, in the case of the Arbitrator or any Additional Party, addressed as directed by such party. Such notices and other communications will be deemed to be received by the addressee on the next Working Day if sent by e-mail after normal business hours or if sent by overnight commercial courier. An address for a Party or the Arbitrator may be changed by delivering a written notice to such effect to the other Parties and the Mediator setting out the new address in accordance with this clause 4.1.
- 4.2 [Intentionally Deleted]”.
- 2.4 Location of Arbitration. Add the following as a second sentence to clause 5.1:
- “Failing agreement by the Parties, the Arbitrator may select a location for the arbitration within the jurisdiction of the Place of Work, which is reasonably convenient to both parties considering the location of the Place of the Work.”.
- 2.5 Appointment of Arbitrator: In clause 9.1, delete the words “Unless otherwise required by law or by the Agreement to Arbitrate,”.
- 2.6 Appointment of Arbitrator: Delete clause 9.3 and replace it with “[Intentionally Deleted]”.
- 2.7 Appointment of Arbitrator: Delete clause 9.4 and replace it with “[Intentionally Deleted]”.
- 2.8 Appointment of Arbitrator: In clause 9.7 delete the words “or 9.4(b)” and “or a third Arbitrator, as the case may be”.
- 2.9 Appointment of Arbitrator. Delete clause 9.9 and replace it with the following:
- “9.9 When an arbitrator has been appointed, pursuant to this Section 9, the Parties and the arbitrator shall enter an agreement in writing setting out, at minimum, the name of the arbitrator, the undertaking of the arbitrator and the parties to conduct the arbitration pursuant to these Rules and the terms and

conditions of engagement of the arbitrator including the fees to be paid and expenses to be reimbursed and any arrangements required to provide for interim payment of fees and/or expenses to the arbitrator.”

2.10 Procedural Meeting: In clause 10.1, delete the words “or the chairperson of the arbitral tribunal”.

2.11 Procedural Meeting. Add the following new sentence to clause 10.3:

“Such written record shall be deemed to be the procedural code for the conduct of the arbitration, subject to any further orders of the Arbitrator or of the Court of competent jurisdiction.”

2.12 Powers of the Arbitrator. Delete clause 11.1 and substitute the following:

“Subject to these Rules and subject to the written record described in clause 10.3, the Arbitrator may conduct the arbitration in such manner as the Arbitrator, acting reasonably, considers appropriate provided that in all events each Party shall be treated fairly and given a full opportunity to present its case and respond to the case presented by the other Party.”

2.13 Powers of the Arbitrator: Delete clause 11.4 and replace it with “[Intentionally Deleted]”.

2.14 Disclosure. Delete clause 13.1(a) and replace it with the following:

“(a) which are relevant to the issues in dispute, and..”.

2.15 Disclosure. Delete clause 13.2 and replace it with the following:

“13.2 The Arbitrator may order one or both Parties to prepare an affidavit, within a specified time, in which such Party deposes under oath that it has made a full and complete listing of documents pursuant to clause 13.1(a) that the Party has in its care custody or control, where the Arbitrator has reason to believe that one or both Parties have not made full and complete disclosure of the documents relevant to the issues in the arbitration.”

2.16 Disclosure. Delete clause 13.3 and replace it with the following:

“13.3. The Parties shall agree upon a protocol for the efficient electronic disclosure of all documents that a Party has listed under clause 13.1 or that the Arbitrator has ordered to be produced under clause 13.2. Any dispute as to the protocol shall be fully and finally resolved at the discretion of the Arbitrator.”

2.17 Expert Evidence. Amend clause 16.2 by deleting the words “, but without the Parties’ consent,” and replace them with “, and only with the Parties’ consent,”

2.18 Consolidation. Amend clause 24.1(a) by adding the following wording to that clause:

“...on the same Project,..”.

3. APPENDIX A – MEDIATOR SERVICES AGREEMENT

3.1 Delete Appendix A and all clauses therein.

4. APPENDIX B – ARBITRATOR SERVICES AGREEMENT

4.1 Delete Appendix B and all clauses therein.

END OF APPENDIX 1

APPENDIX 2

LANGUAGE FOR OAHS PERSONNEL OR FOR THIRD PARTY CONTRACTORS ENTERING A PROJECT SITE WHERE THE *Contractor* HAS ASSUMED OVERALL RESPONSIBILITY – IN CONTRACT – FOR OCCUPATIONAL HEALTH AND SAFETY

"The (trade or employee) acknowledges that the work it will perform on behalf of OAHS requires it to enter a job site which is under the total control of a general contractor which has a contract with OAHS. The (trade or employee) acknowledges that [name of contractor] has assumed overall responsibility for compliance with all aspects of the health and safety legislation of Ontario, including all the responsibilities of the "constructor" under the Occupational Health and Safety Act (Ontario). Further, (trade or employee) acknowledges that [name of contractor] is also responsible to OAHS to co-ordinate and schedule the activities of our work with the work of the general contractor.

We agree to comply with [name of contractor] directions and instructions with respect to occupational health and safety and coordination. We acknowledge that it will be cause for termination under our contract with OAHS should (I/we) fail or refuse to accept the direction and instruction of the general contractor with respect to matters of occupational health and safety or matters related to coordination of work."

END OF APPENDIX 2

EXHIBIT “1”
Project-specific requirements for a “*Proper Invoice*”

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

- (a) be in the form of a written bill, invoice, application for payment, or request for payment;
- (b) the *Contractor’s* HST number;
- (c) be dated the last day of the applicable *Payment Period*;
- (d) contain the *Contractor’s* name, telephone number and mailing address and contact information of the *Contractor’s* project manager;
- (e) contain the title of the *Project*, *Project* number, and the *Owner’s* contract number or purchase order number under which the work was performed and the related request for qualification, tender, or request for proposal number, as applicable;
- (f) contain a reference to the application for payment number in which the requested payment is being made (e.g. Progress Payment #1, Progress Payment #2, etc.);
- (g) contain the date the written bill, invoice, application for payment, or request for payment is being issued by the *Contractor*;
- (h) identify the period of time in which the labour and/or materials were supplied to the *Owner*;
- (i) reference to the provisions of the *Contract* under which payment is being sought (e.g., GC 5.3 –PAYMENT for progress payments, GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK for release of holdback or GC 5.5 – FINAL PAYMENT for final payment, etc.);
- (j) a description, including quantities where appropriate, of the services or materials, or a portion thereof, that were supplied and form the basis of the *Contractor’s* request for payment;
- (k) *Subcontractor* and *Supplier* invoices and supporting materials, as needed, to support the amount being claimed by the *Contractor*;
- (l) a statement based on the schedule of values required under GC 5.2.4;
- (m) the amount the *Contractor* is requesting to be paid by the *Owner*, set out in a statement based on the schedule of values approved under GC 5.2.5, separating out any statutory or other holdbacks, set-offs, credits in favour of the *Owner*, and HST;
- (n) with each application for progress payment after the first, a Statutory Declaration, on an original form of CCDC Document 9A-2018, stating that all accounts for labour, subcontracts, *Products*, *Equipment*, and other indebtedness which may have been incurred by the *Contractor* as of the last day of the payment period or an alternative day agreed by the parties and for which the *Owner* might in any way be held responsible have been paid in full, except for amounts properly retained as a holdback or as an identified amount in dispute;
- (o) a current Workplace Safety Insurance Board clearance certificate;
- (p) an updated *Construction Schedule*, each in compliance with the format(s) required under GC 3.4 – CONSTRUCTION SCHEDULE;

- (q) if requested by the *Owner*, a current and valid certificate(s) of insurance as required under GC 11.1 – INSURANCE;
- (r) the following statement: “Provided this *Proper Invoice* complies with the requirements of the *Contract* and provided no *Notice of Non-Payment* is issued by the *Owner*, payment is due within 28 days from the date this *Proper Invoice* is received by the *Owner*.”;
- (s) payment terms (in accordance with this *Contract*);
- (t) the name, title, telephone number, email address and mailing address of the person at the place of business of the *Contractor* to whom payment is to be sent; or, if payment is to be made to an office or department, its name, address, email address and telephone number; and
- (u) in the case of the *Contractor*’s application for final payment under GC 5.5:
 - (i) sufficient evidence of the *Contractor*’s compliance with GC 3.11.3; and
 - (ii) an executed, original, Full and Final Release of all claims that may arise as a result of the *Work*, which Full and Final Release executed by the *Contractor* shall be in a form approved by the *Owner*.

END OF EXHIBIT 1

EXHIBIT "2"

Project-specific requirements for the Baseline Schedule and the Construction Schedule

1. The *Baseline Schedule* and every subsequent update to the *Construction Schedule*, shall include and conform to the following basic requirements:
 - (a) be developed and maintained using the most current version of Oracle Primavera P6 or, when requested in writing by the *Contractor* and approved by the *Owner*, the latest version of MS Project;
 - (b) clearly demonstrate that the *Work* will be performed in conformity with the *Contract Time*, with express references to (at a minimum):
 - (i) the date of the *Contractor's* mobilization at the *Place of the Work*;
 - (ii) a *Products* delivery schedule showing those *Products* whose delivery will affect the critical path to achieve *Occupancy* within the *Contract Time* or are required under the *Specifications* to be included in the *Products* delivery schedule;
 - (iii) each *Milestone*, including the dates prescribed in Article A-1.3 for *Occupancy*, *Substantial Performance of the Work*, and *Ready-for-Takeover*;
 - (iv) any interim milestones requested by the *Owner* in writing following an adjustment to the *Contract Time* that has been approved in accordance with the *Contract*;
 - (c) logically link all activities with predecessor and successor activities, so that the critical path and interconnections are accurately identified and progress and re-forecasting can be correctly made as changes during the performance of the *Work*;
 - (d) a tracking variance showing the current *Construction Schedule* relative to the *Baseline Schedule*;
 - (e) relationships types shall be shown as Finish to Start relationships (to maintain forward reaction), and the application of constraints, lags, and leads is not acceptable;
 - (f) activities of a length greater than 20 *Working Days* shall be broken into sub-tasks (each not to exceed 20 *Working Days*) to allow for the progress of the *Work* to be accurately tracked;
 - (g) all non-*Working Days* shall be identified and accounted for in the *Contractor's* scheduling analysis, including statutory holidays, any trade, union, or industry-specific non-*Working Days*, weather allowances, labour shifts and collective agreement stipulations, technical requirements and other considerations influencing the duration and logic of activities;
 - (h) each update to the *Construction Schedule* shall provide a data date referencing the status of the *Construction Schedule* as the cutoff date on which the *Construction Schedule* is updated;
 - (i) each submission of the *Construction Schedule* by the *Contractor* to the *Owner*, including the submission of the *Baseline Schedule*, shall be in both PDF and in native format (e.g., .mpp format for Microsoft Project, .xer format for Primavera);
 - (j) attach, either as part of the *Construction Schedule* or as a separate document, a *Construction Schedule* dependent cash flow forecast showing the *Contractor's* anticipated monthly billings as a function of the *Construction Schedule* logic;
 - (k) assign the responsibility for performance of each activity to a party (e.g., the *Contractor*, the *Owner*, the *Consultant*, *Subcontractor(s)* and *Supplier(s)*;

- (l) shall be compliant with the relevant metrics of DCMA-14 Point Assessment, as approved by the *Owner*; and
 - (m) shall include the schedule contingency set out in paragraph 3.4.6.
2. At a minimum, each PDF and native file submission shall show the below noted schedule elements. The title-block of any of the *Construction Schedule* document shall include project title, unique project identifier number, title of the document, version number, schedule status date, author name, date on which the document was published for distribution. The activity durations must be full working days and shall not use fractional durations.
- (a) task/activity ID;
 - (b) task/activity name;
 - (c) duration;
 - (d) baseline start and finish dates;
 - (e) planned start and finish dates;
 - (f) actual start and finish dates;
 - (g) total float/slack;
 - (h) predecessors and successors activities;
 - (i) party responsible for activity;
 - (j) Gantt chart; and
 - (k) the percentage completion for each activity. For clarity, the percentage represents the actual percentage of completion of the activity.
3. No activity referenced in the *Baseline Schedule* or any revised *Construction Schedule* will be deleted for any reason. In the event that an activity or group of activities are no longer required (in that the *Work* that the activities represent has been removed from the *Project*) then the affected activities will be moved to a *work* breakdown structure element called "deleted" (positioned at the end of the work breakdown structure). Logic tying these deleted activities to the *Construction Schedule* shall be removed. The *Construction Schedule* logic shall be adjusted to ensure that the removal of these deleted activities does not leave any open ends and that the integrity of the schedule logic is not compromised.
4. Each update of the *Construction Schedule* shall be accompanied by a progress schedule report that sets out:
- (a) a summary of significant progress since the previous *Construction Schedule* was issued, including elements started or completed during the period;
 - (b) a brief explanation of any alterations in the *Construction Schedule* since the previous *Construction Schedule* (or *Baseline Schedule*, as the case may be) was issued, including any alterations (whether increments or decrements) made to the original duration (duration in the *Baseline Schedule*) of activities listed in the *Construction Schedule* and any alterations to the sequencing of work;
 - (c) confirmation that details of all third-party items, including activities dependent on and/or subject to third-party actions, included in the *Construction Schedule* are accurately represented as documented by the third-party in the schedule to the best of *Contractor's* knowledge; and

- (d) a statement by *Contractor* that there either “has”, or “has not” been, any alteration to the critical path since the previous *Construction Schedule* was issued.
5. Each update of the *Construction Schedule* shall also include a “Critical Path Report” encompassing all Work from the date stated in Article A-1.3 for commencement of the *Work to Ready-for-Takeover*. The Critical Path Report shall include:
- (a) a Gantt Chart schedule that shows the critical path of the *Project* as well as near-critical path activities. Near-critical path activities shall be activities having less than 20 days total float;
 - (b) Gantt Chart schedules that show the individual critical paths through each of the *Milestones*;
 - (c) critical path analysis including the following:
 - (i) actual progress against baseline target dates for each critical path or near-critical path activity;
 - (ii) any critical path or near-critical path activities and/or milestones that are more than 20 *Working Days* behind schedule, relative to the then current *Construction Schedule*;
 - (iii) a narrative that describes the changes in the critical path or near-critical path activities since the approval of the current version of the *Construction Schedule*;
 - (iv) assessment and analysis of the risk of delay to the *Construction Schedule* and the mitigation of these risks in a tabular form;
 - (v) provisions for addressing the behind-schedule critical path or near-critical path activities such that each *Milestone* will occur on the respective target dates currently listed in the approved *Construction Schedule*;
 - (vi) the identification of critical path activities that have a duration at completion variance, relative to the then current *Construction Schedule*; and
 - (vii) the identification of critical path activities that have a change in logic with reasons for the change, relative to the then current *Construction Schedule*.

END OF EXHIBIT 2

1 GENERAL

- 1.1 Requirements of the Articles of Agreement, Conditions of the Contract, and Division 1 apply to and form all Sections of the Contract Documents and the Work.
- 1.2 Work in this Specification is divided into descriptive sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and their Subcontractors. Contractor is solely responsible for organizing division of labour and supply of materials essential to complete the Work. The Consultant and Owner assume no liability to act as an arbiter to establish Subcontract limits between Sections or Divisions of Work.
- 1.3 It is intended that Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown on Drawings, to make finished Work complete and fully operational, consistent with the intent of the Contract Documents.
- 1.4 Mention in the specifications or indication on the Drawings of materials, Products, operations, or methods, requires that the Contractor provide each item mentioned or indicated of the quality or subject to the qualifications noted; perform according to the conditions stated in each operation prescribed; and provide labour, materials, Products, equipment and services to complete the Work.
- 1.5 Specifications, Schedules and Drawings are complementary and items mentioned or indicated on one may not be mentioned or indicated on the others.
- 1.6 Contractors finding discrepancies or ambiguities in, or omissions from the Drawings, Specifications or other Contract Documents, or having doubt as to the meaning and intent of any part thereof shall contact the Consultant for clarification. The absence of any contact by the Contractors to that effect during the Tender, is assumed as an acceptance by the Contractor of the Drawings, Specifications and other Contract Documents as not having any discrepancies, ambiguities, omissions, or not having any doubt as to the meaning and intent of any part of thereof.

2 SPECIFICATION LANGUAGE, STYLE, AND DEFINITIONS

- 2.1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to Contractor, unless stated otherwise.
- 2.2 Complete sentences by reading "shall", " Contractor shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.
- 2.3 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.

- 2.4 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.
- 2.5 Work designated as "N.I.C." is not included in this Contract.
- 2.6 When used in the context of a Product, it shall be understood the word "Provide" to mean supply, install, and connect as applicable, complete and in place including accessories, finishes, tests, and services required for a complete installation ready for its intended use.
- 2.7 The terms "approved", "review", "reviewed", "accepted", "acceptance", "acceptable", "satisfactory", "selected", "directed", "instructed", "required", "submit", "permitted", "approved alternative", "approved equal", or similar words or phases are used in standards or elsewhere in Contract Documents, it shall be understood, that words "by (to) the Consultant" follow, unless context provides otherwise.
- 2.8 The term 'or approved alternative' following a list of Products, systems, or manufacturers used in the Contract Documents shall be construed to mean approved by Consultant. Specified products to be Base Bid. Contractor to follow 'Substitution' procedures specified in Section 01 25 00 for submitting proposed Products, systems, and manufacturers and obtain Consultant's approval of the same prior to proceeding with ordering proposed Products and systems or engaging manufacturers. Contractors who purchase Products and systems or engage manufacturers prior to Consultant's review and acceptance do so at their own risk.
- 2.9 Where the words 'submit', 'acceptable' and 'satisfactory' are used in the Contract Documents, they shall be considered to be followed by the words 'to the Consultant' unless the context provides otherwise.
- 2.10 The terms "exposed" or "exposed to view" refers to surfaces that are within the line of vision of persons from any accessible viewpoint, both within and without the building. Where any part of a surface is exposed to view, all other portions of that surface shall also be considered as exposed to view.

3 CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES

- 3.1 Owner will supply Contractor with a complete set of Contract Documents in electronic format before commencement of the Work. Contractor may print hard copies for construction purposes as required. Hard copy prints are to be made in colour.

4 EXISTING SITE CONDITIONS

- 4.1 Building at 25 James St. will remain occupied during construction.

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- 4.2 Make a careful examination of the site, and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken, as to the means of access and egress thereto and therefrom, as to the obstacles to be met with, as to the extent of the Work to be performed, any limitations under which the work has to be executed, and any and all matters which are referred to in the Contract Documents. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to Tender closing.
- 4.3 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to the Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant. Ensure that each Subcontractor performing work related to the site conditions has examined it so that all are fully informed on all particulars which affect the Work thereon in order that construction proceeds competently and expeditiously.
- 4.4 Before commencing the Work of any Section or trade, carefully examine the Work of other Sections and trades upon which it may depend, examine substrate surfaces, and report in writing to the Consultant, defects which might affect new Work. Commencement of Work shall constitute acceptance of conditions and Work of other sections, trades, and Other Contractors upon which the new Work depends. If repair of surfaces is required after commencement of specific work it shall be included in the work of the trade providing the specific system or finish.
- 5 CONTRACTOR'S USE OF SITE**
- 5.1 Except as otherwise specified, Contractor has unrestricted use of Place of the Work and will accept full responsibility for assigned work and storage areas from time of Contract award until Ready-for-Takeover.
- 5.2 Written notice is required 24 hours in advance for access to existing tenant spaces on-site. Coordinate with Owner if access is required into existing tenant spaces, including exterior spaces (patios).
- 5.3 Accept full responsibility for the Work and storage areas from the time of Contract award until Ready-for-Takeover.
- 5.4 Confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and Contract Documents, whichever is most restrictive. Do not unreasonably encumber Place of the Work.
- 5.5 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances or exits. Direct construction traffic and locate access to site as directed by municipality.

- 5.6 The primary entrance and exiting for 25 James St., and any fire department connection access must be maintained during the duration of the Work.
- 5.7 Where encroachment beyond property limits is necessary make arrangements with respective property owners.
- 5.8 Before vehicles or equipment enter the Site, obtain permission from the Owner/Consultant for storage and appropriate access route. Appropriately barricade, stake off, or snow fence access route and storage area and around construction area in order to minimize damage to buildings, grounds, planting, turf, and surrounding facilities at the Site, and to restrict unauthorized persons from entering the construction area.
- 5.9 Be responsible for making good any/all damages to the existing building caused by operations at the Site. Restoration of such damages shall be to original condition or better and to the satisfaction of the Owner.
- 5.10 Cost of providing temporary protection, roads and services, including removal of same at completion of the Work and restoration of the involved areas to original state, shall be included in the Contract Price.
- 5.11 Maintain the exterior of the building during performance of the work. provide proper housekeeping measures to maintain a neat and orderly site to eliminate any complaints from surrounding neighbours.

6 ACCESS/PROPERTY CONSTRAINTS

- 6.1 All suites in 25 James St. will remain occupied during entire construction period. Life safety systems and exiting shall be continuously maintained.
- 6.2 Cooperate with Owner in scheduling operations and sequencing work to minimize disruptions and to facilitate Owner usage.
- 6.3 Perform Work only during the following times unless otherwise approved by the Owner: 8 a.m and 5 p.m., Monday to Friday.
- 6.4 Site access: Deliveries to be made to site "just in time" from John Street so as to not obstruct traffic. Contractor to coordinate and pay for flagging staff, allowable delivery hours and road closure fees with the municipality and authorities having jurisdiction.
- 6.5 Provide building occupants with written notice two (2) weeks prior to any disruptive activity.
- 6.6 Delivery times: Contractor to confirm and work within delivery hours allowed by municipality on John Street
- 6.7 Provide and maintain access facilities as may be required for access to the Work.

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- 6.8 Minimize disruption, noise and dust to the functions of existing operational areas of existing buildings. Times of entry, routes of access and time required to complete the Work shall be arranged and scheduled in cooperation with the Owner.
- 6.9 On-site tenant parking is to be maximized to the extent possible during construction.
- 6.10 Confine Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.
- 6.11 Organize delivery of materials/equipment to and removal of debris and equipment from place of Work to permit continual progress of work and suitable for restricted site conditions.
- 6.12 Determine and make arrangement as required for loading and unloading of equipment and Products at times that will not affect public traffic flow and that will be permitted by the Town of Cobourg. Conform to City by-laws with regard to parking restrictions and other conditions.
- 6.13 Make provisions and arrangements and provide allowances if times for loading and unloading allowed by the Town of Cobourg are other than regular working hours.
- 6.14 All Products, materials and equipment required on Site shall be portable and/or size suitable for access and movement on Site and without causing damage to buildings.
- 6.15 The Work shall be confined to the area defined on the Drawings and by the property lines except that services connections and certain portions of landscaping, hard paving and curb work shall be executed on Municipal property under regulation of authorities.
- 6.16 Provide locked doors in barriers, permit access by Owner and Consultant to Work areas and to areas Contractor is responsible for.
- 6.17 Workers shall not enter existing buildings beyond construction areas except where required for connection or modification to existing services or other such work. Arrange such requirements with Owner prior to entering existing occupied areas.
- 6.18 Personnel access and material deliveries to the Site shall be only by routes designated by the Owner. Unless otherwise permitted by the Owner, deliver Products between hours 8:00 a.m. to 4:00 p.m. and in accordance with regulations of the municipality from John Street. Owner's equipment such as trucks, bins, dollies, and other such equipment/facilities shall not be used by Contractors. Arrangements for handling items weighty or bulky enough to require special treatment must be made and reviewed with the Owner.
- 6.19 Advise the Owner 48 hours in advance of large or cumbersome item deliveries. Give particulars of item size and weight, protection to existing surfaces to be provided and safety precautions during movement.

7 CONTINUITY OF LIFE SAFETY SYSTEMS

- 7.1 Maintain operational life safety systems and public access to exits in occupied areas during all stages of the Work.
- 7.2 Determine nature and exact locations of existing fire and smoke sensors prior to the commencement of the Work. Avoid direct or indirect jarring or damage while working in adjacent areas and exercise caution to avoid triggering these devices.
- 7.3 Be responsible for costs incurred by Owner on account of false fire alarms activated as a result of the execution of the Work without adequate precautions.

8 CONTINUITY OF EXISTING SERVICES

- 8.1 Shutdowns and planning of operations that may affect Owner's use of services shall be coordinated with, approved by, and in accordance with the Owner's written directions. Provide advanced notice for all required interruptions to utility, heating, cooling, mechanical, electrical, and life safety systems. Interruption to services not to exceed four (4) hours.
- 8.2 Coordinate and provide necessary services, access, exiting and other facilities as required.
- 8.3 Make written requests for shutdown at least 5 working days in advance, unless specifically stated herein or as otherwise instructed by the Owner.
- 8.4 Shutdowns shall be scheduled in advance with Owner and shutdown period shall be minimized to Owner's convenience. Facilities in existing adjacent areas will be occupied during the Work.
- 8.5 Major shutdowns shall take place on weekends or at night by prior arrangement with and at no additional cost to the Owner.
- 8.6 Tag and mark switches and valves used by the Contractor to isolate services with name of Contractor, tradesman's name, date and time of shut-off, and date and time to be turned back on.
- 8.7 Arrange work so that physical access to existing adjacent facilities is not unduly interrupted at any one time except as approved by the Owner.
- 8.8 Protect existing work to remain at the commencement of each work shift in occupied areas, as completely as possible to hold the replacing of damaged work to a minimum. Provide covering and other protection material. Include protection for access routes and temporary storage

- 8.9 areas. Make good damage to existing surfaces caused by lack of adequate protection. Protection in such areas shall be removed at the end of each work shift.
- 8.10 All areas shall be cleaned and left in condition suitable for use by Owner and building operations before commencement of their work day.
- 8.11 Minimize disruption, noisy work, vibration, and dust to the function of existing building and to avoid disturbances to building occupants. Percussion noise, noisy work, and vibration shall not be permitted before the hours of 8 a.m. and after 5 p.m. from Monday to Friday. Perform noisy work in accordance with Town of Cobourg Noise Bylaw.
- 8.12 Permission for work on Saturdays must be requested of Owner with a minimum of 48 hours notice. No work is permitted on Sundays. Permission to work on weekends is not guaranteed.
- 8.13 These requirements are for security reasons and for the consideration of the Owner. Requirements shall not be construed as cause for elimination or restriction of Contractor's working schedule, claims for delay or work, nor additional cost.

9 SECURITY

- 9.1 Be responsible for security of all areas affected by Work of this Contract until taken over by Owner. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause. Provide safe and secure access to and egress from existing premises at all times.
- 9.2 Provide suitable surveillance equipment and /or employ guard services, as required to adequately protect the work.
- 9.3 Make provisions to permit Owner's security personnel to view areas where all Work is being performed.
- 9.4 Use of facilities at 25 James St., such as building entrances, washrooms, elevators and access corridors is prohibited.
- 9.5 Take acceptable precautions to guard Work site, premises, materials and the public during and after working hours due to the Work of this Contract.
- 9.6 A regular full time watchman is generally not required on Site, however, if in the opinion of the Consultant the Work is not adequately protected, the Owner may request that a watchman be employed by the Contractor at no extra cost to the Contract.
- 9.7 Any security service provided by the Owner is for the protection of the

- 9.8 Owner's interest in the Work on the Site and shall not relieve the Contractor of the responsibility to protect the Site and the Work of the Contract.

10 WEATHER

- 10.1 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 available from Environment Canada, for weather conditions on and near the Site, over the last ten (10) years. The Contractor may be entitled to a schedule extension for those activities on the critical path which are delayed on account of inclement weather, assessed on a quarterly basis, by the number of days in excess of the anticipated number of working days for the quarter in question by more than 20%. No additional payment will be made on account of any such schedule extension.
- 10.2 For the purpose of this clause the quarters are defined as January 1 to March 31, April 1 to June 30, July 1 to September 30, and October 1 to December 31.

11 WASTE AUDIT/PLANS FOR WASTE REDUCTION

- 11.1 Comply with requirements of authorities having jurisdiction.
- 11.2 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.
- 11.3 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.
- 11.4 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.

END OF SECTION

- **GENERAL**

- .1 Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.
- .2 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in Conditions of the Contract.
- .3 A schedule and scope of work shall be prepared by the Contractor to show when items called for under allowances must be authorized by the Consultant for ordering purposes so that the progress of the Work will not be delayed.
- .4 Submit, before application for final payment, copies of all invoices and statements from suppliers and Subcontractors for work which has been paid from cash allowances.

- **EXPENDITURE OF CASH ALLOWANCE(S)**

- .1 Owner, through Consultant, will provide Contractor with documentation required to permit pricing of a cash allowance item.
- .2 Where a Cash Allowance is for work performed under a Subcontract, Owner, through Consultant, will request Contractor to identify potential Suppliers and Subcontractors, as applicable, and to obtain at least three competitive prices for each cash allowance item.
- .3 Contractor will provide to the Owner and Consultant bids, quotations, and other price related information received from potential Suppliers and Subcontractors complete with Contractor's recommendations for approval.
- .4 Owner, through Consultant, will determine by whom and for what amount each cash allowance item will be performed. Obtain Owner's prior written approval in the form of a Change Order before entering into a subcontract, amending an existing subcontract, or performing own forces work included in a cash allowance. Upon issuance of the Change Order, the Contractor's responsibilities for a cash allowance item shall be the same as for other work of the Contract.
- .5 Where costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.
- .6 Amount of each cash allowance does not include Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

-	CASH ALLOWANCE(S)	
.1	Cash allowances, unless otherwise specified, cover the net cost to Contractor of services, Products, supply, construction machinery and equipment, freight, delivery, handling, unloading, storage, installation where indicated, all related costs, and other authorized expenses incurred in performing the Work.	
.2	Cash allowances shall not be included by a Subcontractor in the amount for their Subcontract work.	
.3	Supply only allowances shall include:	
.1	Net cost of Products as invoiced by Supplier.	
.2	Delivery to Site.	
.3	Applicable taxes and duties, excluding HST.	
.4	Supply and install allowances shall include:	
.1	Net cost of Products.	
.2	Subcontractor's overhead and profits related to the Cash Allowance.	
.3	Delivery, unloading, storing, handling or Products on Site.	
.4	Installation, finishing and commissioning of Products.	
.5	Applicable taxes and duties, excluding HST.	
.5	Inspection and testing allowances shall include:	
.1	Net cost of inspection and testing services.	
.2	Applicable taxes and duties, excluding HST.	
	-	
.1	Other costs related to work covered by cash allowances are not covered by the allowance but shall be included in the Contract Price.	
.2	Include in the Bid Price the amount of each cash allowance:	
.1	Inspection and Testing:	\$ 45,000
.2	Interior Signage (supply and installation):	\$ 7,500
.3	Finish Hardware:	\$ 75,000
-	Finishing hardware, supply and install, with the following exclusions:	
.1	Supply and install of hardware for vinyl windows. Vinyl windows hardware to be supplied and installed under Section 08 53 13.	
.2	Install of hardware for aluminium doors, frames and windows. Aluminium doors, frames and windows hardware as specified under Section 08 44 00 to be supplied under finishing hardware allowance, and installed under Section 08 44 00.	
.3	Automatic door operators, supply and install.	
.4	Fire Safety Plan:	\$ 6,000

.5	Security, Cameras and Access Control:	N/A
	Cameras, Access Control, cabling, equipment and installation by owner's security contractor. Conduits, boxes rough-in and coordination by Contractor - included in contract.	
.6	Photovoltaic (PV) System Procurement & Construction:	\$511,900
	- General contractor to tender to get minimum 3 competitive quotes (see attached list of experienced contractors) - This is a flush mounted solar photovoltaic module installation - All racking shop drawings are to be stamped/sealed by a P.Eng. accredited by PEO. - Award of approved contract at the discretion of Owner/Consultant - Execute the procurement, construction and installation sufficient to provide a turn-key system - Refer to Drawings PV-101 and PV-102 for indicative system design - Refer to Specifications Section 48 14 00 for all equipment and submittal requirements. - Project is currently going through Connection Impact Assessment (CIA) that will be held by owners - Allowance includes all LDC connection costs. - Refer to list of solar PV subcontractors and suppliers under Document 00 43 01	
.7	Photovoltaic (PV) System Connection costs:	\$38,100
	- CIA - CCA Class B - ESA	
.7	Site De-watering:	\$10,000
.8	Irrigation:	\$24,000
.9	Feature Lighting fixture in Lobby 116 (supply and installation):	\$10,000

END OF SECTION

1.1 **DEFINITION**

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

1.2 **SUBSTITUTION PROCEDURES**

- .1 Requests for Substitutions will not be accepted prior to the Notification of Award.
- .2 Contractor may only propose a Substitution wherever a Product or manufacturer is specified by proprietary name(s) and accompanied by language such as "or approved alternative", "or approved equal", or other similar words. Do not construe such language as an invitation to unilaterally provide a Substitution without Consultant's prior acceptance in writing. Do not order or install any Substitution without a Supplemental Instruction or Change Order. If the above wording is not indicated, no Substitution of a Product or manufacturer will be accepted.
- .3 Provided a proposed Substitution submission includes all of the information specified in this Section, Consultant will promptly review and accept or reject the proposed Substitution.
- .4 Substitutions will not be considered if:
 - .1 They do not meet the requirements of this Section.
 - .2 They are indicated or implied on Shop Drawings or Product data without Consultant's acceptance.
 - .3 Acceptance with require substantial revisions to the Specifications and Contract Drawings.
- .5 Consultant may accept a Substitution if satisfied that:
 - .1 the proposed substitute Product is the same type as, is capable of performing the same functions as, interfaces with adjacent work the same as, and meets or exceeds the standard of quality, performance and, if applicable, appearance and maintenance considerations, of the specified Product,
 - .2 the proposed substitute manufacturer has capabilities comparable to the specified manufacturer, and
 - .3 the Substitution provides a benefit to Owner.
- .6 If Contractor fails to order a specified Product or order a Product by a specified manufacturer in adequate time to meet Contractor's construction schedule, Consultant will not consider that a valid reason to accept a Substitution.

- .7 If Consultant accepts a Substitution and subject to Owner's agreement, the change in the Work will be documented in the form of either a Supplemental Instruction or Change Order as specified in Section 01 26 00.
- .8 If a Substitution is accepted in the form of a Supplemental Instruction or Change Order, Contractor shall not revert to an originally specified Product or manufacturer without Consultant's prior written acceptance.
- .9 Installation of the accepted substitution is coordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the Drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.
- .10 Approved substituted Products shall be subject to the Consultant's inspection and testing procedures. Approved substituted Products shall only be installed after receipt of the Consultant's written approval.
- .11 All claims are waived for additional costs related to the substitution which may subsequently arise.

1.3 SUBMISSION REQUIREMENTS FOR PROPOSED SUBSTITUTIONS

- .1 Include with each proposed Substitution the following information:
 - .1 Reason(s) for proposing the Substitution and the proposed substitutions has been investigated and complete information and data as specified in this Section is submitted. Consultant will only review information and data submitted. Incomplete data will be grounds for non-acceptance.
 - .2 Identification of the Substitution, including product name and manufacturer's name, address, telephone numbers, and web site.
 - .3 Data and a statement verifying that the proposed Substitution will not affect the Contract Price and Contract Time unless the proposed Substitution results in a decrease in the Contract Price and Contract Time.
 - .4 Same warranty or better is given for the substitution as for the original Product specified.
 - .5 A statement verifying that the Substitution will not affect the performance or warranty of other parts of the Work.
 - .6 Manufacturer's Product literature for the Substitution, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.
 - .7 Product samples as applicable or requested.
 - .8 A summarized comparison of the physical properties and performance characteristics of the specified Product and the Substitution, with any significant variations clearly highlighted.

- .9 Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.
- .10 If applicable, estimated life cycle cost savings resulting from the Substitution.
- .11 Details of other projects and applications where the Substitution has been used.
- .12 Identification of any consequential changes in the Work to accommodate the Substitution and any consequential effects on the performance of the Work as a whole. A later claim for an increase to the Contract Price or Contract Time for other changes in the Work attributable to the Substitution will not be considered.

1.4 SUBSTITUTIONS TO METHODS AND PROCESSES

- .1 Substitutions to methods or processes described in the Specifications or Drawings, may be proposed for the consideration of the Consultant. Ensure that such substitutions are in accordance with the following requirements:
 - .1 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Contract Time.
 - .2 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation.
 - .3 Be responsible for substitutions to methods or processes concerning such Work and ensure that the warranty covering all parts of the Work will not be affected.
 - .4 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor.
 - .5 The substituted methods or processes fit into space allotted for the specified methods or processes. Revisions to the Drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

END OF SECTION

1.1 SCHEDULE OF LABOUR RATES

- .1 Prior to the first application for payment, submit for the Consultant's review a schedule of labour rates for all trades and classifications of trades, such as journeymen, apprentices, and foremen that will be employed in the Work. Provide a breakdown of payroll burden component of labour rates.
- .2 Labour rates shall reflect the salaries, wages, and benefits paid to personnel in the direct employ of the Contractor, Subcontractors, and sub-Subcontractors, stated as hourly rates, that will be used when:
 - .1 Preparing price quotations for Change Orders, and
 - .2 Determining the cost of work attributable to Change Directives.
- .3 Labour rates stated in the schedule of labour rates shall be consistent with rates that will actually be paid, and payroll burden costs that will actually be incurred, in the normal performance of the Work, during regular working hours. Labour rates shall not include any additional overhead and profit component.
- .4 Where collective agreements apply, the labour rates shall not exceed those established by collective agreement.
- .5 Obtain the Owner's written acceptance of the schedule of labour rates before submitting the first Change Order quotation.
- .6 Accepted schedule of labour rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.
- .7 The Contractor may request amendments to the accepted schedule of labour rates if changes in the labour rates that will actually be paid, or payroll burden cost that will actually be incurred, in the normal performance of the Work can be demonstrated. Obtain the Owner's written acceptance of such changes.

1.2 SCHEDULE OF EQUIPMENT RATES

- .1 Equipment rates shall reflect the rates that will be used when:
 - .1 Preparing price quotations for Change Orders, and
 - .2 Determining the cost of work attributable to Change Directives.
- .2 Equipment rates stated in the schedule shall be consistent with local equipment rental market rates and shall not include any additional overhead and profit component.
- .3 Obtain the Owner's written acceptance of the schedule of equipment rates before submitting the first Change Order quotation.

- .4 Accepted schedule of equipment rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.
- .5 The Contractor may request amendments to the accepted schedule of equipment rates if changes in local equipment rental market rates can be demonstrated. Obtain the Owner's written acceptance of such changes.

1.3 VALUATION OF CHANGES BASED ON AGREED UNIT PRICES

- .1 The Consultant may, at the outset of the Contract or at any other time, request the Contractor to submit unit prices anticipated to be required in valuing changes in the Work.
- .2 The Contractor shall submit such unit prices promptly upon request.
- .3 The unit prices shall be valid for a specified duration.
- .4 The unit prices shall exclude all fees for overhead and profit and shall be subject to the percentage fees specified in this Section under Fees for Overhead and Profit — Change Orders.
- .5 The Consultant will evaluate the Contractor's quoted unit prices and, if accepted by the Owner in writing, the agreed unit prices shall be used to value subsequent proposed changes in the Work wherever they are applicable.

1.4 METHOD OF CONTRACT PRICE ADJUSTMENT - CHANGE ORDERS

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

1.5 CHANGE ORDER PROCEDURES

- .1 Upon issuance by the Consultant to the Contractor of a proposed change in the Work, and unless otherwise requested in the proposed change or unless otherwise agreed:
 - .1 Submit to the Consultant a fixed price quotation for the proposed change in the Work within 10 days after receipt of the proposed change in the Work.
 - .2 Always provide a detailed breakdown of the price quotation including the following to the extent applicable, with appropriate supporting documentation, regardless of if requested or not in the proposed change:
 - .1 Estimated labour costs, including hours and applicable hourly rates based on the accepted schedule of labour rates.

- .2 Estimated Product costs, including Supplier quotations, estimated quantities and unit prices.
 - .3 Estimated Construction Equipment costs.
 - .4 Enumeration of all other estimated costs included in the price quotation.
 - .5 Estimated credit amounts for labour and Products not required on account of the proposed change.
 - .6 Fees, not exceeding the applicable percentages for overhead and profit as specified in this Section.
 - .7 Where applicable, Subcontractor quotations, also including a detailed breakdown of all of the above.
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- .3 Include in the quotation the increase or decrease to the Contract Time, if any, for the proposed change, stated in number of days.
 - .4 Include in the quotation the number of days for which the quotation is valid.
 - .5 The quotation will be evaluated by the Consultant and the Owner and, if accepted by the Owner, be documented in the form of a signed Change Order.

1.6 FEES FOR OVERHEAD AND PROFIT - CHANGE ORDERS

- .1 Where the Contractor's price quotation for a Change Order results in a net increase to the Contract Price, the Contractor's entitlement to a fee for overhead and profit in the quotation shall be as follows, as applicable:
 - .1 For work to be performed by the Contractor's own forces, 10 % of the Contractor's price quotation before the Contractor's fee is applied.
 - .2 For work to be performed by a Subcontractor, 5 % of the Subcontractor's price quotation including the Subcontractor's fee.
- .2 Where a Subcontractor's price quotation for a Change Order results in a net increase to the Subcontractor's contract price, the Subcontractor's entitlement to a fee for overhead and profit in the quotation shall be as follows, as applicable:
 - .1 For work to be performed by the Subcontractor's own forces, 10 % of the Subcontractor's price quotation before the Subcontractor's fee is applied.
 - .2 For work to be performed by a sub-Subcontractor, 5 % of the sub-Subcontractor's price quotation including the sub-Subcontractor's fee.
- .3 Where the Contractor's or a Subcontractor's price quotation for a Change Order results in a net decrease in price before adjustment for fees for overhead and profit, such a price quotation shall be for the net decrease without any adjustment for fees for overhead and profit.

1.7 METHOD OF CONTRACT PRICE ADJUSTMENT - CHANGE DIRECTIVES

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

1.8 CHANGE DIRECTIVE PROCEDURES

- .1 If a Change Directive is issued for a change in the Work for which a proposed change was previously issued, but no Change Order has yet been signed, the Change Directive shall cancel the proposed change and any Contractor quotations related to that change in the Work.
- .2 When proceeding with a change in the Work under a Change Directive, keep accurate records of daily time sheets for labour and Construction Equipment, and invoices for Product and Construction Equipment costs. Submit such records to the Consultant daily, until the Change Order superseding the Change Directive is issued.

1.9 FEES FOR OVERHEAD AND PROFIT — CHANGE DIRECTIVES

- .1 Where a Change Directive results in net savings on account of work not required to be performed and a net decrease in the Contractor's or Subcontractor's cost, the net savings to the Contractor or Subcontractor shall be calculated without any adjustment for fees for overhead and profit.
- .2 When a Change Directive is ultimately recorded as a Change Order, there shall be no additional entitlement to fees for overhead and profit beyond those specified in this article.

1.10 SUPPLEMENTAL INSTRUCTIONS

- .1 The Consultant may issue Supplemental Instructions to provide clarifications to the Contract Documents, provide additional information, or make minor variations in the Work not involving adjustment in the Contract Price or Contract Time.
- .2 If the Contractor considers a Supplemental Instruction to require an adjustment in Contract Price or Contract Time, the Contractor shall promptly notify the Consultant and the Owner in writing and shall not proceed with any work related to the Supplemental Instruction pending receipt of a Change Order, a Change Directive, or,

in accordance with the dispute resolution provisions of the General Conditions of Contract, a Notice in Writing of a dispute and instructions to proceed.

END OF SECTION

1.1 REQUEST FOR INTERPRETATION (RFI)

- .1 A Request for Interpretation or Information (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents or to obtain additional information.
- .2 An RFI shall not constitute notice of claim for a delay.

1.2 SUBMITTAL PROCEDURES

- .1 Number RFIs consecutively in one sequence in order submitted, in numbering system as established by the Contractor and agreed to by the Consultant.
- .2 Submit one distinct subject per RFI form. Do not combine unrelated items on one form.
- .3 RFI form:
 - .1 Submit RFIs to the Consultant on "Request for Interpretation" form, appended to this Section. The Consultant shall not respond to an RFI except as submitted on this form.
 - .2 Where RFI form does not have sufficient space to provide complete information thereon, attach additional sheets as required.
 - .3 Submit with RFI form all necessary supporting documentation.
- .4 RFI log:
 - .1 Maintain log of RFIs sent to and responses received from the Consultant, complete with corresponding dates.
 - 2 Submit updated log of RFIs with each application for payment submission.
- .5 Submit RFIs sufficiently in advance of affected parts of the Work so as not to cause delay in the performance of the Work. Costs resulting from failure to do so will not be paid by the Owner.
- .6 Only the Contractor shall submit RFIs to the Consultant.
- .7 RFIs submitted by Subcontractors or Suppliers directly to the Consultant shall not be accepted.

1.3 SCREENING OF RFIs

- .1 Subcontractor and Contractor shall satisfy themselves that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the claim, dispute, or other matters in question relating to the performance of the Work or the Interpretation of the Contract Documents cannot be resolved by direct reference to the Contract Documents.

- .2 Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected.

1.4 **RESPONSE TO RFI**

- .1 Consultant shall review RFIs from the Contractor submitted in accordance with this Section with the following understandings:
- .1 Consultant's response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Price or Contract Time or changes in the Work.
- .2 Only the Consultant shall respond to RFIs. Responses to RFIs received from entities other than the Consultant shall not be considered valid.

1.5 **RESPONSE TIMING**

- .1 Allow 5 Working Days, if to be reviewed by only one *Consultant* (discipline), and, 10 working days, if to be reviewed by more than one *Consultant* (one discipline), for review of each RFI by the Consultant.
- .2 Day one (1) of the review period begins on the next Working Day after the RFI is received by the Consultant from Contractor, if received during normal business hours, and the day following that, if received after normal business hours, and extends to date RFI is returned by Consultant.
- .3 If, at any time, the Contractor submits a large enough number of RFIs or the Consultant considers the RFI to be of such complexity that the Consultant cannot process these RFIs within noted timings, the Consultant, will confer with the Contractor and the originator of the RFI within 3 Working Days of receipt of such RFIs, and the Consultant, the Contractor, and the originator will jointly prepare an estimate of the time necessary for processing same as well as an order of priority among the RFIs submitted. The Contractor and originator shall accommodate such necessary time at no increase in the Contract Time and at no additional cost to the Owner.
- .4 If, in the opinion of the Contractor, a response to RFI or the issuance of a Supplemental Instruction involves an adjustment in the Contract Price or in the Contract Time, the Contractor shall, within five (5) Working days of receipt of a response to RFI or the issuance of a Supplemental Instruction, provide the Consultant with a written notice to that effect and shall await further instructions. In the event that the Contractor needs additional information to determine whether a response to RFI or a Supplemental Instruction involves an adjustment of the Contract Price or in the Contract Time, the Contractor shall issue a written request to the Consultant seeking such additional information or informing the Consultant that it is seeking additional information from others. This written request shall occur within five (5) Working days of receipt of a response to RFI or the issuance of a Supplemental Instruction from the

Consultant. Following receipt of such additional information, the Contractor shall provide the Consultant with the written notice described in the first sentence of this paragraph. Failure to provide written notification within the time stipulated in this paragraph shall be deemed as an acceptance of the response to RFI or the Supplemental Instruction by the Contractor without adjustment in the Contract Price or Contract Time.

END OF SECTION

Project No.:

RFI Number: RFI-

Contractor or Sub-Contractor:

Date Prepared:

Action required by:

File:

Contractor:

RFI from:

Attention:

RFI Item	Question	Spec/Detail Ref
1	List RFI items here or refer to attached RFI document from contractor.	

Note: The following response provides an answer to the request for information noted herein. Proceeding with work in accordance with this response indicates the *Contractor's* acknowledgment that there will be no change in the *Contract Price* and/or *Contract Time*. If the *Contractor* believes that this response affects the *Contract Price* or *Contract Time*, the *Contractor* shall notify the *Consultant*.

RFI Item	Response

RFI Response by:

Date:

Attachments

list attachments or state "none"

1.1 SCHEDULE OF VALUES

- .1 Prior to the first application for payment, submit for Consultant's review an initial schedule of values. Modify the initial schedule of values if and as requested by Consultant. Obtain Consultant's written acceptance of the initial schedule of values prior to the first application for payment.
- .2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and Products delivered to Place of the Work.
- .3 Provide the schedule of values in an electronic spreadsheet format (PDF and EXCEL) based on a format acceptable to all parties to the Contract, that provides for inclusion of the following information:
 - .1 Identifying information including title and location of the Work, name of Contractor, number and date of application for payment, and period covered by the application for payment.
 - .2 A work breakdown structure that is sufficiently detailed and comprehensive to facilitate Consultant's evaluation of applications for payment at an appropriate level of detail.
 - .3 Provisions for approved Change Orders, allowances, and other relevant values, so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price. Also provide for indicating the estimated value of Change Directives within the schedule of values, separately from the current total Contract Price.
 - .4 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:
 - .1 Breakdown Amount: A dollar amount, including an appropriate pro rata portion of Contractor's overhead and profit.
 - .2 Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for payment, stated as a percentage of the Contract Price and in dollars.
 - .3 Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.
 - .4 Current Period: The value of Work performed and Products delivered to Place of the Work for which Contractor is currently applying for payment, stated in dollars.
 - .5 Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.

1.2 **CASH FLOW PROJECTION**

- .1 Prior to the first application for payment submit, for Consultant's review, a forecast of approximate monthly progress payments for each month of the Contract Time.
- .2 Submit revised cash flow forecasts on a monthly basis when required due to significant changes in rate of progress of the Work or significant changes in the Contract Price or as requested by Consultant.

1.3 **WORKERS' COMPENSATION CLEARANCE**

- .1 Submit proof of workers' compensation clearance with each application for payment.

1.4 **STATUTORY DECLARATIONS**

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

END OF SECTION

1 GENERAL

- 1.1 Coordination of the work of all Sections of the specifications as required to complete the Project is the responsibility of the Contractor.
- 1.2 Cooperate and coordinate with Other Contractors including Other Contractor's employed by Owner.
- 1.3 Ensure that Subcontractors and trades cooperate with other subcontractors and trades whose work attaches to or is affected by their own work. Ensure that minor adjustments are made to make adjustable work fit fixed work.
- 1.4 Allow access of Owner's Other Contractors on site and to areas of Work. Cooperate and coordinate with such Other Contractors. Schedule work to complement work of such Other Contractors.
- 1.5 Entry by the Owner's own forces and by Other Contractors shall not mean acceptance of the Work and shall not relieve the Contractor of their responsibility to complete the Contract.
- 1.6 Placing, installation, application and connection of work by the Owner's own forces or by Other Contractors on and to the Contractor's Work shall not relieve the Contractor of his responsibility to provide and maintain the specified warranties.
- 1.7 Coordinate with removals/installations specified in other Divisions and Other Contracts.
- 1.8 Coordination of the installation of systems specified in Divisions 21, 22, 23 and 26, including the interrelating operation and functioning between components of a system and between systems, is the responsibility of those performing the work of those Divisions, with final coordination the responsibility of the Contractor.
- 1.9 Coordinate relocation of existing mechanical and electrical items with work specified in Divisions 21, 22, 23, and 26.
- 1.10 Existing equipment shall remain in present locations unless designated otherwise. Protect from damage. Remove, store and reinstall existing fixed equipment, fixtures and components which interfere with construction and which are scheduled for relocation. Move, relocate or remove existing equipment as required to perform the work. Reinstall as required to make good.
- 1.11 Pay particular attention to types of ceiling construction and clearances throughout, especially where recessed fixtures are required. Coordinate work with Other Contractors and Subcontractors wherever ventilation ducts or piping installations occur to ensure that conflicts are avoided.
- 1.12 Install ceiling mounted components in accordance with final ceiling plans. Inform Consultant of conflicting installations.

- 1.13 Install and arrange ducts, piping, tubing, conduit, equipment, fixtures, materials and product to conserve headroom and space with minimum interference and in neat, orderly and tidy arrangement. Run pipes, ducts, tubing and conduit, vertical, horizontal and square with building grid unless otherwise indicated. Install piping, ducts, and conduit as close to underside of structure as possible unless shown otherwise.
- 1.14 Make provision, without interference or restriction by items located within the ceiling space, for unrestricted relocation of light fixtures to replace ceiling panels at grid spaces of the same size.
- 1.15 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Have cutting, drilling and other remedial work, and the subsequent patching or other work required for failing to comply with this requirement, performed at a later date at no additional Cost to Owner.
- 1.16 Properly coordinate the work of the various Sections and trades, taking into account the existing installations to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the work. Prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to the Consultant for review before the commencement of work. Proceed with work in these areas only as, and when directed by the Consultant.
- 1.17 Coordinate with mechanical and electrical trades to ensure protecting supporting, disconnecting, cutting off, capping, diverting, relocating or removing of existing services in areas of Work before commencement of alteration work.
- 1.18 In case of damage to active services on utilities, notify Consultant and respective authorities immediately and make all required repairs under direction of Consultant and respective authorities. Carry out repairs to such damaged services and utilities continuously to completion, including working beyond regular working hours. Costs to be borne by the Contractor.
- 1.19 Existing areas shall remain in use except where alteration work is actually in progress. Confine effects of Work to areas indicated on Drawings unless otherwise approved by Owner.

2 METRIC DIMENSIONS

- 2.1 Measurements in this specification are expressed in metric (SI) units and depending on the progress made in the various sectors of the industry are either hard or soft converted units.
- 2.2 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.

2.3 It is the Contractor's responsibility to check and verify with manufacturers and suppliers on the availability of materials and products in either metric or imperial sizes. Be responsible for coordinating products supplied in metric (SI) and imperial units into the overall layout.

2.4 Where both metric and imperial sizes or dimensions are shown, the metric size or dimension shall govern.

3 BUILDING DIMENSIONS

3.1 Take necessary job dimensions for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.

3.2 Verify that work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by requirements of the Drawings, and ensure that work installed in error is rectified before construction resumes.

3.3 Check and verify dimensions referring to the work and the interfacing of services.

3.4 Do not scale directly from the Drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Changes required through the disregarding of this clause shall be the responsibility of the Contractor. If diagrams are used to describe a scope of work, it is the contractors responsibility to complete actual building and site measurements to confirm lengths and quantities to complete the full scope of work

3.5 All details and measurements of any work which is to fit or to conform with work installed shall be taken at the building.

3.6 Advise Consultant of discrepancies and if there are omissions on Drawings, particularly reflected ceiling plans and jointing patterns for surfaces finishes, which affect aesthetics, or which interfere with services, equipment or surfaces. Do not proceed with work affected by such items without direction from the Consultant.

3.7 Provide written requirements for site conditions and surfaces necessary for the execution of respective work, and provide setting drawings, templates and all other information necessary for the location and installation of material, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels. Inform respective contractors whose work is affected by these requirements and preparatory work.

4 INTERFERENCE AND COORDINATION DRAWINGS

4.1 Provide interference drawings between all disciplines and provide interference drawing, indicating all items such as, but not necessarily limited to: all existing below-grade services and utilities to remain (based on on-site service locates), proposed sanitary and storm sewer piping, all utility and services lines, HVAC lines, electrical conduit, natural gas lines, water lines, and communication lines. Show invert elevations and identify crossovers where applicable. Any

interferences not captured in the interference drawings will be remedied at the contractor's expense.

- 4.2 Coordinate placement of equipment to ensure that components will be properly accommodated within the spaces provided prior to commencement of work.
- 4.3 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided. Provide copies of interference drawings to Consultant when requested by Consultant.
- 4.4 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.
- 4.5 Take complete responsibility for any remedial work that results from failure to coordinate any aspect of the Work prior to its fabrication/installation.
- 4.6 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are provided in the layout of equipment and services.
- 4.7 The Statement of values included in Applications for Payment shall include a line item the *Contractor's* allocation for "delivery of complete interference and coordination drawings" in an amount to the satisfaction of the consultant and the owner.

5 SLEEVING AND INSERT DRAWINGS AND TEMPLATES

- 5.1 Prepare sleeving drawings for work of Divisions 21, 22, 23, and 26, showing size and location of all penetrations through load bearing elements. Submit sleeving drawings in the form of one transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.
- 5.2 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings in the form of a transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.
- 5.3 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, fixtures, equipment, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires cooperative location and installation by other Sections, and that such information is communicated to the applicable installer.
- 5.4 Provide cutting, fixing and making good to the work of Other Contractors, Subcontractors and trades as required for sleeving and inserts and make up time lost as a result of failure to comply with this requirement, at no additional cost to the Owner.

1 CONSTRUCTION START-UP MEETING

- 1.1 Promptly after Contract award, Contractor shall establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. Contractor shall notify Consultant at least 5 Working Days before the meeting.
- 1.2 Senior representatives of Owner, Consultant(s), and Contractor, including Contractor's project manager and site superintendent, and major Subcontractors, shall be in attendance.
- 1.3 Consultant will arrange attendance of other interested parties not responsible to the Contractor. Consultant will prepare and distribute copies of Agenda prior to meeting.
- 1.4 Agenda will include but not be limited to the following topics as are pertinent to the Contract.
 - .1 Review project communications procedures.
 - .2 Contract Documents for construction purposes.
 - .3 Construction progress meetings
 - .4 Review contract administration requirements including submittals, payment, and change order procedures.
 - .5 Construction progress schedule, including long lead time items for positive action.
 - .6 Submittals schedule and procedures
 - .7 Identify all critical points on construction schedule for positive action.
 - .8 Identify any product availability problems and substitution requests.
 - .9 Establish site arrangements and temporary facilities, including site telephone available for conference during site meetings when required.
 - .10 Contractor's mobilization and construction facilities.
 - .11 Establish work restrictions, site arrangements, and temporary facilities.
 - .12 Review Consultants inspection requirements.
 - .13 Quality requirements, including testing and inspection procedures.
 - .14 Temporary controls, utilities, barriers and enclosures.
 - .15 Field engineering and layout of work.
 - .16 Site safety and security.
 - .17 Cleaning and waste management.

- .18 Review any points which, in Owner's, Consultants, and Contractor's opinion, require clarification.

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

1.6 Consultant will record minutes of meeting and distribute type written copies to all participants and other interested parties, within one week of meeting date.

2 CONSTRUCTION PROGRESS MEETINGS

2.1 Attend regularly scheduled progress meetings to be held on Site at times and dates that are mutually agreed to by the Owner, Consultant, and Contractor.

2.2 Contractor to arrange for and provide physical space for meetings. Meeting space to include a TV monitor and all A/V equipment as required to allow for stakeholders to attend virtual meetings.

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

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

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

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

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

2.8 Prepare and distribute copies of Agenda prior to meeting.

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

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

- .1 Review and agreement of previous minutes.

- .2 Construction safety.

- .3 Work progress since previous meeting.

- .4 Field observations, including any problems, difficulties, or concerns.
 - .5 Construction progress schedule.
 - .6 Submittal schedule and status of submittals, complete with Ready-for-Takeover and Occupancy date.
 - .7 Quality control.
 - .8 Coordination.
 - .9 Contract Schedule.
 - .10 Work plan up to next scheduled meeting.
 - .11 Requests for information/clarification.
 - .12 Proposed changes in the Work.
 - .13 Other business.
- 2.11 Record minutes of meeting and distribute type written copies to all participants and other interested parties, within one week of meeting date.
- 3 MEETINGS WITH OTHER CONTRACTORS**
- 3.1 Consultant will arrange and organize coordination meetings with Other Contractors working on the Project.
- 3.2 Attend all such meetings and ensure that representative has required authority to commit Contractor to actions agreed upon.

END OF SECTION

1 GENERAL

- 1.1 Be responsible for planning and scheduling the Construction Progress Documentation of the Work.
- 1.2 Be responsible for ensuring that Subcontractors plan and schedule their respective portions of the Work. Subcontractor's schedules shall form part of the above mentioned schedules.

2 SCHEDULE MANAGEMENT

- 2.1 Be responsible for planning and scheduling of the Work. As a minimum, prepare and update the following schedules:
 - .1 Contract Schedule.
 - .2 Detailed Construction Schedule.
 - .3 Submittals Schedule.
- 2.2 A schedule submitted as specified and accepted by Consultant shall become the baseline schedule and shall be used as the baseline for updates.
- 2.3 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Consultant and Owner, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.
- 2.4 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

3 CASH FLOW CHART

- 3.1 Within 7 days after award of Contract, submit, in form approved by Consultant, cash flow chart broken down on a monthly basis in an approved manner. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.
- 3.2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant. Maintain original cash flow projection in subsequent months' cash flow charts, for tracking purposes.

4 CONTRACT SCHEDULE

- 4.1 Prepare and submit, in a format acceptable to the Owner, the Contract Schedule within 10 Working Days following award of Contract. This schedule, once it is reviewed by the Consultant and Owner and if it meets the project requirements, will form part of the Contract. Allow for minimum one revision on all submittals.

-
- 4.2 Contract Schedule shall be developed using a logic network technique for planning and scheduling.
- 4.3 Contract Schedule shall be submitted for approval in its optimum levelled form. This presentation may be in either a time scaled network or a bar chart form. It shall be subdivided into either work areas or systems as applicable.
- 4.4 Contract Schedule shall include but not be limited to the following information. Information to be provided in a sufficient level of detail to effectively manage the construction process.
- .1 Starting and ending dates, milestones, and key activities of each activity including the float periods.
 - .2 Cash flow chart listed in Clause 3 of this Section.
 - .3 Manpower requirements for each activity.
 - .4 Work Packages.
 - .5 Order and delivery dates for long delivery Products and major or critical equipment.
 - .6 Interdependency with activities of other Contractors.
 - .7 Dates specified in the Contract Documents.
 - .8 Milestone dates for Ready-for-Takeover and Substantial Performance of the Work.
 - .9 Occupancy date.
 - .10 Inspection and testing activities.
 - .11 Dates on which specific data will be required for submittal, i.e., Vendor data, shop drawings, samples, etc.
 - .12 Preparation and review of Mock-ups.
 - .13 Consultant periods for review as per contract.
 - .14 Contractor subsequent revisions and re-submission.
 - .15 Consultant revised review.
 - .16 Shutdown or closure activities.
 - .17 Demonstration and training activities.
- 4.5 Submit updated schedule to the Consultant and Owner monthly. This schedule shall be reviewed at all project meetings indicating as a minimum actual and projected start and finish dates, report date line and progress, activity relationships, float, Contract changes as well as major changes to the schedule.

5 DETAILED CONSTRUCTION SCHEDULE

- 5.1 Prepare and submit a detailed construction schedule within 10 Working Days of final review and acceptance of the Contract Schedule. This schedule, once reviewed and accepted by the Consultant, will be updated and submitted monthly with the Contract Schedule and weekly once the Contractor starts on Site.
- 5.2 This schedule shall cover the construction period. It will show, in detail, activities on a daily basis indicating durations, manpower and constraints. The activities shown on this schedule shall further clarify or detail the activities shown on the Contract Schedule.
- 5.3 The schedule shall indicate the start and duration of activities that may cause disruption to occupants within 25 James Street. Activities should include a description of the activity, and occupant impacts including, but not limited to, odour, vibration, noise, dust, and any impact to building services such as power, water, sanitary, fire alarm, or life safety systems.
- 5.4 The detailed construction schedule shall be presented in a bar chart form and include for all items listed in Clause 4.4 of this Section.

6 SUBMITTALS SCHEDULE

6.1 Format and Content:

- .1 Prepare schedule identifying all required Shop Drawing, Product data, and sample submissions, including samples required for testing.
- .2 Prepare schedule in electronic format acceptable to Owner.
- .3 Provide a separate line for each required submittal, organized by Specification section names and numbers, and further broken down by individual Products and systems as required.
- .4 Allow time in schedule for review of submittals and resubmission of submittals, should resubmission be necessary. Refer to Submittal Procedures for specific required review durations associated with specific scopes of work and incorporate into Submittals Schedule.

6.2 Submission:

- .1 Submit initial schedule to Consultant within 15 Working Days after Contract award.
- .2 Submit schedule in format acceptable to Owner.

- .3 If changes are required, resubmit finalized schedule within 5 Working Days after return of review copy.
- .4 Submit updated submittals schedule monthly to Owner and Consultant.

7 PROGRESS RECORDS

- 7.1 Maintain on site, permanent written records of daily progress of the Work. Records shall be open to review by Consultant and Owner at all times and a copy shall be furnished to Consultant on a weekly basis.
- 7.2 Records shall show dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to number of employees of various trades and type and quantity of equipment employed daily, temperature, protection methods and other such data shall be noted.

8 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

- 8.1 Obtain from Consultant an electronic copy of the construction Drawings for the purpose of creating as-built drawings. Record information in electronic form Portable Document Format (PDF) and AutoCAD, clearly identifying as-built deviations from the originally obtained construction Drawings.
- 8.2 Electronic copies of Contract Drawings can be obtained from Consultant in PDF format for Architectural Drawings. AutoCAD drawings may be supplied for floor plans, and elevations only. A 'Release/Terms of Use' waiver will be required to be signed at the Consultant's sole discretion. Any costs incurred are not included in Contract and are to be borne by the Contractor.
- 8.3 Authorized deviations from drawings shall be marked in red accurately on one set of drawing prints in a neat, legibly printed manner and shall be dated. Submit updated drawings to the Consultant monthly. Prior to final inspection, neatly transfer the recorded information to a second set of drawing prints of the most recent revision to the drawings and submit both sets to the Consultant.
- 8.4 In addition to the hard copies transfer all as built information in computer model format. This digital copy of "As-Built" to be in AutoCAD or Revit 2020 format. Submit the AutoCAD or Revit Model "As-BuiltCopy" file(s) on one Memory/USB stick.
- 8.5 Maintain as-built drawings up to date as Work progresses. Status of maintained as-built drawings may be considered as a condition for validation of applications for payment. Make as-built drawings available to the Consultant at all times.
- 8.6 Record actual construction including but not limited to the following:
 - .1 Accurate dimensioned record of deviations and changes in Work from drawings.

- .2 Measured depths of elements of foundation in relation to finish first floor datum.
 - .3 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .4 Measured locations of pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.
 - .5 Field changes of dimension and detail.
 - .6 Changes made by Change Orders and Supplemental Instructions
 - .7 References to Shop Drawings, where Shop Drawings show more detail.
 - .8 Do not use as-built drawings for construction purposes.
-
- 8.7 Accurately record locations of concealed structure, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration Work and future additions. Do not conceal such Work until the location has been recorded.
 - 8.8 Accurately record locations of equipment bases, anchors, concrete pads and roof curbs, sleeves, piping, conduits, ducts, maintenance holes and valves, etc. located either below, outside or within structure.
 - 8.9 Where piping, conduits and ducts are underground, underfloor, embedded in concrete or otherwise in inaccessible locations, accurately record with respect to structure column lines or walls and elevations with respect to finished floor levels or grades referenced to the centre line of components.
 - 8.10 Accurately record any components which will be in inaccessible locations for Consultant's review before the component is covered, or buried, or made inaccessible.
 - 8.11 As-built drawings shall be signed and dated by Contractor.
 - 8.12 Submit as-built drawing to Consultant for review and make corrections as directed by Consultant.
-
- 9 **PROGRESS PHOTOGRAPHS**
 - 9.1 Concurrently with monthly application for payment submit 2 USB storage devices with digital pictures in high definition, in format acceptable to Owner, illustrating the progress of the Work as follows:
 - .1 A minimum of 20 pictures that best illustrate the progress on the site.

- .2 Pictures shall be in focus and properly illuminated; view shall be unobstructed .
 - .3 Pictures shall be taken with a minimum 10-megapixel camera or better such that quality and details can be discerned from photo.
 - .4 Pictures shall either have an accurate date-stamp present in the photo or be numbered and dated in the original digital filename.
 - .5 The USB storage devices containing the photos shall be labeled with the following information: The project name, date taken, the period the pictures are taken in, name of photographer, description of view and date of photograph taken, and the monthly application number which the pictures are associated with.
- 9.2 Do not use progress or any other Project photographs for promotional purposes without Owner's written consent.

10 **PROGRESS REPORTS**

- 10.1 Prepare a monthly progress report current to the last Friday of each month. The report shall indicate the period covered and include but not be limited to the following:
- .1 Executive Summary.
 - .2 Areas of Concern/Action Required.
 - .3 Work Accomplished This Period.
 - .4 Work Planned Next Period.
 - .5 Schedule Status.
 - .6 Budget Status.
 - .7 Status of Submittals.
 - .8 Quality Control.
 - .9 Contract Changes.
 - .10 Outstanding Actions.
- 10.2 Submit the monthly progress report such that it is received by the Consultant no later than the Wednesday following the last Friday of the month, regardless of whether or not the Monday is a public holiday.

END OF SECTION

1 GENERAL

- 1.1 Provide labour, Products, equipment, services tools and supervision necessary for submittals. Make submittals specified in this Section to Consultant unless otherwise specified.
- 1.2 Submit electronic copies of submittals in PDF format acceptable to Owner where submittals are specified in technical Specifications. Ensure PDF documents include all layers and are not “flattened”.
- 1.3 Submit submittals to Consultant for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time or for Product substitutions or other deviations from the Drawings and Specifications
- 1.4 Verify accuracy and completeness of submittals prior to submission.
- 1.5 Verify field measurements, field construction criteria, catalogue numbers and similar data.
- 1.6 Coordinate each submittal with requirements of the Work and the Contract Documents.
- 1.7 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.
- 1.8 Do not proceed with Work affected by a submittal until review is complete.
- 1.9 Present Shop Drawings, Product data, and samples in SI metric units. Where items or information is not produced in SI metric units, converted values are acceptable.
- 1.10 Supplement standard information to include details applicable to Project.
- 1.11 Review submittals and affix Contractor's review stamp prior to submission to Consultant. Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and Contract Documents.
- 1.12 Submittals not meeting specified requirements will be returned without comments.
- 1.13 Reproduction of construction Drawings to serve as background for Shop Drawings is not permitted without written permission of Consultant.
- 1.14 Do not propose Substitutions or deviations from Contract Documents via Shop Drawing, Product data and sample submittals. No changes to the Contract

Documents are allowed be made via submittals. Should the Contractor submit Substitutions or deviations in this manner any impact to the schedule as a result will be the responsibility of the Contractor and no construction delay and associated cost will be able to be claimed by the Contractor.

- 1.15 Notify Consultant in writing at time of submission on a separate accompanying letter, complete with Contractor letterhead, of any deviation in submittals from requirements of the Contract Documents. Should the Contractor fail to notify the Consultant, and as a result, any work required to be re- fabricated, re-manufactured, re-erected, and/or re-installed in accordance with the contract Documents, or any impact to the schedule, will be the responsibility of the Contractor and no construction delay and associated cost will be able to be claimed by the Contractor.
- 1.16 Requests for substitution shall follow section 01 60 01 and include Product and material conformance form.
- 1.17 Submit in accordance with dates established under Section 01 32 00 for shop drawings, fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.
- 1.18 Accompany each submittal with a letter of transmittal in duplicate containing all pertinent information required for identification and checking of submittals including but not limited to the following:
 - .1 Date of initial submission and date of each subsequent submission if required.
 - .2 Project title and Consultant's project number.
 - .3 Names of:
 - .1 Contractor.
 - .2 Subcontractor.
 - .3 Supplier/manufacturer/fabricator as applicable.
 - .4 Identification of each submittal item and quantity.
 - .5 Specification section numbers to which submission is related.
 - .6 Countersigned stamp of Contractor certifying that they have reviewed the submission.
- 1.19 Where a submittal includes information not applicable to the Work, clearly identify applicable information and strike out non-applicable information.
- 1.20 Allow 10 working days for the Consultant's review, if to be reviewed by only one *Consultant* (discipline), and, 15 working days, if to be reviewed by more than one *Consultant* (discipline), of each submission, without prejudice of what is included in the different disciplines respective specs. In case of discrepancy the longer period stands.

- 1.21 If upon Consultant's review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of Work may proceed.
- 1.22 If upon Consultant's review significant errors or omissions are discovered, a so noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.
- 1.23 Consultant's notations on submittals are intended to ensure compliance with Contract Documents and are not intended to constitute a change in the Work requiring change to the Contract Price or Contract Time.
- 1.24 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the Work proceeds. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant. Contractor to modify submittal schedule and Contract Schedule in accordance with Section 01 32 00. Any impact to the schedule as a result of resubmission will be the responsibility of the Contractor and no construction delay and associated cost will be able to be claimed by the Contractor.
- 1.25 When submittals are resubmitted, transmit under a new letter of transmission.
- 1.26 Do not carry out Work until Consultants review of submittals has been completed.
- 1.27 Be responsible for payment of charges for delivery of submissions and resubmission to Consultant.
- 1.28 Notation on shop drawings indicating "by other" or similar is not permitted. Contractor to identify specific trade responsible for scopes of work identified

2 PRODUCT DATA

- 2.1 Before delivery of Products to the Site, submit Product data as specified in each section or as requested by the Consultant.
- 2.2 Product data submittals shall include Safety Data Sheets (SDS) for all controlled Products.
- 2.3 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable/specified standards.

3 SHOP DRAWINGS

- 3.1 Arrange for the preparation of Shop Drawings as called for in the Contract Documents or as may be reasonably requested by the Consultant. The Contractor and each Subcontractor shall operate as experts in their respective fields and all Shop Drawings and samples shall conform to the requirements of the Contract Documents. The Work included in Shop Drawings may include work by different sections and must encompass all elements of a complete assembly.

- 3.2 The term "Shop Drawings" means drawings, diagrams, schematics, illustrations, schedules, performance charts, brochures and other data which are required to illustrate details of the Work.
- 3.3 In addition to Shop Drawings specified in the specification sections, submit Shop Drawings required by jurisdictional authorities in accordance with their requirements.
- 3.4 Shop Drawings for openings, sleeving and conduit
 - .1 Prior to preparation of Shop Drawings, coordinate sizes of all structural openings and sleeves with respective fabricators for mechanical ducting. Adjustments to the opening sizes indicated on the Contract Drawings shall not be made without the approval of the Consultant.
 - .2 Prior to detailing structural reinforcement on Shop Drawings, arrange for the Structural Engineer to review formed holes, recesses and sleeving. Completely dimension openings, recesses and sleeves and relate to appropriate grid line(s) and elevation(s).
 - .3 Prior to forming of the structure, arrange for the preparation of Shop Drawings for review by the Consultant showing embedded conduit to be cast within the structure. Shop Drawings shall include conduit from all sources.
- 3.5 Shop Drawings shall indicate the following minimum criteria and any additional criteria indicated in the individual specification sections requiring Shop Drawings:
 - .1 Clear and obvious notes of any proposed changes from the Contract Documents.
 - .2 Indicate Products, methods of construction, and attachment or anchorage, fabrication and erection diagrams, dimensions, connections, explanatory notes and other information necessary for completion of the Work
 - .3 Fabrication and erection dimensions.
 - .4 Provisions for allowable construction tolerances and deflections provided for live loading.
 - .5 Where Products attach or connect to other Products, indicate construction arrangements and details of the parts and their connections, and interconnections with other work and that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.
 - .6 Location and type of anchors and exposed fastenings.
 - .7 Materials, physical dimensions including thicknesses, and finishes.
 - .8 Descriptive names of equipment.
 - .9 Mechanical and electrical characteristics when applicable.
 - .10 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnection work.

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- .11 Assumed design loadings, and dimensions and material specifications for load-bearing members.
- 3.6 Include in Shop Drawing submissions detailed information, templates, and installation instructions required for incorporation and connection of the Work.
- 3.7 Ensure shop drawings are of one uniform size and based on field measurements.
- 3.8 Before submitting to the Consultant, review all Shop Drawings to verify that the Products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers and similar data and that it has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a qualified person possessing the appropriate authorization from the Contractor.
- 3.9 Be responsible for dimensions, confirmed at the Site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the Work of all subtrades.
- 3.10 Submit Shop Drawings for the Consultant's review with reasonable promptness and in orderly sequence so as to cause no delay in the Work nor in the work of Other Contractors. At the time of submission, notify the Consultant in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents. The Contractor will be held responsible for changes made from the Contract Documents which are not indicated or otherwise communicated in writing with the submission. Contractor to modify submittal schedule and Contract Schedule in Section 01 32 00. Any impact to the schedule as result of changes will be the responsibility of the Contractor and no construction delay and associated cost will be able to be claimed by the Contractor.
- 3.11 Drawings submitted by the Contractor as required herein are the property of the Owner who may use and duplicate such drawings where required in association with the Work.
- 3.12 Submit Shop Drawings signed and sealed by a licensed Professional Engineer registered in the place of the Work where indicated in individual Sections. Where a licensed professional engineer is responsible for the design, signing and stamping the shop drawings, the licensed professional engineer is required to conduct shop and on-site inspections, prepare and submit written inspection reports, and provide a sign-off letter at the end of the work, where indicated in the individual sections.
- 3.13 Shop Drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints at original as well as reduced size.
- 3.14 Provide submissions in electronic Portable Document Format (PDF) format delivered via electronic means as directed by the Consultant.

- 3.15 Shop Drawings shall contain the following identification:
- .1 Date and revision dates.
 - .2 Project name and Contract number.
 - .3 Applicable 6-digit Contract Specification number describing the item.
 - .4 Location (unit, level, room number, etc.).
 - .5 Name of equipment or Product.
 - .6 Name and address of Subcontractor or supplier/fabricator.
 - .7 Contractor's stamp, date, and signature of Contractor's authorized representative responsible for Shop Drawing review, indicating that each Shop Drawing has been reviewed for compliance with Contract Documents and, where applicable, that field measurements have been verified.
 - .8 Details of appropriate portions of the Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationships to other parts of the Work.
 - .9 On submissions subsequent to the first, the following additional identification:
 - .1 The revised submission number and date.
 - .2 Bubbled Identification of the item(s) revised.
 - .10 Where a licensed professional engineer is responsible for the design, signing and stamping the shop drawings, the licensed professional engineer is also required to include confirmation in a conspicuous location in the shop drawings and design calculations that 'The proposed Work will conform to the Ontario Building Code 2012, applicable CSA standards and any other applicable standards and regulations related to the work.'
 - .11 The parts of the proposed Work stated in 3.15.10 can include work by different sections and must encompass all elements of a complete assembly
- 3.16 Dimensions and designations of elements shall be shown in the same system of measurement used on the applicable Contract Drawings.
- 3.17 The Consultant reserves the right to refuse acceptance of drawing submissions not meeting the above requirements.
- 3.18 The Consultant's review will be for conformity to the design concept and for general

arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of responsibility for meeting all

requirements of the Contract Documents unless a deviation on the Shop Drawings has been approved in writing by the Consultant on a separate accompanying letter, complete with Consultant letterhead. Review does not mean that Consultant approves detail inherent in Shop Drawings, responsibility which shall remain with Contractor submitting same.

- 3.19 The Contractor shall make any changes in Shop Drawings which the Consultant may require consistent with the Contract Documents and re-submit unless otherwise directed by the Consultant. When re-submitting the Shop Drawings, the Contractor shall notify the Consultant in writing on a separate accompanying letter, complete with Contractor letterhead, of any revisions other than those requested by the Consultant.
- 3.20 Shop drawings consultant review stamp will be marked as follows:
- .1 Marked as *Reviewed*: Shop drawing follows the Contract Documents' general design concept intent and general arrangement. May proceed to fabrication, manufacture, erection and installation, unless otherwise noted.
 - 2 Marked as *Reviewed as Noted*: Shop drawing follows the Contract Documents' general design concept intent and general arrangement, provided all noted items are addressed prior to fabrication, manufacture, erection and installation.
 - .3 Marked as *Revise and Resubmit*: Shop drawing does not follow the Contract Documents' general design concept intent and general arrangement. Requires revision and resubmission as per consultant comments.
- 3.21 Only drawings noted for revision and resubmission need be resubmitted.
- 3.22 File one copy of each submitted Shop Drawing at the Site.

4 **SAMPLES**

- 4.1 Before delivery of Products to the Site, submit samples of Products as specified or as requested by the Consultant. Label samples as to origin and intended use in the Work and in accordance with the requirements of the Specification Sections. Samples must represent physical examples to illustrate materials, equipment or work quality and to establish standards by which completed Work is judged.
- 4.2 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:
- .1 The quality and functional characteristics of Products, including integrally related parts and attachment devices.
 - .2 The full range of colours available.
- 4.3 Notify the Consultant in writing, at time of submission, of any deviations in samples from requirements of the Contract Documents, and/or reviewed shop drawings, and state the reasons for such deviations. Failure to do so may require the Contractor to redo the

work, even in the event of review by the Consultant and/or fabrication, manufacture, erection and installation has occurred. Any impact to the schedule as a result will be the responsibility of the Contractor and no construction delay and associated cost will be able to be claimed by the Contractor.

- 4.4 Identify samples with Project name, Contract number, date, Contractor's name, number and description.
- 4.5 Consultant selection from samples is not intended to change the Contract Price or Contract Time. If a selection would affect the Contract Price or Contract Time, notify Consultant in writing prior to proceeding with the Work.
- 4.6 If samples are not acceptable, both samples will be returned. If samples are acceptable, one sample will be so indicated and returned. Samples returned shall be stored on site and available to the consultant and owner at all times. Be responsible for the cost of samples that are not accepted and for resubmission of samples.
- 4.7 Resubmit samples as required by Consultant to comply with Contract Documents.
- 4.8 Reviewed and acceptable samples will establish the standard against which installed Work will be reviewed.
- 4.9 Each Product incorporated in the Work shall be precisely the same in all details as the acceptable sample.
- 4.10 Should there be any change to the accepted sample, submit in writing for approval of the revised characteristics and resubmit samples of the Product for approval if requested.
- 4.11 When samples are very large, require assembly, or require evaluation at the Site, they may only be delivered to the Site with approval and as directed.
- 4.12 Sample and colour selection chart submissions will be physical samples of the specified product. PDF or electronic format submissions of the specified sample will not be considered an acceptable sample submission.

5 CERTIFICATES

- 5.1 Submit certificates that are required by authorities having jurisdiction or that are requested in the applicable specification sections.
- 5.2 Clearly show on each certification the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery and name of certifying company.
- 5.3 Certificates shall verify that Products and/or methods meet the specified requirements and shall include test reports of testing laboratories approved to validate certificates.
- 5.4 Submit certificates in duplicate and signed by an authorized representative of the certifying company.

6 CERTIFICATION OF TRADESMEN

- 6.1 Provide certificates, at the request of the Consultant, to establish qualifications of

personnel employed on the Work, such as, but not limited to, foreman and laborers,

where such certification is required by authorities having jurisdiction, by the Consultant or by the Contract Documents.

7 EXTENDED WARRANTIES

- 7.1 Submit extended warranties as requested in sections of the Specifications showing title and address of Contract, warranty commencement date and duration of warranty.
- 7.2 Extended warranties shall commence on termination of the standard warranty specified in the conditions of the contract and shall be an extension of these provisions. Clearly indicate what is being warranted and what remedial action is to be taken under the warranty. Ensure warranty bears the signature and seal of the Contractor.
- 7.3 Submit each extended warranty on a form that is acceptable to the Owner and Consultant.

8 INSPECTION AND TEST REPORTS

- 8.1 Submit inspection and test reports as specified in the Sections of the specifications for "Source Quality Control" and "Field Quality Control" within 3 working days of inspection or testing. If immediate action is required by the Contractor or Consultant inform the Consultant immediately and submit inspection and testing report within one working day.
- 8.2 Submit 3 copies of reports submitted with certificates of compliance indicating but not limited to the following:
 - .1 Project name and number.
 - .2 Date of inspection or test and date report is issued.
 - .3 Name and address of inspection and testing company.
 - .4 Name and signature of inspector or tester.
 - .5 Identification of Product and Specification Section covering inspected or tested work.
 - .6 Specified requirements for which the inspection or testing was performed and results of inspections or tests.
 - .7 Location of inspection or from which tested material was derived.
 - .8 Overview of inspection and testing methods and procedures.
 - .9 Remarks and observations on compliance with Contract Documents.
- 8.3 Inspection and test reports shall be signed by a responsible officer of the inspection and testing company.

9 **PROGRESS PHOTOGRAPHS**

9.1 Submit Progress photographs in accordance with Section 01 32 00.

10 **PROGRESS REPORTS**

10.1 Submit record documents in accordance with Section 01 32 00.

11 **OPERATION AND MAINTENANCE MANUALS**

11.1 Submit Operation and Maintenance Manuals in accordance with Section 01 78 23.

12 **RECORD DOCUMENTS**

12.1 Submit record actual site conditions on as-built drawings in accordance with Section 01 32 00.

END OF SECTION

1 **CONSTRUCTOR**

- 1.1 For the purposes of the Contract, the term "Constructor", as defined in the Occupational Health and Safety Act, shall mean the Contractor who shall be responsible for ensuring that the provisions of the statutes, regulations and by-laws pertaining to the safe performance of the Work are to be observed. The "Constructor" shall submit the Notice of Project.
- 1.2 In the event of conflict between any of the provisions of Statutes, Regulations and By-laws, and other requirements of authorities, the most stringent provision applies.
- 1.3 the Contractor's representative shall be responsible for ensuring that the provisions of statutes, regulations and by-laws pertaining to safe performance of the Work and the work of Other Contractors and Owner's own forces working on the Site are observed and that the methods of performing the Work do not endanger the personnel employed thereon nor the general public, and are in accordance with the latest edition of the Occupational Health and Safety Act. Include on the Joint Health and Safety Committee representatives of Other Contractors working on Site.
- 1.4 Prior to the Contractor's representative being absent from the Site for an extended period during execution of the Work, the Contractor's representative will name, in writing to the Consultant, another person who is competent to assume these responsibilities. The Contractor shall advise the Consultant of change of the individual identified as the Contractor's representative.
- 1.5 At the discretion of the Consultant, the "Constructor" designation may be transferred to/from a Contractor at any time at no additional cost to the Owner.

2 **PROJECT RESPONSIBILITIES**

- 2.1 The Contractor's representative shall ensure that:
- 2.2 All measures and procedures prescribed by the following Acts and Regulations are carried out on Site:
- .1 The Occupational Health and Safety Act;
 - .2 The Regulations for Construction Projects;
 - .3 WHMIS Regulations;
 - .4 The Environmental Protection Act and regulations,
 - .5 All other legislation, regulations and standards as applicable.
- 2.3 Every employer and every worker performing Work on the Site must comply with the requirements referred to above.

- 2.4 Ensure that the health and safety of workers, employees of the Owner and the general public are protected in relation to the Work performed on the Site.

3 **WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)**

- 3.1 Be familiar with and comply with WHMIS regulations.
- 3.2 Properly label controlled products. Provide proper warning labels and training at the Site.
- 3.3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS. Log shall be open for inspection by Owner, Consultant and all personnel on Site.
- 3.4 Provide copies of safety data sheets (SDS) for any controlled products prior to delivery to the Site.
- 3.5 Be responsible for all applicable requirements of the regulations.
- 3.6 Before commencing any Work on Site, attend the pre-construction meeting and provide the Consultant with a proposal as to how hazardous materials will be stored and dispensed on Site. In addition, specifically outline the measures which will be undertaken to prevent damage or injury in the event of an accidental spill.
- 3.7 Provide "Handling Procedure for Hazardous Materials".

4 **JOINT HEALTH AND SAFETY COMMITTEE**

- 4.1 The Contractor shall be responsible for the establishment and operation of the Joint Health and Safety Committee as required by the Occupational Health and Safety Act.

5 **DELIVERABLES**

- 5.1 The Contractor shall deliver to the Consultant:
- .1 The Contractor's Occupational Health and Safety Policy.
 - .2 The Contractor's safety program to implement the Occupational Health and Safety Policy for the Contract, which will effectively prevent and control accidents for the Contract.
 - .3 A copy of all communications with, and including all orders by, the Ministry of Labour or other occupational health and safety enforcement authority.
 - .4 A copy of all accident/injury investigation reports, not just the WSIB Form 7. Each report must contain a statement of actions that will be taken to prevent a recurrence.

- .5 A copy of all inspection reports made by the Contractor in compliance with the employer's responsibility under the Occupational Health and Safety Act.
 - .6 A copy of all safety information pertaining to the Contract made and furnished by the Contractor's own "Safety Personnel" or outside consultants/advisers engaged for the purpose of inspecting the workplace for occupational health and safety.
 - .7 A verification that all workers in the employ of the Contractor on Site, have had a WHMIS training or refresher course within the last twelve months.
 - .8 A verification that all workers in the employ of the Contractor have had "Explosive Activated Tool Training" on the type of tools being used.
 - .9 A verification that the instruction manuals are on Site for all tools and equipment being used.
 - .10 A copy of the most recent workers compensation experience rating account, i.e. CAD-7, NEER, and/or an insurance carrier's experience rating account.
 - .11 Statistical information for the purpose of determining injury frequency and severity rates (hours worked, first-aid injuries, medical aid injuries, lost time injuries, restricted workday injuries, near-miss accident/incident and significant occurrence data), in a timely manner as required by the Consultant.
 - .12 The immediate reporting to the Consultant of all instances that are defined in the Occupational Health and Safety Act as "Notices of Injuries" and "Occurrences" and any occasion that a worker exercises their "Right to Refuse Unsafe Work".
- 5.2 The Consultant reserves the right to require additional or amended deliverables pertaining to safety during the duration of the Work at no additional cost to the Owner.
- 5.3 Items specified above shall be delivered to the Consultant prior to the Contractor commencing Work on the Site.

6 DUE DILIGENCE

- 6.1 The Contractor acknowledges that it has read and understands the measures and procedures relating to occupational health and safety as prescribed above. The Contractor acknowledges and understands its duties as therein set out and hereby expressly undertakes and agrees to comply with all such requirements and standards in their entirety and at the Contractor's expense.
- 6.2 The Contractor further agrees to fully cooperate with all health and safety requirements, rules, regulations, standards and criteria set out in the Contract Documents, which agreement is in furtherance of the Contractor's duties and responsibilities under occupational health and safety legislation.

- 6.3 The Contractor agrees that if, in the opinion of the Consultant or Owner, the health and safety of a person or persons is endangered or the effective operation of the system put in place to ensure the health and safety of workers on the Site is not being implemented, the Consultant or Owner may take such action as it deems necessary and appropriate in the circumstances, including, without limitation, the following:
- .1 Require the Contractor to remedy the condition forthwith at its own expense;
 - .2 Require that the Site be shut down in whole or in part until such time as the condition has been remedied;
 - .3 Remedy the problem and the Owner shall back-charge the Contractor for the cost of such remedial work, together with an appropriate overhead factor as determined by the Owner in its sole discretion; and
 - .4 Terminate the Contract without further liability in the event the Contractor fails to comply with these provisions.
- 6.4 If a lien is registered, in respect to any monies held back, back-charged or assessed in accordance with these paragraphs, the Contractor shall consent to an order vacating such registration and shall indemnify the Owner for any and all loss, whereby direct or consequential which the Owner may sustain as a consequence of such registration.
- 7 **SITE SAFETY PERSONNEL**
- 7.1 In the event the Consultant deems it necessary, because of the Work, the Contractor shall assign a "Competent Safety Person" to assist the Contractor's representative in the discharging of safety responsibility, at no additional cost to the Owner.

END OF SECTION

1 GENERAL

- 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.
- 1.2 Employment of inspection and testing agencies by Contractor or Owner does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.
- 1.3 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off site manufacturing and fabrication plants.
- 1.4 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections.
- 1.5 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

2 INSPECTION AND TESTING BY OWNER

- 2.1 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.
- 2.2 Owner retained inspection and testing:
 - .1 The Consultant, on behalf of the Owner may appoint an independent inspection and testing company to carry out quality control reviews of parts of the Work for conformance to the Contract Documents.
 - .2 Such costs for inspection and testing will be paid by the Owner. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.
- 2.3 Inspection and testing under allowances:
 - .1 Submit a list of inspection and testing agencies for approval by the Owner and Consultant. Inspection and testing services will be tendered by the Contractor and the results submitted to the Consultant for review and approval.

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

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

3 **INSPECTION AND TESTING BY CONTRACTOR**

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

- 3.2 Source and Field Quality Control specified in Other Sections:

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

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

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

4 **INSPECTION BY CONTRACTORS LICENSED PROFESSIONAL ENGINEER**

- 4.1 The Professional Engineer is required to conduct shop and on-site inspections, prepare and submit written inspection reports, and provide a sign-off letter at the end of the work.

5 **QUALIFICATIONS OF INSPECTION AND TESTING COMPANIES**

- 5.1 Inspection and testing companies to be certified by the Standards Council of Canada (SCC) or Canadian Council of Independent Laboratories (CCIL).

- 5.2 Companies engaged for inspection and testing shall provide equipment, methods of recoding and evaluation, and knowledgeable personnel to conduct tests precisely as specified in reference standards.

- 5.3 If requested, submit affidavits and copies of certificates of calibration made by an accredited calibrator to verify that testing equipment was calibrated and its accuracy ensured within the previous twelve months.

6 RESPONSIBILITIES OF INSPECTION AND TESTING COMPANIES

- 6.1 Determine from specifications and Drawings the extent of inspection and testing required for Work of the Contract. Subcontractors shall notify Consultant of any omissions or discrepancies in the work inspected and/or tested.
- 6.2 Perform applicable inspection and testing described in the Specifications and as may be additionally directed.
- 6.3 Provide competent inspection and testing personnel when notified by the Contractor that applicable work is proceeding. Inspection personnel shall cooperate with the Consultant and Contractor to expedite the Work.
- 6.4 Subcontractors shall notify the Consultant and Contractor of deficiencies and irregularities in the Work immediately when they are observed in the course of inspection and testing.
- 6.5 Inspection and testing companies shall not perform or supervise any of the Contractor's work, and shall not authorize:
- .1 Performance of work that is not in strict accordance with the Contract Documents.
 - .2 Approval or acceptance of any part of the Work.

7 INSPECTION AND TESTING PROCEDURES

- 7.1 Perform specified inspection and testing only in accordance with specified Reference standards, or as otherwise approved.
- 7.2 Observe and report on compliance of the Work to requirements of Contract Documents.
- 7.3 Ensure that inspectors are on site or at fabricator's operations for full duration of critical operations, and as otherwise required to determine that the Work is being performed in accordance with the contract Documents.
- 7.4 Submit test samples required for testing in accordance with submittals schedule specified in Section 01 32 00.
- 7.5 Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.
- 7.6 Identify samples and sources of materials.

- 7.7 Review and report on progress of the work. Report on count of units fabricated and inspected at fabricator's operations.
- 7.8 Observe and report on conditions of significance to work in progress at time of inspection or at fabricator's operations. Include where applicable and if critical to the work in progress:
 - .1 Time and date of inspection.
 - .2 Temperature of air, materials, and adjacent surfaces.
 - .3 Humidity of air, and moisture content of materials and adjacent materials.
 - .4 Presence of sunlight, wind, rain, snow and other weather conditions.
- 7.9 Ensure that only materials from the work and intended for use therein are tested.
- 7.10 Determine locations for work to be tested.

8 INSPECTION AND TESTING REPORTS

- 8.1 For inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies, submit to Consultant and Owner copies of reports. Submit within 5 Working days after completion of inspection and testing.
- 8.2 For inspection and testing performed by Owner retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to Contractor.
- 8.3 Include in reports all information critical to inspection and testing.

9 TOLERANCES FOR INSTALLATION OF WORK

- 9.1 Unless specifically indicated otherwise, work shall be installed plumb, level, square and straight.
- 9.2 Unless acceptable tolerances are otherwise specified in specification sections or are otherwise required for proper functioning of equipment, site services, and mechanical and electrical systems:
 - .1 "Plumb and level" shall mean plumb or level within 1 mm in 1 m.
 - .2 "Square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.
 - .3 "Straight" shall mean within 1 mm under a 1 m long straightedge.
 - .4 "Flush" shall mean within:
 - .1 6 mm for exterior concrete, masonry, and paving materials.
 - .2 1 mm for interior concrete, masonry, tile and similar surfaces.

.1 0.05 mm for other interior surfaces.

9.3 Allowable tolerances shall not be cumulative.

10 REFERENCE STANDARDS

10.1 Perform inspection and testing in accordance with Standards quoted and as required by procedures described in specified reference standards that are applicable to the work being inspected and tested.

11 DEFECTS AND REMEDIAL WORK

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

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

12 SAMPLE UNITS (TYPICAL UNIT 'A')

12.1 Sample units will be established at a later date by Consultant. Sample units shall include the room proper, including installation of millwork, washrooms and the full width and length of corridors adjoining these rooms.

12.2 Sample unit preparation shall proceed in two stages:

.1 Stage 1: partitions framed and all services roughed-in; potential interferences shall be identified and access to isolation valves and fire dampers shall be shown.

.2 Stage 2: complete in all respects including finishes, fixtures, fitments, cabinets, appliances, hardware and trim, with all services fully energized and operational, cleaned and ready for use.

12.3 Work in sample units shall be complete, reviewed and accepted prior to executing work in other units.

12.4 Upon completion of each stage and after being notified by Contractor, Consultant will inspect units and if necessary prepare and issue a list of deficiencies.

12.5 Contractor shall correct deficiencies as directed by Consultant, until units meet requirements of Contract Documents.

12.6 Sample units, once accepted by Consultant, shall serve to establish a minimum standard for all other units of this room type.

13 **MOCK UPS**

- 13.1 Prepare mock-ups of Work as specified in the technical Specifications. If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by Consultant. Construct mock-ups of Work as required by Contract Documents on site unless otherwise indicated herein or directed by Consultant.
- 13.2 Construct mock-ups prior to start of affected work. Allow sufficient time for Consultant's review. Work affected by mock-ups may not commence prior to acceptance of mock-ups.
- 13.3 Construct mock-ups to include all related specified materials and workmanship. Make revisions as directed by Consultant, in accordance with the intent of the Contract Documents, until mock-ups are acceptable.
- 13.4 Modify mock-up as required until Consultant approval is obtained.
- 13.5 Mock-ups, reviewed and accepted by Consultant, shall become the standard of quality against which installed work will be measured.
- 13.6 Protect mock-ups from damage until the Work they represent is complete.
- 13.7 Mock-ups, by prior arrangement, may be incorporated into finished work if approved by Consultant only.
- 13.8 Remove mock-ups only when the Work they represent is complete or when otherwise directed by Consultant.

14 **EXTERIOR WALL MOCK-UP**

- 14.1 For exterior wall elements, construct a 10 m² mock-up of wall system incorporating all wall components specified. Construct mock-up on Site in a location acceptable to Consultant.
- 14.2 The mock-up shall include the work of all trades involved in exterior wall elements, complete in all respects including masonry, air/vapour retarders, aluminum siding, aluminum work, sealants, etc., and shall establish a minimum standard for the work of the exterior wall elements, clear up any misunderstandings and point out any possible problems.
- 14.3 Upon completion of mock-up, and after being notified by the Contractor, Consultant will inspect mock-up and if necessary prepare and issue a list of deficiencies. Once mock-up has been accepted, it will form the minimum standard of quality for exterior wall elements.
- 14.4 Mock-up will not form part of the work and will be independent of building. Remove and dispose of mock-up from Site during final cleanup, or when directed by Consultant.

15 EXTERIOR WALL MOCK-UP AT SUITE

- 15.1 For exterior wall elements at suite locations, construct a 10 m² mock-up of wall system incorporating all wall components specified. Construct mock-up on Site in a location acceptable to Consultant.
- 15.2 The mock-up shall include the work of all trades involved in exterior wall elements, complete in all respects including masonry, air/vapour retarders, aluminum siding, sealants, etc., and shall establish a minimum standard for the work of the exterior wall elements, clear up any misunderstandings and point out any possible problems.
- 15.3 Exterior wall mock-up at suites shall proceed in two stages:
- .1 Stage 1: Wall framed and all services roughed-in, vinyl doors and windows installed, including all control membrane tie-ins; potential interferences shall be identified.
 - .2 Stage 2: complete in all respects including finishes, fitments, exterior cladding, hardware and trim, with all services cleaned and ready for use.
- 15.4 Upon completion of mock-up, and after being notified by the Contractor, Consultant will inspect mock-up and if necessary prepare and issue a list of deficiencies. Once mock-up has been accepted, it will form the minimum standard of quality for exterior wall elements.
- 15.5 Mock-up will not form part of the work and will be independent of building. Remove and dispose of mock-up from Site during final cleanup, or when directed by Consultant.

16 BUILDING ENVELOPE

- 16.1 Requirements specified herein apply to all elements of the exterior building envelope.
- 16.2 Continuity of air barrier/vapour retarder and insulation components is critical and must be maintained at all locations. Where different systems meet, ensure proper interface and continuity between adjacent components by implementing suitable construction sequences and by using compatible materials only. Ensure proper tie-ins of control membranes to building components including, but not limited to, windows, Aluminum Work, doors, overhead doors, and other openings through building envelope as required.
- 16.3 Maximum air leakage shall be 0.10 L/(s·m²) when measured with a warm-side relative humidity of 27-55% at 21°C and a measured air pressure difference of 75Pa.
- 16.4 Anchor exterior cladding components to structure in manner suitable to accommodate structural deflection and creep and to withstand loads from expected temperature gradients. Design anchorage to withstand expected wind loads, positive and negative, in accordance with applicable regulations.

- 16.5 Ensure that air spaces within exterior building components are firestopped in accordance with applicable regulations.
- 16.6 Ensure that air spaces on the outside of vertical air barrier/vapour retarder (walls), window systems, and curtain wall systems are constructed with adequate drainage provisions to the exterior.
- 16.7 Owner may complete a thermographic scan upon completion of the building envelope. Contractor will be responsible to correct identified thermal anomalies.
- 17 **DRAINAGE**
- 17.1 Layout and construct work to ensure that positive drainage is provided to floor drains, ditches, site drains and catch basins, as set in their final position, preventing undrained areas and ponding.
- 17.2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.
- 17.3 Report to Consultant in writing prior to executing work affected, in case adequate drainage cannot be provided.

END OF SECTION

1 GENERAL

- 1.1 Provide Labour, Products, equipment, services, tools and Supervision to ensure that Work complies with minimum acceptable standards of materials and performance of Work in accordance with codes and standards referenced in the Specification.
- 1.2 Consider contract forms, codes, Specifications, standards, manuals, and installation and application instructions referred to in these specifications to be the latest published editions at the date of submission of the bid unless otherwise stated in the Specifications or otherwise required by the authorities having jurisdiction.

2 BY-LAWS, PERMITS, AND FEES

- 2.1 The Building Code - Ontario Regulation 332/12, including all amendments, shall govern the construction of the Work.
- 2.2 Comply with all By-Laws and regulations of authorities having jurisdiction. These codes and regulations constitute an integral part of the Contract Documents.
- 2.3 If required, pay for construction damage deposit required by authorities having jurisdiction.
- 2.4 Where permits, licences, and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by particular subtrade responsible for that work.
- 2.5 Arrange for inspection, testing of Work and acceptance required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay all associated costs.
- 2.6 Be responsible for ensuring that no work is undertaken which is conditional on permits, approvals, reviews, licences, fees, until all applicable conditions are met. No time extension will be allowed for delay in obtaining necessary permits.
- 2.7 Any additional work or changes to the materials due to Work not complying with the Ontario Building Code and Regulations as indicated by the Building Inspector shall be changed. All costs involved shall be borne by Contractor.
- 2.8 Obtain permit required to work on Municipal rights of way. Provide damage deposits for sidewalks, roads and services work, as applicable.
- 2.9 Give notice of completion of project prior to occupancy, as required by applicable legislation.

3 EXISTING PUBLIC SERVICE LINES

- 3.1 Where existing public services are indicated to be removed and/or relocated, perform Work in compliance with authorities having jurisdiction.

- 3.2 Make good public roads, walkways and curbs soiled or damaged due to construction to the requirements of local authorities.

4 **CODES**

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

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

5 **REFERENCE STANDARDS**

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

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

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

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

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

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

- 5.7 If there is question as to whether a material, product or system is in conformance with applicable standards, the Consultant reserves the right to have such materials, products or systems tested to prove or disprove conformance. The cost for such testing will be paid by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.
- 5.8 Where application, installation and workmanship standards are cited, it is intended that referenced standards form the basis for minimum requirements of the specified item and specifications supplement the standards unless specified otherwise.
- 5.9 Matters may be dealt with in part by these specifications which are also dealt with, under the same or similar headings in cited standard. It is not intended that these specifications take the place of the standards but supplement them, unless specified otherwise.
- 5.10 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.
- 5.11 Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or abbreviations:

.1	AA	Aluminum Association
.2	AAMA	Architectural Aluminum Manufacturers Association
.3	AASHTO	American Association of State Highway and Transportation Officials
.4	ACI	American Concrete Institute
.5	AFBMA	Anti-Friction Bearing Manufacturer's Association
.6	AIEE	American Institute of Electrical Engineers
.7	AISC	American Institute of Steel Construction
.8	AISI	American Iron and Steel Institute
.9	AMCA	Air Movement and Control Association
.10	AMEU	Association of Municipal Electric Utilities
.11	ANSI	American National Standards Institute
.12	APA	American Plywood Association
.13	ARI	Air-Conditioning and Refrigeration Institute
.14	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
.15	ASME	American Society of Mechanical Engineers
.16	ASTM	American Society for Testing and Materials
.17	AWMAC	Architectural Woodwork Manufacturers Association of Canada
.18	AWPA	American Wire Producers Association
.19	CaGBC	Canadian Green Building Council
.20	CEMA	Canadian Electrical Manufacturer's Association
.21	CGSB	Canadian General Standards Board
.22	CISC	Canadian Institute of Steel Construction
.23	CMPA	Canadian Paint Manufacturers Association
.24	CPCI	Canadian Prestressed Concrete Institute
.25	CRCA	Canadian Roofing Contractors Association

.26	CSA	Canadian Standards Association
.27	CSSBI	Canadian Sheet Steel Building Institute
.28	CWB	Canadian Welding Bureau
.29	CWC	Canadian Wood Council
.30	EEMAC	Electrical and Electronic Manufacturers Association Canada
.31	FM	Factory Mutual
.32	ICEA	Insulated Cable Engineers Association
.33	IEEE	Institute of Electrical and Electronics Engineers
.34	IGMAC	Insulating Glass Manufacturers Association of Canada
.35	LEED	Leadership in Energy and Environmental Design
.36	MFMA	Maple Flooring Manufacturers Association
.37	MPI	Master Painters Institute
.38	MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
.39	MTO	Ministry of Transportation Ontario
.40	NAAMM	National Association of Architectural Metal Manufacturers
.41	NAAWS	North American Architectural Woodwork Standards
.42	NEMA	National Electrical Manufacturers Association
.43	NFPA	National Fire Protection Association
.44	NHLA	National Hardwood Lumber Association
.45	NLGA	National Lumber Grades Authority
	NRC	National Research Council of Canada
.46	OPSS	Ontario Provincial Standard Specification
.47	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
.48	SSPC	The Society for Protective Coatings
.49	TTMAC	Terrazzo, Tile and Marble Association of Canada
.50	ULC	Underwriters' Laboratories of Canada

6 FIRE RATINGS, ASSEMBLIES AND SEPARATIONS

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

- .1 Underwriters' Laboratories of Canada.
- .2 Underwriters' Laboratories Inc.
- .3 Factory Mutual Laboratories.
- .4 The National Research Council of Canada.
- .5 The National Board of Fire Underwriters.
- .6 Intertek Testing Services.

- 6.2 Where reference is made to only one testing authority an equivalent fire rating as determined or listed by another of the aforementioned testing authorities is acceptable if approved by authorities having jurisdiction. Obtain and submit such approval of authorities, in writing when requesting acceptance of a proposed equivalent rating or test design.
- 6.3 Fire rated door assemblies shall include doors, frame, anchors, and hardware and shall bear label of fire rating authority showing opening classification and rating.
- 6.4 Material having a fire hazard classification shall be applied or installed in accordance with fire rating authorities printed instructions.
- 6.5 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.
- 6.6 Construct fire separations as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.
- 6.7 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are non-combustible and are tightly fitted and sealed with a ULC approved sealant for the assembly being sealed.
- 6.8 Construction that abuts on or is supported by a non-combustible fire separation shall be constructed so that its collapse under fire conditions will not cause the collapse of the fire separation.
- 6.9 Do not use combustible members, fastenings, attachments and similar items to anchor electrical, mechanical or other fixtures to fire separations.
- 6.10 At penetration through fire rated walls, ceilings or floors, completely seal voids with ULC approved firestopping material; full thickness of the construction element. In locations that require a smoke seal, provide appropriate ULC approved system installed in accordance with the manufacturer's recommendations.
- 6.11 For all assemblies in the Contract Documents with a designated listing from one of the testing authorities, it is the full responsibility of the Contractor to independently research and provide the complete published assembly as described by the associated testing authorities. The description of the assemblies noted in the Contract Drawings are noted "as basis of design" and may not represent the full criteria as defined by the testing authorities.

END OF SECTION

1 TEMPORARY CONTROLS AND CONSTRUCTION FACILITIES

- 1.1 Provide temporary controls and construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements.
- 1.2 Maintain temporary controls and construction facilities in good condition for the duration of the Work.
- 1.3 Remove controls and temporary construction facilities from Place of the Work when no longer required.

2 TEMPORARY CONTROLS

- 2.1 Hoarding, fencing and barriers:
- 2.2 Provide sealed hoarding drawings, showing phasing to allow for temporary hammerhead construction, and maintenance of existing exiting and access to main entrance/FDC of 25 James Street.
 - .1 25 James Street will remain occupied during construction. Contractor to confirm and provide temporary exiting strategy and "safe zone" from 25 James Street for acceptance by Authorities having Jurisdiction and fire department. Maintenance of the exiting and access pathways including "safe zone" is the responsibility of the Contractor. Contractor is also to maintain clear access to 25 James Street.
 - .2 Ensure clear path of travel at all times from the West exit stair discharge at 25 James Street during the duration of the Work, to allow occupants unencumbered access from the exit discharge to the existing driveway.
 - .3 Erect temporary hoarding, fencing and barriers around entire perimeter of Site to height determined by applicable regulatory requirements.
 - .4 Before commencing operations, supply, erect and maintain hoarding around intended construction area of Site. Paint outside of hoarding in a colour selected by the Consultant and mark with "POST NO BILLS" signs.
 - .5 Provide temporary enclosures as required to protect the building in its entirety or in its parts, against the elements, to maintain environmental conditions required for work within the enclosure, and to prevent damage to materials stored within.
 - .6 Provide lockable gates through hoarding and barriers for access to Site by workers and vehicles.
- 2.3 Prevent unauthorized entry to the Site. Barricade, guard or lock access points to the satisfaction of the Consultant and post "NO TRESPASSING" signs.

- 2.4 Provide hoarding, barriers and covered walkways required by governing authorities for public safety, public rights-of-way and for access to buildings. Snow fencing is not allowed as protection for sidewalk.
- 2.5 Provide temporary exterior and/or interior barrier free ramps/guardrails/handrills as required to permit public access to existing complex functions.
- 2.6 Install signs for movement of people around Work Site as required and directed by the Consultant.
- 2.7 Provide secure, rigid guide rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs as required for protection of Work, workers, and the public.
- 2.8 Remove hoarding barriers, building enclosures, guide rails and barricades upon Contract Completion unless otherwise noted on the Contract Drawings or as directed by the Consultant.

3 SERVICE AND UTILITY SYSTEMS

- 3.1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.
- 3.2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.
- 3.3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.
- 3.4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.
- 3.5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.
- 3.6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.
- 3.7 Provide all temporary services to 84 Wilson and 210 Fourth as required to complete Work and not disrupt existing Service and Utility systems as the existing building with remain occupied during construction.

4 SCAFFOLDING, HOISTS AND CRANES

- 4.1 Select, operate, and maintain scaffolding, hoisting equipment and cranes as may be required.

4.2 Do not erect or operate equipment that will endanger existing structures, local municipalities hydro installations, or traffic signals.

4.3 Design and construct scaffolding in accordance with CAN/CSA S269.2-M.

5 TEMPORARY WORKS

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

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

5.3 Pay all costs for temporary works consumed prior to completion of Contract.

5.4 If Owner's utilities and systems are used during the Work, ensure that systems manufacturers' warranties do not commence until the date of Ready-for-Takeover or, if manufacturers' warranties do commence earlier when systems are put into use, arrange for necessary extension of manufacturers' warranties or provide equivalent coverage under Contractor's warranty.

5.5 Temporary Power and Lighting Systems:

.1 Supply, install and maintain electrical power and necessary electrical equipment including overhead and underground feeders, transformers, motors, starters, panels, protective devices and equipment. Connections will be made available to any part of the Work within distance of a 30 m extension.

.2 Provide temporary lighting inside and outside structure of adequate intensity to illuminate construction activities. Provide temporary pedestrian lighting for sidewalk areas affected by the Work.

.3 Supply and install the type and quantity of minimum lighting equipment in each location to ensure adequate, continual illumination 24 hours per day, 7 days per week for the following:

.1 Emergency evacuation, safety and security throughout the Project at intensity levels required by jurisdictional authorities.

.2 General lighting for performance of the Work throughout the Project, evenly distributed, and at intensities to ensure that proper installations and applications are achieved.

.3 Performance of finishing trades in area as required evenly distributed, and of an intensity of at least 50 Lux.

.4 In locations approved by the Consultant. install and support the electrical plant, distribution and temporary lighting systems including service equipment and local hydro authority meter energized by the local hydro circuits. Installations shall be approved by the Consultant and shall be carried out in a neat manner to avoid interference with the application of finish material and to facilitate removal when the installed permanent lighting system is in operation.

- .5 Make all necessary arrangements for and pay all costs for a temporary electrical service of sufficient capacity to supply temporary lighting, operation of power tools, cranes and equipment for all construction, implementation, and inspection and testing purposes. Supply and install necessary temporary cables and other electrical equipment and make all temporary connections as required.
- .6 Temporary power distribution wiring shall comply with Ontario Hydro Electrical Safety Code. Obtain inspection certificates for temporary electrical work.
- .7 Maintain the lighting systems in operation during the life of the Contract. Replace burned or missing lamps immediately.
- .8 Upon Contract Completion, remove electrical plant and temporary lighting from the Site.

5.6 Water Supply:

- .1 Provide and pay for a continuous supply of potable water for construction use. Provide as a minimum one water connection on each floor level.
- .2 Provide and maintain all temporary lines, extensions and hoses as required. Remove all temporary connections and lines on completion of the Work and make good any damage.
- .3 Provide and maintain all temporary lines, extensions and hoses as required. Remove all temporary connections and lines on completion of the Work and make good any damage.

5.7 Temporary Heating:

- .1 Provide and pay for temporary heating required during construction period, including attendance, maintenance and fuel. Connection to the Owner's existing building electrical system will not be allowed.
- .2 Construction heaters used inside buildings must be vented to the outside or be flame less type. Solid fuel salamanders are not permitted.
- .3 Maintain temperatures of minimum 10°C in areas where construction is in progress unless otherwise indicated in the Contract Documents. Protect exposed and adjacent services from freezing. Repair at no cost to the Owner any such services, buildings or other utilities disrupted by freezing.
- .4 Ventilate heated areas and keep the Work free from fumes, vapours, exhaust and combustion gases, and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.

5.8 Temporary Telephone and facsimile: Provide and pay for separate telephones, facsimile and internet services, as required for own use and use of the Consultant and Owner.

5.9 Elevators:

.1 Permanent elevators may not be used by construction personnel.

5.10 Sanitary Facilities:

.1 Provide portable sanitary facilities for Contractor's staff in accordance with occupational health and safety requirements in the place of the Work.

.2 Use of Owner's sanitary facilities in 25 James Street or 321 John Street is not allowed.

6 PROTECTION

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

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

6.3 Protection of Building Finishes and Equipment:

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

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

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

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

.5 Provide temporary weather tight, dust tight, and lockable partitions within the building where work is performed. Provide weather tight closures to unfinished door and window openings, top of shafts and other openings in floors and roofs.

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

- .7 Protect finished surfaces of new work from damage by restriction of access or by use of physical means suitable to the material and surface location. Where construction operations must be performed or traffic routed over finished floors, lay 6 mm plywood coverings tightly fitted and secured over surface in such areas.

6.4 Fire Protection:

- .1 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, by-laws and to the satisfaction of the Consultant and insurance authorities.
- .2 Excessive storage of flammable liquids and other hazardous materials is not allowed on Site. Flammable liquids must be handled in approved containers. Remove combustible wastes frequently.
- .3 Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently.
- .4 Open burning of rubbish is not permitted on the Site.
- .5 Handle, transport, store, use and dispose of gasoline, benzene or other flammable materials with good and safe practice as required by authorities having jurisdiction.
- .6 Provide fire extinguishers of the non-freezing chemical type in each temporary building, enclosure and trailer. Use only fire-proofed tarpaulins.
- .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:
 - .1 any open flame activities(e.g., soldering and welding);
 - .2 shutdown of fire detection system;
 - .3 shutdown of sprinkler system.

6.5 Maintain adequate cover over services as required by Utility Authorities.

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

7 TEMPORARY BUILDINGS

7.1 Provide, and maintain until contract completion a temporary office as required for work, large enough to accommodate site administrative activities and site meeting, complete with lighting, heating, and air conditioning equipment to maintain 21°C. Ventilation, telephone, facsimile machine on a separate line, copier (not combination fax/copier), table and chairs, Internet connection, monitor, and all A/V equipment necessary for hosting virtual meetings. Do not store materials, tools, equipment in meeting area; keep clean and tidy.

7.2 For all trailers and temporary buildings, provide wood stairs, platform and boardwalk, painted and repainted as required with non-skid abrasive paint.

7.3 Do not locate any buildings, structures or equipment in a manner that interferes with surveys along the control line and reference line tangents.

7.4 Remove temporary buildings upon completion of Contract. Restore area(s) to match the existing surrounding area.

8 **PEST CONTROL**

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

9 **FIRST-AID FACILITIES**

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

10 **USE OF NEW PERMANENT SERVICE & EQUIPMENT**

10.1 Do not use any new permanent service or equipment without Owner's written approval.

10.2 Where permission is granted to use permanent services and equipment provide competent persons to operate services and equipment; inspect frequently and maintain facilities in proper operating condition at all times.

10.3 Permanent services and equipment shall be turned over to Owner in "as new" and perfect operating condition.

10.4 Use of permanent systems and equipment as temporary facilities shall not affect the warranty conditions and warranty period for such systems and equipment. Make due allowance to ensure that Owner will receive full benefits of equipment manufacturers warranty after project takeover.

11 **PROJECT IDENTIFICATION**

11.1 If required, obtain approvals from jurisdictional authorities for temporary signs.

11.2 Do not display signs without the Consultant's and Owners written consent.

11.3 Maintain signs in good condition for the duration of Contract.

12 SITE MAINTENANCE

- 12.1 Maintain the Site and adjacent premises in a clean and orderly condition, free from debris and other objectionable matter. Immediately remove rubbish and surplus Products, equipment and structures from the Site. If the Site is not cleaned (within 48 hours after the Contractor has been instructed to do so), the Consultant may clean the Site and retain the cost from monies due, or to become due, to the Contractor.
- 12.2 When the Work is substantially performed, remove surplus Products, tools, construction machinery and equipment not required for the performance of the remaining Work.

13 SITE STORAGE AND OVER LOADING

- 13.1 Store products, materials, equipment and similar items in accordance with Consultant and Owner approved site storage plan.
- 13.2 Confine the Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the Site with Products.
- 13.3 Products shall be stored only in areas designated or approved by the Consultant, and shall not be left lying on streets, sidewalks, boulevards or elsewhere within public view. Products which the Consultant may permit to be stored elsewhere than in the Contractor's storage areas shall be neatly stacked or otherwise disposed and shall be so maintained.
- 13.4 Fabrication shops shall not be set up within the structure except as directed by or with the permission of the Consultant.
- 13.5 Do not load or permit to be loaded any part of the Work with a weight or force that it is not calculated to bear safely. Be solely responsible and liable for damages resulting from violation of this requirement. Provide temporary supports as strong as permanent support.
- 13.6 Do not cut, drill or sleeve load bearing members unless shown on drawings or otherwise approved by the Consultant in writing for each location.
- 13.7 Site storage and loading requirements to be in accordance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

14 PUBLIC CONVENIENCE AND SAFETY

- 14.1 Maintain sidewalks along John Street including the internal 25 James Street walkway and driveway designated to remain, and adjacent to the Site in a safe condition throughout the Contract. Promptly remove ice and snow.
- 14.2 Keep haul routes free at all times from Products spilled on highway or street surfaces and clean highways and streets of deposits due to performance of the Work to the

satisfaction of the Consultant and the highway and street authorities. Clean highways and streets within 24 hours of Consultant's instruction.

- 15 The Consultant may inspect haul routes, the Site and adjacent premises daily and may halt operations, withhold payment or carry out such additional operations as necessary, deducting the cost from monies due, or to become due, to the Contractor.**ACCESS AND EGRESS TO SITE**

- 15.1 Provide and maintain adequate access to Place of the Work.

- 15.2 Where construction requirements demand, construct access roads capable of withstanding construction equipment and haul traffic. Maintain access roads in good condition at all times. Remove access roads prior to completion of the Work unless otherwise noted and restore area as shown on the Contract Drawings.

- 15.3 Waste pickup access at 25 James Street must be maintained at all times during the duration of the Work. Coordinate temporary waste pickup locations as required with the Owner and provide curb ramps as required for the movement of waste bins to temporary pickup locations.

16 **PUBLIC TRAFFIC FLOW**

- 16.1 Provide and maintain flag persons, Police Officers, traffic signals, barricades and illumination as required by Authorities having jurisdiction and/or as necessary to perform the Work and protect the public.

17 **PUBLIC UTILITIES AND SERVICES**

- 17.1 Verify limitations imposed on project work by presence of utilities and services, and ensure no damage occurs to them.

- 17.2 Notify service authorities concerned so that they protect, remove, relocate, or discontinue them, as they may require.

- 17.3 Make arrangements and pay for connection charges for services required for project work.

- 17.4 Locate poles, pipes, conduit, wires, fill pipes, vents, regulators, meters, and sanitary services work in inconspicuous locations. If not shown on Drawings, verify location of service work with Consultant before commencing installation.

18 **ROADS, CURBS, GUTTERS, AND WALKS**

- 18.1 Include all curb cuts and making good of existing curbs, walks and paving on the Owner's and Municipal property to provide fully paved and finished approaches to requirements of the Contract Documents and authorities having jurisdiction .

19 **CONSTRUCTION PARKING**

- 19.1 Parking will not be available on Site.

- 19.2 Contractor shall identify, organize and pay for off-site parking as required to execute the Work.

20 SITE VISITORS

- 20.1 During the progress of the Work, afford access to visitors duly authorized by the Consultant and facilitate inspections or tests they may desire to make. Record site visitors in log book maintained on site.

- 20.2 Ensure Site visitors wear appropriate safety apparel.

21 EROSION AND SEDIMENTATION CONTROL

- 21.1 Control drainage on site to prevent flooding, erosion and run-off onto adjacent properties as a result of construction operations.

- 21.2 Dispose of water containing silt in suspension in accordance with requirements of jurisdictional authorities.

- 21.3 Conform to sedimentation and erosion control requirements of the conservation and/or municipal authority having jurisdiction. Provide and maintain until completion of work or until directed by Consultant to be removed, sediment control devices at catch basins, drainage courses and at other locations on site as directed. Comply with requirements of the local Conservation Authority.

- 21.4 Prevent tracking of mud and dirt from site onto paved roads. Clean mud and dirt from paved roads at end of each day by shoveling or sweeping and subsequent washing. Dispose of mud dirt in a controlled disposal area.

22 TEMPORARY DRAINAGE AND DEWATERING

- 22.1 Prevent surface water runoff from leaving the Site unless approved by authorities having jurisdiction.

- 22.2 Drainage lines, trenched, and gutters shall be kept open at all times. No flow of water shall be directed across or over pavements except through pipes or properly constructed troughs. Keep all portions of Work properly and efficiently drained during construction and until completion. Be responsible for all disturbances, dirt and damage which may be caused by or result from water backing up or flowing over, through, from or along any part of Work, or due to operations which may cause water to flow elsewhere.

- 22.3 Keep trenches and other excavations free of water at all times. Employ adequate means to remove water in a manner that will prevent loss of soil, and maintain the stability of excavation.

- 22.4 Dispose of such water in a manner that will not be dangerous to public health, private property or to any portion of Work completed or under construction, nor which causes an impediment to the use of streets by the public.

22.5 Drainage of trenches or other excavation through newly laid storm drainage pipe will be allowed only with the express permission of the authority having jurisdiction.

22.6 When drainage is directed to existing catch basins, regularly inspect and clean such catch basins of debris and sediment.

22.7 Prevent precipitation from infiltrating or from directly running off stockpiled materials. Cover stockpiled materials with an impermeable liner during periods of work stoppage including at end of each Working Day.

22.8 Control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas as required to prevent erosion and sedimentation.

23 SNOW REMOVAL

23.1 Allow no accumulation of ice and snow on Site, and on roof deck when roofing operations are scheduled to take place.

23.2 Remove snow from access road, Site circulation paths and elsewhere as required to permit access to Work, parking and uninterrupted construction progress.

24 POLLUTION (DUST, DEBRIS, AND NOISE) CONTROL

24.1 Implement and maintain pollution control measures in accordance with applicable regulatory requirements.

24.2 Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.

24.3 Execute Work by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.

24.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

24.5 Keep premises free of waste material.

24.6 Arrange and pay for removal of all waste generated by the work in manner acceptable to authorities having jurisdiction.

24.7 Limit noise levels in accordance with requirements of authorities having jurisdiction.

24.8 Maintain temporary erosion and pollution control features installed under this contract.

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- 24.9 Control emissions from equipment and plant to local authorities emission requirements.
- 24.10 Prevent abrasive-blasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- 24.11 Use appropriate covers on trucks hauling fine, dusty, or loose materials.
- 25 Take immediate action to contain and mitigate harmful effects of the spill or release.**TREE AND PLANT PROTECTION**
- 25.1 Within Contractor's assigned work and storage areas and adjacent to designated access routes, protect existing trees and other plants scheduled to remain, as per Contract Documents. Provide minimum 1.8 m high chain link fencing outside of dripline of trees or groups of trees and other plants, or as noted in Contract Drawings ; the stricter Requirement shall govern.
- 25.2 Leave fenced areas undisturbed; do not use areas for storage, stockpiling or any other purpose. Do not dump or flush any contaminants in areas of tree feeder roots.
- 25.3 Do not attach rigging cables to trees.
- 25.4 Where limbs or portions of plants are required to be removed to accommodate new work, they shall be removed in accordance with accepted arboricultural practice.
- 25.5 For trees designated to remain, protect roots inside dripline from disturbance or damage during excavation and grading. Avoid traffic, dumping and storage of materials over root zones.
- 25.6 Where root systems of protected trees adjacent to construction are exposed or damaged, they shall be neatly trimmed and the area backfilled with suitable material to prevent desiccation.
- 25.7 Where necessary give plants an overall pruning to restore the balance between roots and top growth and/or to restore appearance.
- 25.8 Except at locations where specific procedures are included in Contract Documents do not alter grades around existing trees/plants without first obtaining Consultant's consent and directions.
- 25.9 Minimize stripping of topsoil and vegetation.

END OF SECTION

1 SPECIFIED PRODUCTS

- 1.1 Work of this Contract is based on Products specified by:
- .1 Manufacturer's catalogued trade names and/or;
 - .2 References to standards (i.e. CAN, CGSB, CSA, ASTM) or;
 - .3 Prescriptive Specifications or;
 - .4 Performance Specifications.
- 1.2 When one or more manufacturer's trade name is specified for a Product, any one of the specified Products will be acceptable. Products by other manufacturers are subject to the Consultant's acceptance as an equivalent substitution in accordance with Section 01 25 00.
- 1.3 When more than one manufacturer's catalogued trade name Product is specified along with a referenced standard, any one of the specified Products will be acceptable on condition the Product complies with the referenced standard.
- 1.4 Whenever a Product is specified by reference to a standard only, Provide any Product that meets or exceeds the specified standard for the intended purpose. The onus shall be on the Contractor to establish that such Products meet the reference standard requirements. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such Products are compatible with the Work with which they are incorporated. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard.
- 1.5 Whenever a Product is specified by prescriptive or performance requirements only, Provide any Product that meets or exceeds the specified requirements. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard.
- 1.6 When a Product is specified by reference to a standard or by prescriptive or performance requirements only, upon request of the Consultant, obtain from the manufacturer, an independent testing laboratory report showing that the Product meets or exceeds the specified requirements.
- 1.7 Provide Products that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by Consultant, furnish evidence as to type, source and quality of Products provided.
- 1.8 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the Work.

2 SUBSTITUTIONS

- 2.1 Requests for substitutions will not be accepted prior to the Notification of Award. Substitutions will be considered by the Consultant provided that:
- .1 The proposed substitutions have been investigated and complete data are submitted which clearly includes highlighting all aspects that meet the specifications. Consultant will only review data submitted. Incomplete data will be grounds for non-acceptance.
 - .2 Data relating to changes in the Contract Schedule, if any, and relation to other Work have been submitted. Submit data on Product and Material Conformance Form for Substitutions appended to this Section.
 - .3 Same warranty is given for the substitution as for the original Product specified.
 - .4 All claims are waived for additional costs related to the substitution which may subsequently arise.
 - .5 Installation of the accepted substitution is co-ordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.
- 2.2 Substitutions to methods or processes described in the Specifications or drawings, may be proposed for the consideration of the Consultant. Ensure that such substitutions are in accordance with the following requirements:
- .1 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Contract Time.
 - .2 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation.
 - .3 Be responsible for substitutions to methods or processes concerning such Work and ensure that the warranty covering all parts of the Work will not be affected.
 - .4 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor.
 - .5 The substituted methods or processes fit into space allotted for the specified methods or processes. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

- 2.3 Substitutions will not be considered if:
- .1 They are indicated or implied on shop drawings or Product data or samples without formal request.
 - .2 Acceptance will require substantial revision of the Specifications and Drawings.
- 2.4 Do not substitute Products or methods or processes into the Work unless such substitutions have been specifically approved for the Work by the Consultant.
- 2.5 Approved substituted Products shall be subject to the Consultant's inspection and testing procedures. Approved substituted Products shall only be installed after receipt of the Consultant's written approval.
- 2.6 The Contract Price will be adjusted accordingly to any and all credits arising from the substitutions mentioned above.

3 APPROVAL OF PRODUCTS AND INSTALLATION METHODS

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

4 PRODUCT DELIVERY CONTROL

- 4.1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which he intends to use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.
- 4.2 Promptly upon Contract award and periodically during construction, review and confirm Product availability and delivery times. Order Products in sufficient time to meet the construction progress schedule and the Contract Time.
- 4.3 Contact the Consultant immediately upon receipt of information indicating that the specified Product is no longer available or if any material or item, will not be available on time, in accordance with the original schedule.
- 4.4 The Consultant reserves the right to receive from the Contractor at any time, upon request, copies of actual purchase or work orders of any material or products to be supplied for the work.
- 4.5 If materials and products have not been placed on order, the Consultant may instruct such items to be placed on order, if direct communication in writing from the manufacturer or prime suppliers is not available indicating that delivery of said material will be made in sufficient time for the orderly completion of the Work.

- 4.6 The Consultant's review of purchase orders or other related documentation shall in no way release the Contractor, or his subcontractors and suppliers from their responsibility for ensuring the timely ordering of all materials and items required, including the necessary expediting, to complete the work as scheduled in accordance with the Contract Documents.
- 4.7 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to direct the Contractor to take the following measures at no increase in Contract Price:
- .1 Substitute more readily available Products of similar or better quality and character, or
 - .2 Temporarily install another Product until such time as the specified Product becomes available, at which time the temporarily installed product shall be removed and the specified Product installed.

5 TRADEMARKS AND LABELS

- 5.1 Permanent labels, trademarks and nameplates on Products are not acceptable in the finished Work, except where required by authorities having jurisdiction, for operating instructions, or when located in service rooms.
- 5.2 Remove trademarks and labels by grinding, if necessary, painting out where the particular surface is being painted, or if on plated parts, replace with new plain plated or non-ferrous metal parts.

6 DELIVERY, STORAGE, HANDLING AND PROTECTION

- 6.1 Be responsible for handling and delivery of Products. Protect Products from damage during handling, storage and installation. Deliver store and handle items in accordance with manufacturer's instructions and as specified. Be responsible for all costs of delivery, loading and off-loading, and for transportation back to its origin for correction, if required, due to damage or defect. Reject materials and Products delivered to the Site which are damaged.
- 6.2 Manufacture, pack, ship, deliver, and handle Products so that no damage occurs to structural qualities and finish appearance, nor in any other way which is detrimental to their function and appearance.
- 6.3 Ensure that Products, while transported, are not exposed to an environment which would increase their moisture content beyond the maximum specified.
- 6.4 Organize delivery of materials, Products and equipment to, and removal of debris and equipment from, the site and surrounding property.
- 6.5 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at the Place of the Work.

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- 6.6 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at the Place of the Work.
 - 6.7 Coordinate mechanical and electrical equipment and apparatus deliveries with the manufacturer's and suppliers such that equipment and apparatus is delivered to the site when it is required, or so that it can be stored within the building and protected from the elements.
 - 6.8 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
 - 6.9 Deliver packaged Products, in original unopened wrapping or containers, with manufacturer's seals and labels intact.
 - 6.10 Label packaged products to describe contents, quantity, and other information as specified.
 - 6.11 Labels attesting that materials conform to specified reference standards will be acceptable as verification that contents meet specified requirements. In the absence of labels, submit affidavits to validate conformance of Product to reference standards, as requested by the Consultant.
 - 6.12 Label fire-rated Products to indicate Underwriters' Laboratories approval.
 - 6.13 Handle and store materials and products in such a manner that no damage is caused to the materials and products, the Work, the site and surrounding property.
 - 6.14 Do not obstruct or disrupt local traffic flow during construction period.
 - 6.15 Allocate storage areas according to Consultant and Owner approved site storage plan for storage of Products brought to the site by all trades. Keep storage area tidy at all times and do not use other parts of the property for storage. Arrange and pay for off-site storage as required to execute the Work.
 - 6.16 Locate products on site in a manner to cause minimal interference with the Work and building activities.
 - 6.17 Adequately protect parts of the Work completed and in progress from any kind of damage.
 - 6.18 Store Products off the ground, in a manner to prevent damage, adulteration, deterioration and soiling to the Products, other building components, assemblies, other products, the structure, the site and surrounding property, and in accordance with manufacturer's instructions when applicable.
 - 6.19 Store packaged or bundled Products in original and undamaged condition complete with written application instructions. Keep manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.
 - 6.20 Do not place or store materials and Products in corridors, public areas, streets, lanes, passageways or similar locations.

- 6.21 Store Products so as not to create any overloading conditions to any part of the building, structure, falsework, form work and scaffolding.
- 6.22 Store Products subject to damage from weather in weatherproof enclosures.
- 6.23 Store cementitious Products clear of earth or concrete floors, and away from walls.
- 6.24 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- 6.25 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- 6.26 Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous material in bulk within the Work.
- 6.27 Store and mix paints in a heated and ventilated room or area assigned for this purpose. Keep this room or area locked when unattended. Remove oily rags and other combustible debris from the Place of the Work daily. Take every precaution necessary to prevent spontaneous combustion.
- 6.28 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01 74 00. Protection shall be easily removable under work of Section 01 74 00 without damage to finishes. Do not permit strippable tape or coatings to become baked on surfaces which they protect.
- 6.29 Touch-up to damaged factory finished surfaces will not be acceptable.
- 6.30 Protect glass and other finishes against heat, slag and weld splatter by provision of adequate shielding. Do not apply Visible markings to surfaces exposed to view in finished state or that receive transparent finishes.
- 6.31 Protect surfaces of completed work exposed to view from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable of the material and surface location.
- 6.32 Adequately protect trowelled concrete floors from damage. Take special measure when moving heavy loads or equipment on them.
- 6.33 Keep finished concrete floors free from oils, grease or other material likely to damage or discolour them or affect bond of applied finishes. Once building is enclosed, keep floors as dry as possible after curing.
- 6.34 Protect finished flooring from pedestrian traffic with reinforced kraft paper as a minimum, secured in place and with joints sealed by reinforced pressure sensitive tape. Maintain protection in place until contract completion.
- 6.35 Protect finished flooring from continuing construction work and delivery of products with plywood panels of minimum 6 mm thickness with joints between panels sealed with reinforced pressure sensitive tape. Maintain protection in place until work and

deliveries are complete.

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

7 HAZARDOUS MATERIALS INFORMATION

- 7.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of safety data sheets (SDS) in accordance with jurisdictional authorities.

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

8 MANUFACTURER'S INSTRUCTIONS

- 8.1 Unless otherwise indicated in the Specifications, fabricate, apply, connect, install, erect, use, clean, and condition Products in accordance with manufacturer's instructions except where more stringent requirements are specified. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
- 8.2 Notify the Consultant in writing, of conflicts between the Specifications and manufacturer's instructions, so that the Consultant may establish the course of action. If requested, make a copy of those instructions available at the site.
- 8.3 Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.
- 8.4 In cases of improper installation or erection of Products, due to failure in complying with these requirements, the Consultant may direct removal and re-installation at no increase in Contract Price.

9 WORKMANSHIP

- 9.1 Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce required results.
- 9.2 Do not employ any unfit person or anyone unskilled in their required duties. The Consultant reserves the right to require the dismissal from the Place of the Work, workers deemed incompetent, careless, insubordinate or otherwise objectionable.

- 9.3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Consultant, whose decision is final.
- 9.4 Give particular attention to finished dimensions and elevations of the Work. Make finished Work fit indicated spaces accurately. Make finished Work flush, plumb, true to lines and levels and accurate in all respects.
- 9.5 In finished areas, conceal pipes, ducts, conduit and wiring in floors, walls, ceilings, chases, or behind furring except where indicated otherwise.
- 9.6 Ensure that service poles, fill-pipes, vents, regulators, meters and similar service installations are located in inconspicuous locations. If not indicated on drawings, verify location of service installations with Consultant prior to commencing installation.
- 9.7 Ensure integrity of fire separations is maintained throughout the Work. When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.
- 9.8 Finish access panels and doors to match adjacent wall and/or ceiling finish unless otherwise specified or indicated.
- 9.9 Keep surfaces, on which finished materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.
- 9.10 Enforce fire prevention methods at site. Do not permit fires, open flame heating devices or accumulation of debris. Use flammable materials only if all safety precautions are taken. Provide and maintain in working order ULC labelled fire extinguishers of types suitable for fire hazard in each case, and locate them in prominent location and to approval of jurisdictional authorities.
- 9.11 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.
- 10 **DIMENSIONS**
- 10.1 Check all dimensions at the site before fabrication and installation commences and report discrepancies to the Consultant.
- 10.2 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.
- 10.3 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained
- 10.4 Wall thicknesses and openings shown on the drawings may be nominal only; ascertain actual sizes at the site.

- 10.5 Verify dimensions of shop fabricated portions of the Work at the site before shop drawings and fabrications are commenced. The Owner will not accept claims for extra Contract Time or expense by reason of non-compliance with this requirement.
- 10.6 Fabricate and erect manufactured items, shop fabricated items, and items fabricated on or off site, to suit site dimensions and site conditions.
- 10.7 In areas where equipment is to be installed, check dimensional data on equipment to ensure that area and equipment dimensions are compatible with necessary access and clearance provided. Ensure that equipment supplied is dimensionally suitable for space provided.
- 10.8 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.
- 10.9 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes.

11 CONCEALMENT

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

- .1 After review by Consultant and authority having jurisdiction.
- .2 Where locations differ from those shown on Drawings, after recording actual locations on as-built drawings.

12 RELOCATION OF MECHANICAL AND ELECTRICAL ITEMS

- 12.1 The mechanical and electrical drawings are intended to show approximate locations of mechanical apparatus, fixtures, equipment, piping and duct runs, electrical apparatus, fixtures, outlets, equipment, units, and conduit in diagrammatic form and wherein the mechanical and electrical items are not dimensioned, consider their locations to be approximate. Check the drawings and confer with the Consultant to determine the actual locations of these items as may be required to suit aesthetic and site conditions. Such relocation shall be done without change to the Contract Price.
- 12.2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.
- 12.3 Promptly notify Consultant in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

- 12.4 The Owner and the Consultant reserve the right to relocate outlets at a later date, but prior to installation, without additional cost to Owner, assuming that the relocation per outlet does not exceed 3000 mm from the original location. No credits will be anticipated where relocation per outlet of up to and including 3000 mm reduces materials, products and labour.
- 12.5 Should relocations per outlet exceed 3000 mm from the original location the Contract Price will be adjusted in accordance with the provisions for changes in the Contract Documents.
- 12.6 Alter the location of pipes and other equipment, without additional cost to the Owner, if approved, provided the change is made before installation.
- 12.7 Make necessary changes, due to lack of coordination, as required and when approved, at no additional cost, to accommodate structural and building conditions.

13 EXPANSION, CONTRACTION, AND DEFLECTION

- 13.1 Conform to manufacturer's recommended installation temperatures. If items, components, assemblies, systems, and finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and consultant. Repair all resulting damage should expansion and contraction provisions provide inadequate.
- 13.2 Make provisions for expansion and contraction due to temperature changes within components, Products and assemblies, and between adjacent components, Products and assemblies, and due to building movements including but not limited to creep, column shortening, deflection, sway and twist. Ensure provisions for expansion, contraction and building movements prevent damages from occurring to and within components, Products and assemblies.
- 13.3 Make adequate allowance at wall and partition heads for deflection of the structure above. Determine requirements from Consultant where additional information is required. Where partitions butt to underside of floor assembly, or structural framing, the clearance shall be based on the span of the members supporting the floor or structural framing. In making such allowance use methods which maintain the integrity of the wall or partition as a sound, and/or fire barrier.
- 13.4 Make provisions in pipes, plenums, ducts and vessels containing air and fluids as is necessary to prevent damage due to fluid and air induced pressure, surges and vibrations, to pipes, plenums, ducts and vessels and to adjacent components, assemblies and construction to which pipes, ducts, plenums and vessels are attached or pass through.

14 DIELECTRIC SEPARATION

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

15 PRODUCTS AT SOUND ATTENUATING PARTITIONS

- 15.1 Avoid sound transfer at sound attenuating partitions by careful location and treatment of mechanical and electrical equipment, ducts, grilles, diffusers, electrical outlets and boxes, and similar items. Where electrical boxes are back to back, serving each side, locate them at least 250 mm apart laterally or as noted in the Contract Documents and, if interconnected, use flexible connections.

16 FASTENINGS

- 16.1 Include in the work of each section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work or other sections, deliver and locate devices in ample time for installation.
- 16.2 Do not install fibre, plastic or wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on drawings.
- 16.3 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, construction, components and equipment under static conditions, and to resist building thermal movement, creep and vibration.
- 16.4 Provide metal fastenings and accessories in same material, texture, colour, sheen and finish as metal on which they occur, unless indicated otherwise.
- 16.5 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.
- 16.6 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, and where attached to, or contained within, exterior walls and slabs, unless stainless steel or other material is specified. Leave steel anchors bare where cast in concrete.
- 16.7 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- 16.8 Conceal fasteners where indicated. Keep exposed fastenings to a minimum, space evenly and in an organized symmetrical pattern.
- 16.9 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- 16.10 Bolts shall not project more than one diameter beyond nuts.

- 16.11 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- 16.12 Powder Actuated Fastenings:
 - .3 Do not use powder actuated fasteners for the support of ceilings.
 - .4 Do not use powder actuated fastenings on any portion of the Work, unless written consent for a specific use is obtained from the Consultant.
 - .5 Only low velocity tools will be permitted under any condition. Operators to be qualified and to be in possession of a valid operator's certificate.
- 17 **ADJUSTING**
 - 17.1 Ensure that all components of assemblies fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.
 - 17.2 Verify that work functions properly and adjust it accordingly to ensure satisfactory operation. Lubricate Products as recommended by manufacturer.

END OF SECTION

1 General Information

Project Name: _____

Project #: _____ Date: _____

General Contractor: _____

Product Specified: _____ Division and Section: _____

Product Substitute: _____ Manufacturer Contact: _____

Reason for Substitution: _____

Credit: _____ Schedule Impact: _____

2 Product and Material Substitutions

In the table below provide the appropriate data for comparison as itemized in each part of the Specification Section showing conformance to specified standards, dimensions, fabrication, colour, quality assurance, warranty, execution etc. as necessary for the Consultant to confirm the Substituted Product meets or exceeds the specifications. At the time of this submittal, provide the Consultant with the relevant Architectural details which prove conformance with the design intent and co-ordination with and installation by affected trades.

Specified Product	Proposed Substitution
Part 1.0 - General	Part 1.0 - General
Part 2.0 - Product	Part 2.0 - Product
Part 3.0 - Execution	Part 3.0 - Execution

1 LAYOUT AND SURVEY

- 1.1 Engage a registered land surveyor, licensed to practice in Place of the Work.
- 1.2 Existing grades, lines, and site conditions shown on Drawings were taken from survey information established by persons engaged directly by the Owner. The accuracy of survey information is not the Consultant's responsibility. The Contractor will establish location of property lines.
- 1.3 Be responsible for setting out the Work. Prior to setting out the Work, verify dimensions and elevations shown on the Contract Documents and report to the Consultant any unsatisfactory conditions that may adversely affect the proper completion of the Work.
- 1.4 Prior to starting work at Site, set up and maintain permanent reference points and be responsible for the accuracy of such reference points. Preserve and protect permanent reference points on site during construction. Establish lines and levels required for the performance of the Work.
- 1.5 Report to Consultant when a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations. Require registered land surveyor to replace reference points in accordance with original survey. Do not change or relocate reference points without prior written notice to Consultant.
- 1.6 Accurately set out the Work from levels and lines. Where Work of this Contract is dependent upon grades and elevations of existing structures or facilities, such grades or elevations shall take precedence over those determined by reference to established elevations. Advise the Consultant of any discrepancies.
- 1.7 During any activity of the Work, layout and check all features, including but not limited to the following:
 - .1 Lay out building on the Site, in the survey.
 - .2 Establish a permanent benchmark, or markers as widely separated as possible.
 - .3 Establish and maintain temporary benchmarks set in suitable locations.
 - .4 Provide general dimensions, lines and elevations required by Subcontractors.
 - .5 Verify elevations of floor and roof levels as construction proceeds and relate to benchmark datum.
 - .6 Verify that present or known future restrictions are not violated by construction on the site or lines of traverse to all public utilities.
 - .7 Correlate geodetic elevation of benchmark datum with elevations in use by public utilities adjacent to Project.

- .8 Verify accuracy of site dimensions shown on Drawings.
- .9 Provide a survey to verify location of footings immediately adjacent to property lines, before construction of footings proceeds.
- .10 Provide a survey to verify location of building related to property lines when foundation walls are completed to grade level.
- .11 Provide a survey prior to placement of asphalt and concrete paving to confirm that grades conform to grades indicated on Drawings.
- .12 Provide a survey to verify location of completed building on Site.
- 1.8 Maintain a complete, accurate log of control and survey work as it progresses. Record locations with horizontal and vertical data in project record documents.
- 1.9 Examine, preserve and protect established benchmarks. Re-establish a lost or displaced benchmark by a Land Surveyor licensed to practice in the place of Work at no cost to the Owner. Accept responsibility for setting out the Work.
- 1.10 In the event of a discrepancy between the Owner and the Contractor regarding horizontal and/or vertical alignment conditions, that are beyond allowable specified tolerance, the Owner may engage the services of an independent Land Surveyor. The surveyor shall investigate the disputed condition and the results of the independent investigation shall determine the bearer of costs for this service, being either the Owner or the Contractor.
- 1.11 If the Contractor is found to be in error, all costs incurred to correct the condition shall be assumed by the Contractor.
- 2 **EXISTING UTILITIES AND STRUCTURES**
- 2.1 Before commencing excavation, drilling or other earthwork, establish or confirm location and extent of all existing underground utilities and structures in work area.
- 2.2 Promptly notify Consultant if underground utilities, structures, or their locations differ from those indicated in Contract Documents or in available project information. Consultant will provide appropriate direction.
- 2.3 Record locations of maintained, re-routed and abandoned utility lines.
- 3 **VERIFICATION OF EXISTING CONDITIONS**
- 3.1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.

- 3.2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of Products used.
- 3.3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.
- 3.4 Notify Consultant in writing of unacceptable conditions.
- 3.5 Verify existing footing elevation and existing finish floor elevations of 84 Wilson before proceeding with any work. Do not proceed with work if there is a risk of undermining 84 Wilson existing footing and notify consultant.

END OF SECTION

1 GENERAL

- 1.1 Provide labour, Products, equipment, services, tools, and supervision necessary for cutting and patching work in accordance with the Contract Documents.
- 1.2 Obtain Consultant's approval prior to cutting, boring or sleeving load-bearing members.
- 1.3 It is expected that any damage to slabs, walls, ceilings and finishes in the existing building (25 James St..) where work is occurring is to be repaired and made good to equal or better condition than the existing before work has started as part of the base contract.

2 DEFINITION(S)

- 2.1 The terms "make good", "making good", "made good", "restore to existing", "patch", "repair", or similar words or phases are used in standards and these Contract Documents to mean the following, unless context provides otherwise:
 - .1 Make good materials and finishes which are damaged or disturbed during the process of additions and reconstruction under the Contract.
 - .2 Where existing work is to be made good, match new work exactly with the existing work in material, form, construction and finish unless otherwise noted or specified.
 - .3 Where existing work is to be made good, there shall be no visible difference in appearance, or aesthetics between the existing work and the new work by the naked eye at a distance of 3 metres from the surface being made good. There shall be no difference in performance between existing materials and new materials.

3 SUBMITTALS

- 3.1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of the Structure or Contract.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner's or Other Contractors.
 - .6 Warranty of Products affected.
- 3.2 Include in request:
 - .1 Identification of Project.

- .2 Location and description of affected Work, including drawings and sketches as required.
- .3 Statement of necessity for cutting or alteration.
- .4 Description of proposed Work and Products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on work of Owner's or Other Contractors.
- .7 Written permission of affected Other Contractors.
- .8 Date and time Work will be executed.

- 3.3 Obtain Consultant's approval of proposed method of cutting prior to proceeding with the Work.

4 PRODUCTS

- 4.1 Same quality or better than Products incorporated in original installation.
- 4.2 Unless otherwise specified, when replacing existing or previously installed Products in the course of cutting and patching work, use replacement Products of the same character and quality as those being replaced.
- 4.3 If an existing or previously installed Product must be replaced with a different Product, submit request for substitution in accordance with Section 01 25 00.

5 PREPARATION

- 5.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- 5.2 After uncovering, inspect conditions affecting performance of the Work.
- 5.3 Beginning of cutting or patching means acceptance of existing conditions.
- 5.4 Provide supports to assure structural integrity of surroundings; Provide devices and methods to protect other portions of the Work from damage.
- 5.5 Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

6 EXECUTION

- 6.1 Coordinate and perform the Work to ensure that cutting and patching work is kept to a minimum.
- 6.2 Execute Work to avoid damage to other Work.
- 6.3 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.
- 6.4 Perform cutting, fitting, patching, and remedial work including excavation and fill, to make the affected parts of the Work come together properly and complete the Work.
- 6.5 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the Products affected, in a manner that neither damages nor endangers the Work.
- 6.6 Fit Work segments together, to integrate with penetrations through surfaces and with other Work.
- 6.7 Remove and replace defective and non-conforming Work.
- 6.8 Do any drilling, cutting, fitting, patching and finishing that may be required to make the various classes and kinds of other Work fit together in a professional and finished manner. Make watertight connections with adjoining structures.
- 6.9 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- 6.10 Execute Work by methods to avoid damage to other Work and which will provide proper surfaces to receive patching and finishing.
- 6.11 Cut Products using proper equipment and methods. On rigid materials, use a masonry saw or core drill. Do not use pneumatic or impact tools without Consultant's prior approval.
- 6.12 Where new Work connects with existing structures, cut, patch and make good existing work to match original condition.
- 6.13 Be responsible for correct formation and bridging of openings in masonry and structural walls as required.
- 6.14 Ensure compatibility between installed Products and security of installation.
- 6.15 Restore Work with new Products in accordance with requirements of the Contract Documents.
- 6.16 Fit Work airtight to pipes, sleeves, ducts, conduits and other penetrations through surfaces.

- 6.17 Provide proper surfaces to receive patching, remedial work, and finishing.
- 6.18 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- 6.19 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.
- 6.20 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices
- 6.21 Existing utilities:
 - .1 When breaking into or connecting to existing services' utilities, execute the Work at times directed by local governing authorities, with a minimum of disturbance to the Work, pedestrian and vehicular traffic, and ongoing Owner operations. Inform Owner and Consultant a minimum of 72 hours prior to breaking into or connecting to existing services' and utilities.
 - .2 Maintain excavations free of water.
 - .3 Any Utility disruption to the existing building (25 James St.) shall not exceed four (4) hours in duration.
 - .4 Timing and permission of this work to be requested and coordinated with Owner a minimum of four (4) days prior to proceeding. This work to be coordinated to start at 8 am in the morning of the approved scheduled day and not extend past 5 pm from Monday - Friday . Any work that may affect the existing buildings (25 James St.) fire life safety systems the Contractor is required to provide a fire watch until the existing fire life systems are operational.
 - .5 Protect and maintain existing active services. Record location of services, including depth, on as-built drawings.
 - .6 Construct or erect barriers in accordance local governing authorities as required to protect pedestrian and vehicular traffic.

END OF SECTION

1 **REGULATORY REQUIREMENTS**

- 1.1 Comply with applicable regulatory requirements when disposing of waste materials.
- 1.2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

2 **GENERAL CLEANING REQUIREMENTS**

- 2.1 Provide adequate ventilation during use of volatile or noxious substances. Do not rely on building ventilation systems for this purpose.
- 2.2 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- 2.3 Prevent cross-contamination during the cleaning process.
- 2.4 Notify the Consultant of the need for cleaning caused by Owner or other contractors.

3 **PROGRESS CLEANING AND WASTE MANAGEMENT**

- 3.1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.
- 3.2 Ensure that only cleaning materials are used which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.
- 3.3 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.
- 3.4 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.
- 3.5 Maintain building work areas "broom clean" at least on a daily basis, but shall also be done immediately before finishing work.
- 3.6 Remove from finish work, spatters, droppings, soil, labels, and debris, before they set up.
- 3.7 No waste material may be burned or buried at site. Remove as often as required to avoid accumulation, no less than, at the end of each working day.
- 3.8 Remove packaging materials and debris from the site immediately after product and equipment is unwrapped or uncrated.
- 3.9 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers, in open drain courses, or anywhere on site.

- 3.10 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water. Provide containers in which to collect waste material and debris. Dispose of hazardous products in accordance with requirements of jurisdictional authorities.
- 3.11 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.
- 3.12 Ensure that cleaning operations are scheduled to avoid deposits, of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.
- 3.13 Provide instructions for final cleaning of finishing work, and for inclusion in Maintenance and Operating Manuals.

4 FINAL CLEANING

- 4.1 In addition to requirements for progress cleaning, Work shall include final cleaning by professional cleaning specialists on completion of construction.
- 4.2 Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that Owner, Consultant, Contractor and cleaning company are in attendance.
- 4.3 Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, and Construction Equipment not required to perform any remaining work.
- 4.4 Before final inspection, replace glass and mirrors broken, damaged, and etched during construction, or which are otherwise defective.
- 4.5 Remove waste material and debris from crawlspaces and other accessible concealed spaces.
- 4.6 Remove temporary protections and make good defects before commencement of final cleaning.
- 4.7 Final cleaning shall remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building for all new work throughout new and existing Building. Work shall be done in accordance with manufacturer's instructions for each material. This work shall include:
 - .1 Washing of exterior paved surfaces, and of interior tile, brick, and concrete floors.
 - .2 Remove stains, spots, marks, and dirt from exterior facades.
 - .3 Clean exterior and interior window glass and frames.
 - .4 Cleaning and polishing of glass, mirrors, porcelain, enamel and finish metals.

- .5 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.
- .6 Vacuum cleaning of ceilings, walls and floors, and behind grilles, louvres and screens.
- .7 Cleaning and polishing of terrazzo and ceramic and quarry tile floors.
- .8 Cleaning of resilient flooring.
- .9 Buffing of resilient flooring followed by two light coats of wax, each buffed.
- .10 Washing clean of glazed wall surfaces.
- .11 Cleaning of hardware, mechanical fixtures, plumbing fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components. Replace filters for mechanical equipment if equipment is used during construction.
- .12 Cleaning of windows, entrances and skylights, both interior and exterior surfaces.
- 4.8 Maintain cleaning until Owner has taken possession of building or portions thereof.
- 4.9 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.
- 4.10 Re-clean as necessary areas that have been accessed by Contractor's workers prior to Owner occupancy.
- 5 **WASTE AUDIT, MANAGEMENT AND DISPOSAL**
- 5.1 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.
- 5.2 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.
- 5.3 Be responsible for, and do all work necessary to, ensure that materials removed from the Site are properly prepared and will be accepted by the disposal facility. Dispose of materials at disposal facilities approved by Owner, which are in compliance with applicable regulations and are permitted to receive materials from the Site.
- 5.4 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.

- 5.5 Do not burn or bury waste materials at Place of the Work
- 5.6 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.
- 5.7 Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

1 GENERAL

- 1.1 Submit comprehensive operations and maintenance manual and material suitable for the Owner's maintenance employees electronically in format acceptable to the Owner.
- 1.2 Hand over to the Consultant one (1) copy of closeout submittals and comprehensive operations and maintenance manual and material suitable for the Owner's maintenance employees. Manuals shall cover all Products supplied and installed under the Contract.
- 1.3 Submit draft of closeout submittals including operation and maintenance manuals for the Consultant's review at least 15 days before testing systems and equipment. Incorporate alterations and additions, as found to be necessary during testing, and prepare the final version of the manual from the corrected draft.
- 1.4 Submit final version of closeout submittals including operation and maintenance manuals prior to Ready-for-Takeover.
- 1.5 Testing of systems and equipment will not be deemed to be complete until the requisite number of copies of the final version of the manuals has been handed over to Consultant.
- 1.6 If standard literature is incorporated into the operations and maintenance manual, any irrelevant information shall be deleted, or suitably noted.
- 1.7 The manuals shall have sufficient detail in order that the Owner can totally maintain the equipment without outside help.
- 1.8 Submit all material in English.
- 1.9 Where a licensed Professional Engineer registered in the province where the project is being undertaken is required to design, sign, and stamp the shop drawings, they shall also be responsible for periodic reviews during fabrication, installation and/or construction of the delegated design scope for which they are responsible. On completion of the delegated design scope, and prior to Ready-for-Takeover, they shall provide a signed and stamped sign off letter on their company letterhead stating the following:
 - .1 Name and address of the project.
 - .2 Parts of the Work.
 - .3 Periodic reviews of the delegated design Work have been conducted and,
 - .4 Based on these reviews and inspections, the Professional Engineer is satisfied that the delegated design work has been fabricated, erected, and installed in compliance with their designed, signed, and stamped shop drawings — as reviewed by the Consultants, dated mm.dd.yy -, and applicable codes, regulations and standards.

2 FORMAT

- 2.1 Organize data in the form of an instructional manual.
- 2.2 Arrange content by systems or process flow, under Section numbers and sequence of Table of Contents.
- 2.3 Text: Manufacturer's printed data, or typewritten data.
- 2.4 Provide electronic copy of manual in PDF format.
- 2.5 Provide electronic copy of Shop Drawings in manual as 1:1 scaled CAD files in .dwg format on electronic media acceptable to Owner.

3 OPERATION AND MAINTENANCE MANUAL CONTENT

- 3.1 Operation and maintenance manuals shall contain the following minimum information and data:
 - .1 Table of contents.
 - .2 Introductory information:
 - .1 Provide date of manual submission.
 - .2 Title of Contract, complete contact information for Consultants, subconsultants, Contractor, and Subcontractors with name of responsible parties.
 - .3 Schedule of Products and systems, indexed to content of the volume.
 - .3 For each Product or system: Include complete contact information for Subcontractors, suppliers, manufacturer's, and service representatives, including local source of replacement supplies and parts.
 - .4 Product Data:
 - .1 Mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.
 - .2 Drawings: Supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams and as required in the Specifications.
 - .3 Typed text: As required to supplement Product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions and as required in the Specification.
 - .5 Complete set of reviewed Shop Drawings.
 - .6 All issued responses to Request for Information, Supplemental Instructions, Proposed Changes, Change Order and Change Directive (if applicable).
 - .7 All construction meeting minutes.

- .8 All claims and memorandums issued by any party.
- .9 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.
- .10 Warranties: Warranties are between the Contractor and Owner. Warranties shall include, as a minimum:
 - .1 Separate each warranty with index tab sheets keyed to Table of Contents listing.
 - .2 List each warrantor with complete contact information.
 - .3 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in Owner's name.
 - .4 Description of warranty coverage.
 - .5 Date warranty starts (being date of Ready-for-Takeover).
 - .6 Date warranty expires.
 - .7 Contact name, address and phone number (the Contractor shall also be responsible for advising the Owner of changes in contact information during the warranty period).
 - .8 Equipment and components performance curves.
 - .9 Hydro certificates.
- .11 Reports: For each Product or system provide the following:
 - a. Manufacturer's certified reports.
 - b. Factory test reports.
 - c. Field testing reports.
- .12 Details of design, construction and/or fabrication features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of the installation.
- .13 Technical data, Product data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.
- .14 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.
- .15 Equipment and systems content:
 - .1 Each item of equipment and each system: Include description of unit or system and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - .2 Schematic and wiring diagrams, wiring interconnection lists and diagrams fully cross referenced and coordinated, printed circuit board layouts including the component identification, component parts list with electronic substitution equivalent. Provide cross referenced components lists and sequence of operations.
 - .3 Panel board circuit directories: Provide electrical service characteristics, controls, and communications.
 - .4 Include installed colour coded wiring diagrams.

- .5 Operating procedures: Include start up, break in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .6 Maintenance requirements: Include routine procedures and guide for trouble shooting and fault location; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .7 Provide servicing, preventative maintenance, and lubrication schedule, and list of lubricants required.
- .8 Include manufacturer's printed operation and maintenance instructions.
- .9 Include sequence of operation by controls manufacturer.
- .10 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .11 Provide installed control diagrams by controls manufacturer.
- .12 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .13 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .14 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .15 Include testing and balancing reports.
- .16 Include additional content as specified in technical Specifications sections.
- .16 Product and finishes:
 - a. Include Product data, with specific Product, component parts, and catalogue number, options selected, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured Products. Delete inapplicable information.
 - b. Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - c. Include an outline of requirements for routine and special inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.
 - d. Include additional content as specified in technical Specifications sections.
- .17 As-built drawings: Submit final as-built drawings in the form specified in Section 01 32 00.
- .18 Training materials.
- .19 Spare parts, maintenance materials, and special tools:
 - .1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical Specifications sections.
 - .2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed Products.
 - .3 Provide tags for special tools identifying their function and associated Product.

- .4 Deliver to and store items at location directed by Owner at Place of the Work. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.
- .5 Catalogue all items and submit to Consultant an inventory listing organized by Specifications section. Include Consultant reviewed inventory listing in operation and maintenance manual.

4 DRAWINGS

- 4.1 Submit as-built drawings and record in accordance with Sections 01 32 00 and 01 78 39.

5 TRANSMITTAL

- 5.1 Forward storage media to the Owner through the Consultant with a transmittal form. Transmittal shall contain the list of file names contained on the storage media.
- 5.2 Data forwarded to the Owner shall contain the following files in addition to the design information:
 - .1 Library parts used in the design files.
 - .2 Level convention used for each design file.
 - .3 Plotting instructions used to prepare hard copies including colour tables, pen tables and plot scale.
 - .4 Working units of the design files.
 - .5 Font library, if the standard is not used.

END OF SECTION

1 PROGRESS RECORDS

- 1.1 Maintain on site, permanent written records of daily progress of the Work. Records shall be open to review by Consultant and Owner at all times and a copy shall be furnished to Consultant on a weekly basis.
- 1.2 Records shall show dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to number of employees of various trades and type and quantity of equipment employed daily, temperature, protection methods and other such data shall be noted.

2 AS-BUILT DRAWINGS

- 2.1 Authorized deviations from drawings shall be marked in red accurately on one set of drawing prints (paper copy) in a neat, legibly printed manner and shall be dated.
- 2.2 Prior to final inspection, neatly transfer the recorded information to a second set of drawing prints of the most recent revision to the drawings. Both sets shall be submitted to the Consultant.
- 2.3 Once work is finished, Contractor to supply Owner with hard copies mentioned above, scanned PDF copies and CAD drawings of as built drawings.
- 2.4 Maintain as-built drawings up to date as Work progresses. Status of maintained as-built drawings may be considered as a condition for validation of applications for payment.
- 2.5 Identify each as-built drawing as "As-Built Copy" and maintain the as-built drawings in good condition. Make as-built drawings available to the Consultant at all times.
- 2.6 As-built drawings shall include accurate dimensioned record of deviations and changes in Work from drawings.
- 2.7 As-built drawings shall be signed and dated by Contractor.
- 2.8 Submit as-built drawing to Consultant for review and make corrections as directed by Consultant.
- 2.9 Record accurately all deviations in the Work.
- 2.10 Accurately record locations of concealed structure, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration Work and future additions. Do not conceal such Work until the location has been recorded.
- 2.11 Accurately record locations of equipment bases, anchors, concrete pads and roof curbs, sleeves, piping, conduits, ducts, maintenance holes and valves, etc. located either below, outside or within structure.

- 2.12 Where piping, conduits and ducts are underground, underfloor, embedded in concrete or otherwise in inaccessible locations, accurately record with respect to structure column lines or walls and elevations with respect to finished floor levels or grades referenced to the centre line of components.
- 2.13 Accurately record any components which will be in inaccessible locations for Consultant's review before the component is covered, or buried, or made inaccessible.
- 2.14 Transfer records from the "As-Built Copy" to AutoCAD format matching the Consultant's documents. Arrange computer file in layers to exactly match the layering system of the Consultant.
- 2.15 Submit the "As-Built Copy" on one or more Memory/USB stick with PDF prints of each drawing to the Consultant at the time of Substantial Performance.
- 2.16 Clearly and prominently mark each drawing "AS-BUILT DRAWING prepared by _____ (name of Contractor)".
- 2.17 Electronic copies of Contract Drawings can be obtained from Consultant in AutoCAD format at a cost of \$150 plus HST per sheet for Architectural Drawings. A 'Release/Terms of Use' waiver will be required to be signed at the Consultant's sole discretion. Only floor plans and elevations will be made available.

END OF SECTION

1 - GENERAL

1.1 SUMMARY

- .1 This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration and exfiltration of air.
 - .1 The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the airtightness of the building enclosure are called the "air barrier system". Services include coordination between the trades, the proper scheduling and sequencing of the work, preconstruction meetings, inspections, tests, and related actions, including reports performed by the Contractor, independent agencies, and governing authorities. They do not include contract enforcement activities performed by the Architect.
 - .2 The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of conditioned space is achieved. The air barrier system shall have the following characteristics:
 - .1 It must be continuous, with all joints sealed.
 - .2 It must be structurally supported to withstand positive and negative air pressures applied to the building enclosure.
 - .3 Connection shall be made between:
 - .1 Foundation and walls
 - .2 Walls and windows or doors
 - .3 Different wall systems
 - .4 Walls and roofs
 - .5 Walls, floor and roof across construction, control, and expansion joints
 - .6 Walls, floors and roof to utility, pipe, and duct penetrations.
 - .3 Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration/exfiltration shall be sealed.
- .2 Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with the Contract Document requirements.
- .3 Requirements of this section relate to the coordination between subcontractors required to provide an airtight building enclosure and customized fabrication and installation procedures, not production of standard products.
 - .1 Continuity of the air barrier materials and products with joints to provide assemblies. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole building air barrier system.
 - .2 Specific quality-control requirements for individual construction activities are specified in the sections of the specifications. Requirements in those sections may also cover production of standard products. It is the Contractor's responsibility to ensure that each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each section.
 - .3 Specified inspections, tests, and related actions do not limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
 - .4 Requirements for the Contractor to provide an airtight building enclosure is not limited by quality control services required by the Architect, Owner, or authorities having jurisdiction and are not limited by provisions of this section.

1.2 RELATED SECTIONS

- .1 01 40 00 – Quality Requirements
- .2 01 90 10 – General Requirements for Energy Efficiency
- .3 07 05 20 – Air Tightness Testing

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Contractor Responsibilities
 - .1 Unless otherwise indicated as the responsibility of another identified entity, the Contractor shall provide coordination of the trades, and the sequence of construction to ensure continuity of the air barrier system joints, junctures and transitions between materials and assemblies of materials and products, from substructure to walls to roof.
 - .1 Provide quality assurance procedures as specified herein.
 - .2 Coordinate inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction or by the Owner. Costs for these services are to be paid by the Owner.
 - .3 Organize pre-construction meetings between the trades involved in the whole building air barrier system to discuss where each trade begins and ends, and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
 - .4 Build a mock-up before proceeding with the work, satisfactory to the Architect, of each airtight joint type, juncture, and transition between products, materials, and assemblies.
- .2 Associated Services
 - .1 Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - .1 Provide access to the Work.
 - .2 Furnish incidental labour and facilities necessary to facilitate inspections and tests.
 - .3 Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 - .4 Deliver samples to testing laboratories.
 - .5 Provide security and protection of samples and test equipment at the Project Site.
- .3 Duties of the Testing and Inspection Agency
 - .1 The independent agency engaged by the Owner to perform inspections, sampling, and testing of air barrier materials, components and assemblies specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
 - .1 The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - .2 The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 - .3 The agency shall not perform any duties of the Contractor.
- .4 Coordination

- .1 Coordinate the sequence of activities to accommodate required services with minimum delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - .1 The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 PERFORMANCE REQUIREMENTS

- .1 Airtightness: Refer to Section 07 05 20.

1.5 SUBMITTALS

- .1 Photographs
 - .1 The independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect.
 - .2 Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - .3 Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - .1 Date of issue.
 - .2 Project title and number.
 - .3 Name, address, and telephone number of testing agency.
 - .4 Dates and locations of samples and tests or inspections.
 - .5 Names of individuals making the inspection or test.
 - .6 Designation of the Work and test method.
 - .7 Identification of product and Specification Section.
 - .8 Complete inspection or test data.
 - .9 Test results and an interpretation of test results.
 - .10 Ambient conditions at the time of sample taking and testing.
 - .11 Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - .12 Name and signature of laboratory inspector.
 - .13 Recommendations on retesting.

1.6 QUALITY ASSURANCE

- .1 Qualifications for Air Barrier Testing and Inspection Agencies: Owner to engage Air Barrier inspection and testing service agencies, including independent testing laboratories, that are prequalified and that specialize in the types of air barrier system inspections and tests to be performed.
- .2 Materials and workmanship will be subject to inspection at any time. Cooperate in permitting access for inspection to all places where work is being done or stock is being stored. Refer to Section 01 40 00 and related Sections.
- .3 Owner's quality control inspection and testing is specified in the technical sections and will be paid for directly by the Owner except as otherwise specified. Contractor to pay for inspections and re-testing to verify acceptability of corrected work.
- .4 Allow sufficient time for testing, evaluation, alterations, and re-testing so as not to interrupt the Progress Schedule for the Project.
- .5 The Consultant will require testing of connections and special prefabricated inserts, as part of the work of this Section.

1.7 BUILDING ENVELOPE DESIGN

.1 General Principles

- .1 Design and engineer (as required), fabricate, and install building envelope in compliance with the Ontario Building Code, other regulations, the requirements of authorities having jurisdiction.
- .2 Take into account construction tolerance limitations, creepage, deflection and other movements of the structure.
- .3 Accommodate, by means of expansion and contraction provisions, any movement in the building envelope assemblies themselves and between the assemblies and the building structure. Allow for expansion and contraction of components caused by ambient temperature range, surface temperature variation of components, wind, seismic forces, structural deflection, and racking; without causing misalignment of joints, breakage of joints and air/vapour barriers, water and air penetration through the assembly, glass breakage, or other defects detrimental to appearance or performance.
- .4 Method of attachment to the structure is to take into account site peculiarities so that site and air vibrations or normal temperature movements of the building do not loosen, weaken and/or fracture the connection between building envelope assembly components and the structure or between the components themselves.
- .5 Reinforce building envelope assembly components, as required, so that the members can safely sustain design loads.
- .6 Assemble and secure assemblies in a manner which will keep stresses on sealants within the sealant manufacturer's recommended maximum performance levels.

.2 Rain Screen Principle

- .1 Gaskets, baffles, overlaps, seals and compartmentalization as required to provide a barrier "Rain Screen" to effectively prevent excessive rainwater entry into any of the building envelope cavities but to allow pressure equalization of cavity air spaces.
- .2 Air barriers and seals are required to prevent entry of interior building air into building envelope cavities, and exterior air into the building. Air barriers and seals will be able to withstand wind design pressures.
- .3 Such provisions in the form of openings between cavities and the building exterior of sufficient cross sections to provide adequate pressure equalization. All openings will be effectively baffled against direct rainwater entry.

.3 Limiting Thermal Bridging

- .1 Thermal separators, isolators, and seals to be placed to eliminate contact between interior humid air and a cold surface (or structural components) to prevent condensation build-up on surfaces during cold weather, along with heat transfer through thermal bridging. Refer to Documents for locations of thermal separators, and for details to limit thermal bridging.

3 – PRODUCTS

3.1 NOT USED

4 - EXECUTION

4.1 REPAIR AND PROTECTION

- .1 Upon completion of inspection, testing, sampling, and similar services, repair damaged construction and restore substrates and finishes. Comply with the Contract Document requirements for Section 01 71 00.
- .2 Protect construction exposed by or for quality control service activities and protect repaired construction.
- .3 Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

1 - GENERAL

1.1 SUMMARY

- .1 Section includes:
 - .1 Administrative and procedural requirements for meeting the project energy efficiency requirements and air tightness targets.
 - .2 Identification of construction activities and tasks related to energy efficiency and air tightness.
 - .3 Monthly and project close-out reporting requirements.

2.1 RELATED SECTIONS

- .1 01 40 00 – Quality Requirements
- .2 07 05 20 – Air Tightness Testing

3.1 ADMINISTRATIVE REQUIREMENTS

- .1 Contractor Responsibilities
 - .1 Unless otherwise indicated as the responsibility of another identified entity, the Contractor shall provide coordination of the trades, and the sequence of construction to ensure all energy efficiency and air tightness requirements relating to construction activities and tasks have been met. Coordinate the sequence of activities to accommodate required services with minimum delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - .2 The Contractor shall provide the necessary orientation for all subcontractors.
 - .3 The Contractor shall acquire photos throughout construction as requested by the Energy Efficiency Consultant
 - .4 The Contractor shall work with the Energy Efficiency Consultant to coordinate, schedule and accommodate all testing, inspection, and quality assurance activities. For reference, testing activities will include:
 - .1 Whole-building air tightness testing
 - .2 Dwelling unit compartmentalization air tightness testing
 - .3 Heating, cooling and ventilation air distribution system measurement and balancing
 - .5 The Contractor shall allow enough time for testing, evaluation, alterations, and re-testing so as not to interrupt the Project Schedule.
 - .6 Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - .1 Provide access to the Work.
 - .2 Furnish incidental labour and facilities necessary to facilitate inspections and tests.
- .2 Subcontractors shall comply with all procedure and submittal requirements as detailed within the related specification sections as they pertain to their scope of work.
- .3 Pre-Construction meeting: After award of contracts and prior to mobilization onsite, the Contractor shall schedule a meeting with the Energy Efficiency Consultant to discuss the execution and documentation requirements as detailed within the related specification sections.

- .4 Site Review Responses: The Energy Efficiency Consultant will conduct inspections intermittently throughout construction. Feedback will be provided to the Contractor in the form of Site Review reports. The Contractor shall respond to all high and medium priority issues identified in the report within 5 working days from the time it was issued. The response shall be in written format and correspond to the item numbers used in the original report. If required, the Contractor shall provide photos and/or other supporting documentation that has been requested to demonstrate that the identified issues have been addressed.

4.1 QUALITY ASSURANCE

- .1 Materials and workmanship will be subject to inspection at any time. Cooperate in permitting access for inspection to all places where work is being done or stock is being stored. Refer to Section 01 40 00 and related Sections.
- .2 Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- .3 Owner's quality control inspection and testing is specified in the technical sections and will be paid for directly by the Owner except as otherwise specified. Contractor to pay for inspections and re-testing to verify acceptability of corrected work.

5.1 SUBMITTALS

- .1 Photographs
 - .1 Upon project completion, the Contractor shall upload all required photographs taken during construction to a FTP or cloud-based site setup by the Architect or Energy Efficiency Consultant.

2 – PRODUCTS

- 1.2 NOT USED

3 - EXECUTION

- 1.3 NOT USED

- .1 END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for demolition and removals Work in accordance with the Contract Documents.
- .2 Refer to Section 02 41 19 for additional requirements for structural alterations. Where a conflict occurs, the most stringent requirements shall apply.
- .3 Work included: Requirements for demolishing, salvaging and removing wholly or in part the various items designated on the drawings or required to be removed or partially removed for the receipt of the Work of this Contract, including not necessarily limited to:
 - .1 Demolition and removals shall be coordinated for preparation of new work shown in drawings. Contractor shall coordinate with all trades as required for demolition work required by this Project.
 - .2 Removal and relocation of structures abandoned or otherwise, above or underground, as required for the preparation for the Work, such as, but not necessarily limited to, pavement and paving, slabs, footings.
 - .3 Removal of rubbish, debris, demolished fixtures, fitments and items not scheduled to remain the Owner's property, resulting from the demolition and preparatory work.
 - .4 Remove abandoned services such as catch basins, water and sewer lines, gas lines conduits, pipes, wiring, ducts, fixtures, equipment, etc. where required for the work or indicated on the drawings.
 - .5 Removal of asphalt pavements, concrete and walks, curbs, fences, trees and shrubs, sodding and other site amenities where required for the work or indicated on drawings and/or where required to be relocated.
 - .6 Removal and/or relocation of all mechanical items including plumbing fixtures, services etc. where required for the work or indicated on drawings and/or where required to be relocated.
 - .7 Removal and/or relocation of existing electrical items including fixtures and equipment, etc. where required for the work or indicated on the drawings and/or where required to be relocated.
 - .8 Dust control during the operations of the work of this Section.
 - .9 Removal shall mean removal from site and safe disposal in a legal manner.

1.2 **REFERENCES**

- .1 CSA S350-M, Code of Practice for Safety in Demolition of Structures.

1.3 **SUBMITTALS**

- .1 Where required by Authorities having jurisdiction, submit a Fire Plan to local fire department for review and approval.

- .2 Submit shop drawings, diagrams and details in accordance with Section 01 33 00.
- .3 30 calendar days prior to start of demolition and removals work, submit for review, drawings, diagrams or details showing sequence of disassembly work and shoring of supporting structures in accordance with authorities having jurisdiction.
- .4 Submit for approval, a plan showing impacts, interruptions and delays to Owners operations.
- .5 Have submissions signed and sealed by Professional Engineer licensed in Province of Ontario.
- .6 Submit to Consultant, details of where rubble, debris and other materials are to be disposed or reused. Include each disposal/reuse site location, operator's name and business address, type of license under which site operates, and criteria used by site to assess suitability of rubble, debris and other materials for disposal.
- .7 Give notice to Utility Authorities controlling services and appurtenances which will be affected by demolition work.

1.4 QUALITY ASSURANCE

- .1 Prepare waste audits, waste reduction workplans, source separation programs and recycling programs as required by jurisdictional authorities and update programs and implement such programs as required.
- .2 Perform the work of this section in accordance with the 'Environmental Protection Act' including Ontario Regulation 102 and the 'Environmental Assessment Act' including Ontario Regulation 103.
- .3 Conform to Fire Code, Regulation under the Fire Marshals Act.
- .4 The demolition contractor must engage a registered professional engineer who holds a certificate of authorization and an appropriate level of liability insurance to prepare demolition procedures.
- .5 As part of the contract requirements, the engineer for the demolition contractor should be required to sign the general review commitment required by city building departments.

- .6 Roof Removal: Conform the requirements of Canadian Roofing Contractors Association.

1.5 **SITE CONDITIONS**

- .1 Interruptions to Owners operations will not be permitted.
- 2 Perform operations, machine and equipment movements, deliveries and removals at time or times that will permit uninterrupted operations in and around structures, including parking, deliveries, and Site access and egress.
- .3 Take over structures to be demolished based on condition on date that Tenders close.

2 **Products**

2.1 **MATERIALS**

- .1 All materials requiring removal shall become the Contractor's property and shall be removed and disposed of from the site, as the work progresses, unless indicated otherwise.
- .2 Salvaged material:
 - .1 Salvage and stockpile Products, materials, and equipment as specified herein, indicated on Site or indicated on drawings.
 - .2 Coordinate items to be salvaged with Consultant.
 - .3 Salvaged materials shall not be chipped, cracked, split, stained or damaged.
 - .4 Store items off of moist surfaces.

3 **Execution**

3.1 **GENERAL**

- .1 Be responsible for collecting and discharging water from floor slabs and roof decks as demolition work progresses.
- .2 Clean up rubble and debris, resulting from work promptly and dispose at end of day or place in waste disposal bins. Empty bins on regular basis.
- .3 Stockpiling of rubble, debris, and surplus Products on Site will not be permitted.

- .4 Remove, handle and transport Products indicated to be salvaged and stored for future use. Transport Products to storage area(s) designated by Consultant. Perform work to prevent any damage to Products during removal and in storage. Products damaged during removal, will be inspected by Consultant. Consultant will determine extent of damage and accept or refuse Products.
- .5 List and description of items to be removed and stored or reused:
 - .1 Brick for reinstallation under Section 04 20 00.
 - .2 Acoustic tiles for reinstallation under Section 09 51 00.
 - .3 Windows for Owner's storage.
 - .4 Light fixtures for Owner's storage.
 - .5 Security cameras for re-use.
 - .6 Unit heaters for re-use.
 - .7 Additional items as indicated on the drawings or by the Consultant.
- .6 Tag and log all items to be salvaged to the satisfaction of the Consultant. Ensure identification tags do not damage items to be salvaged and are non-permanent, removable and durable.
- .7 Take precautions to guard against movement, settlement or collapse of adjacent services, sidewalks, driveways, or trees. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.

3.2 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- 2 Inspect site conditions prior to commencement of work to confirm asbestos abatement has been completed satisfactorily by Owner's abatement contractor. Report any concerns to the Owner to be rectified and OSHA requirements satisfied before beginning the work of this Section.
- .3 Examine adjacent structures and other installations prior to commencement of demolition and removals work.
- 4 Verify that existing roof surface is clear and ready for work of this section.

3.3 **PRESERVATION OF REFERENCES**

- .1 Record location and designation of survey markers and monuments located within demolition area, prior to removal. Store and restore markers and monuments upon completion of Work or relocate as directed by Consultant.

3.4 PROTECTION

- .1 Provide, erect and maintain required hoarding, sidewalk sheds, catch platforms, lights and other protection around Site before commencing work. Maintain such areas free of snow, ice, mud, water and debris. Lighting levels shall be equal to that prior to erection.
- .2 Provide flagmen where necessary or appropriate to provide effective and safe access to Site to vehicular traffic and protection to pedestrian traffic.
- .3 Prevent movement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, and parts of existing structure to remain. Supply and install bracing, and shoring as required. Make good damage caused by demolition to acceptance of Consultant.
- .4 Protect adjacent structures and property against damage which might occur from falling debris or other causes. Repair or replace damage caused from work of this Section to acceptance of Consultant.
- .5 Do not interfere with use of adjacent structures and Work areas. Maintain free, safe passage to and from adjacent structures and Work areas.
- .6 Take precautions to support affected structures. If safety of structure being demolished, adjacent structures or services are endangered, cease demolition operations and take necessary action to support endangered item. Immediately inform Consultant. Do not resume demolition until reasons for endangering have been determined and corrected and action taken to prevent further endangering.
- .7 If movement or settlement occurs, install additional bracing and shoring as necessary and make good damage to acceptance of Consultant.
- .8 Hang tarpaulins where debris and other materials are lowered. Build in around openings with wood and plywood at locations used for removal of debris and materials.
- .9 Prevent debris from blocking surface drainage system, elevators, mechanical, and electrical systems which are required to remain in operation.
- .10 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger Work or adjacent structures and premises.
- .11 Supply and install adequate protection for materials to be re-used, set on ground and prevent moisture pick-up. Cover stockpiles of materials with tarpaulins.
- .12 Close off access to areas where demolition is proceeding by barricades and post warning signs.
- .13 Supply, install and maintain legal and necessary barricades, guards, railings, lights, warning signs, security personnel and other safety measures, and fully protect persons and property.

- .14 Dust/weather partitions:
 - .1 Prior to demolition work proceeding in existing structures, temporarily enclose Work areas, access and supply and install dustproof and weatherproof partitions. Design partitions to prevent dust and dirt infiltration into adjoining areas, prevent ingress of water, and to resist loads due to wind.
 - .2 Prevent dust, dirt and water from demolition operations entering operational areas.
 - .3 Adjust and relocate partitions as required for various operations of work.
 - .4 Upon completion of work, remove and dispose of partitions from Site.
- .15 Dust protection:
 - .1 Clean water to be applied to hard and soft surfaces on Site daily to eliminate dust.
 - .2 Roadways and sidewalks to be cleaned daily or as required.
 - .3 A designated truck loading area on granular material or existing asphalt to be used to mitigate tracking of potentially contaminated soil and demolition debris off Site. Contaminated loading points to be cleaned or re-established.
 - .4 Loaded vehicles leaving Site to be cleaned of loose soil and debris with power washing or alternative method.
 - .5 Trucks loaded with indigenous soil or demolition debris to be covered by tarps or attached screens.
- .16 Blasting is not permitted.

3.5 **PREPARATION**

- .1 Disconnect and/or re-route electrical data, communication, security cameras, and telephone service lines entering and/or routing over structures to be demolished to make good. Remove abandoned lines as required for renovation work. Post warning signs on electrical lines and equipment which is required to remain energized.
- .2 Disconnect and cap designated mechanical services:
 - .1 Natural gas supply lines: As required for renovation work, to be removed by qualified workers in accordance with gas company instructions.
 - .2 Sewer and water lines: Remove and dispose of as required for renovation work.
- .3 Disassemble and remove mechanical equipment, ductwork and piping complete with supports and associated components.
- .4 Do not disrupt active or energized utilities designated to remain undisturbed.
- .5 Perform rodent and vermin control to comply with health regulations.

3.6 CONCRETE CUTTING AND CORING

- .1 Prior to cutting or coring any concrete slab, suspended or on grade, or any concrete beam, investigate by telemetrically scanning the element for presence of embedded services (piping, cabling, conduit, etc.), and for locations of reinforcing steel in suspended concrete slabs and beams.
- .2 Acceptable telemetric scanning systems include:
 - .1 X-Ray scanning of suspended slabs and for concrete beams.
 - .2 (Ground-penetrating) radar for suspended slabs and for concrete beams.
- .3 Magnetic radio scanners not acceptable for telemetric scanning.
- .4 The term x-rays include gamma ray methods, and procedures that use electrically generated x-rays.
- .5 Where x-rays employed:
 - .1 Provide Owner minimum 5 working days advance notice of scanning time in order to provide sufficient advance notice to personal that may be affected by the x-ray work.
 - .2 Conform to Owner's radiation protection requirements prior to start of any x-ray work.
- .6 Provide Owner and Consultant with inspection agency's written report, summarizing investigations and conclusions.
- .7 Obtain Consultant's direction where investigations reveal that cutting or coring required in Contract would cut or damage embedded services, or cut or damage reinforcing steel in suspended concrete slabs or beams.
- .8 Execute cutting and coring to prevent damage to all embedded services. Make good all damage arising from cutting embedded services.
- .9 Execute cutting and coring to prevent damage (cutting in whole or in part) reinforcing steel in suspended concrete slabs with Consultant's prior authorization.
- .10 Make good all damage arising from cutting reinforcing steel in suspended concrete slabs and beams.

3.7 DEMOLITION

- .1 Perform demolition with extreme care. Confine effects of demolition to those parts which are to be demolished.
- .2 Perform work and prevent inconvenience to persons outside those parts which are to be demolished.
- .3 Carry out demolition in accordance with the requirements of CSA S350-M.

- .4 Demolish parts of structure to permit construction of addition and remedial Work as indicated.
- .5 Demolition shall proceed safely in systematic manner from roof to grade and as necessary to accommodate remedial work indicated. Work on each floor level shall be complete before commencing work on supporting structure and safety of its supports are impaired. Parts of building which would otherwise collapse prematurely shall be securely shored. Walls and piers shall not be undermined.
- .6 Do not overload floor or wall with accumulations of material or debris or by other loads.
- .7 Perform work to minimize dusting. Keep work area wetted down with fog sprays to prevent dust and dirt rising. Supply and install temporary water lines and connections that may be required. Upon completion, remove installed temporary water lines. Use covered chutes, water down.
- .8 Do not sell or burn materials on Site.
- .9 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as Work progresses.
- .10 At end of day's work, leave Work in safe condition with no part in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements.
- .11 Drainage and sewer system protection:
 - .1 Ensure that no dust, debris or slurry enters drainage and sewer system on Site.
 - .2 Remove and dispose of debris and slurry promptly from Site.
 - .3 Comply with City of Toronto Sewer Use By-Law.
- .12 Asphalt pavement:
 - .1 Break out and remove existing asphalt pavement, curbs and sidewalks within confines of Work as shown on Contract Drawings.
 - .2 Square up adjacent surfaces to remain in place by saw cutting or other methods acceptable to Consultant to avoid damage to remaining pavement.
 - .3 Protect adjacent joints and load transfer devices.
 - .4 Protect underlying granular materials.
- .13 Concrete:
 - .1 Demolish concrete by methods which avoid impact loads on items which are not to be demolished.
 - .2 Where only part or parts of a concrete floor, wall, roof, or other items are to be demolished, use saw cuts to isolate areas which are to be demolished except where existing reinforcing steel is to be left in place. Prior to such isolating, install suitable support to prevent premature movement of area(s) being isolated and undesirable transfer of loads as cutting progresses. If necessary remove area(s) to be demolished by successively isolating small sections.

- .3 Where reinforcing steel is to be left in place, use saw cuts from surface of concrete around perimeter(s) of area(s) to be demolished, chip concrete without damaging reinforcing steel. Retouch damaged epoxy coating of existing reinforcing steel.
- .14 Masonry:
 - .1 Demolish block or brick walls in small sections of not more than 2 m². Do not permit masonry to fall in mass from one level to another.
 - .2 Where only part(s) of a wall is to be demolished, install adequate support for adjacent part(s).
 - .3 Clean and stack bricks to be reused.
 - .4 After removal of masonry walls, grind smooth floors ready for new floor finish.
- .15 Remove shelf angles as required where masonry is to be demolished, unless directed otherwise by Consultant.
- .16 Steel: Where only part or parts of structure is to be demolished, dismantle and maintain structure stable. Do not place excessive loads on components. Install adequate temporary guys and supports to ensure stability and to prevent excessive loading. Support each component being disconnected from structure, and lower, do not drop, component after it is disconnected.
- .17 Cut openings through existing walls, partitions, roofs and floors. Establish exact location of steel reinforcing in existing concrete slabs or walls before cutting. Be responsible for damage to existing steel reinforcing and be liable for structural failure. Make good surfaces disturbed with materials to match existing.
- 18. Where doors are scheduled to be removed, include removal of door frames and door hardware.
- 19. Remove interior partitions, fittings, fixtures and accessories as indicated on drawings. Partitions and walls shall be removed full height to structure above.
- 20. Remove interior finishes, such as ceiling and floor finishes, where new finishes are indicated on Contract Drawings.
 - 1. Removal of existing ceilings shall include complete removal including bulkheads and suspension system.
 - 2. Removal of adhesive applied finishes shall include complete removal to substrate including adhesive. Take adequate care to prevent damage to substrate.
 - 3. Remove existing floor finishes, include mortar bed, underlayment or other cleavage membranes, underpad, base, floor moulding and transition strips.
- .21 Where acoustic ceiling tiles are indicated for removal and subsequent reinstallation, the tile are to be removed and stored on site in a dry and safe location approved with the Consultant and Owner. The suspension system and framing is to be removed only as required for work above the ceiling, and subsequently re-installed with the ceiling tiles.

22. Demolish all other items indicated or required.

3.8 **RECYCLING**

- .1 Whenever possible, all materials shall be recycled. Pay all costs for this work.
- .2 Deliver to nearest appropriate recycling depot all materials accepted for recycling by Authorities having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass.
- .3 Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material.
- .4 Ceiling tiles to be stacked on skids and wrapped for recycling and delivered to nearest appropriate recycling depot.
- .5 Carpet tile to be recycled by Viking Recycling or by Interface (only when a new order is placed).
- .6 Base building light fixture lamps to be placed on skids and wrapped for recycling and delivered to nearest appropriate recycling depot.

3.9 **DISPOSAL OF MATERIALS**

- .1 Remove from Site, rubble, debris, and other materials that can not be recycled resulting from demolition and removals work in accordance with Authorities having Jurisdiction, except where specified or indicated on Contract Drawings to be reused.
- .2 Conform to requirements of municipality's Works Department regarding disposal of waste materials.
- .3 Materials prohibited from municipality waste management facilities shall be removed from Site and dispose of at recycling companies specializing in recyclable materials.

3.10 **RESTORATION**

- .1 Where demolition removed a structure or installation, restore area in accordance with Authorities having Jurisdiction.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- 1.1.1 The General Conditions of the Contract and any Supplements and/or Addenda thereto form an integral part of this Specification and must be read in conjunction herein.

1.2 RELATED SECTIONS

- 1.2.1 Section 01 80 00 – Performance Requirements
- 1.2.2 Section 03 20 00 – Concrete Reinforcing
- 1.2.3 Section 03 30 00 – Cast-in-Place Concrete
- 1.2.4 Section 03 35 00 – Concrete Finishing
- 1.2.5 Section 05 12 23 – Structural Steel for Buildings

1.3 GENERAL INSTRUCTIONS

- 1.3.1 Make a thorough examination of the drawings, specifications, and the site, to determine the intent, extent, materials, conditions of interfacing with other work, and to be fully cognizant of requirement.
- 1.3.2 Assume full responsibility for the design, for the adequacy and for the safety of all formwork and falsework.

1.4 REFERENCE STANDARDS

- 1.4.1 Conform with the requirements of the latest edition of the Ontario Building Code, inclusive of all amendments and Minister's Rulings, and any applicable acts of any authority having jurisdiction.
- 1.4.2 All codes, standard specifications, and by-laws referred to in this Specification shall be current editions, including all latest revisions, addenda, and supplements, unless otherwise noted in the Building Code.
- 1.4.3 Canadian Standards Association (CSA International)
 - 1.4.3.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - 1.4.3.2 CSA S269.1, Falsework and Formwork.
 - 1.4.3.3 CSA S269.3, Concrete Formwork
- 1.4.4 Underwriters' Laboratories of Canada (ULC)
 - 1.4.4.1 CAN/ULC-S701.1: 2017, Standard for Thermal Insulation, Polystyrene Boards.

- 1.4.5 Standards referenced by those Standards noted above are to be applied to the Work even if they are not listed in the above list.
- 1.4.6 In the event of conflict between standards, codes, drawings, and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally, the most stringent provision shall govern. No extras to the contract will be approved due to such clarification.
- 1.5 TOLERANCES
 - 1.5.1 Perform forming operations and place hardware such that finished concrete will be within the tolerances defined by CSA A23.1.
 - 1.5.2 Tolerances as set out in A23.1 are acceptable regarding structural requirements however, interfacing tolerances may not be compatible. Review and coordinate interfacing tolerances so that the various elements come together adequately.
- 1.6 DESIGN
 - 1.6.1 Formwork, Falsework, and Reshoring
 - 1.6.1.1 The design of formwork and falsework shall be conducted by a qualified Professional Engineer licensed in the Province of Ontario with demonstrated competence in the design of such temporary works.
 - 1.6.1.2 Design formwork, including shoring and bracing, to ensure its stability and to safely support the vertical and lateral loads imposed until such time as the structure has reached sufficient strength to become self-supporting. Shoring design shall account for loads imposed by weight of forms and wet concrete, wind, fluid pressure of concrete, equipment and workers.
 - 1.6.1.3 Design and provide shoring and bracing to excavations to safely withstand any lateral pressure to which they may be subjected.
 - 1.6.1.4 If requested, submit test data on patented and proprietary devices and assemblies that are proposed for use on the work.
- 1.7 SUBMITTALS
 - 1.7.1 Product Data
 - 1.7.1.1 Provide data on void form materials.
 - 1.7.1.2 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in formwork liners and coatings and include product characteristics, performance

criteria, physical size, finish, and limitations.

- 1.7.1.3 Submit one copy of WHMIS SDS in accordance with Section 01 35 25.

1.7.2 Shop Drawings

Prepare shop drawings for formwork, falsework, and reshoring showing complete details of materials, design, fabrication, and erection of formwork and falsework.

- 1.7.2.2 Shop drawings shall be stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- 1.7.2.3 The review of shop drawings shall not relieve the Contractor of responsibility for completeness, accuracy, or adequacy of work, or for ensuring the work complies with all regulations and safety requirements of all authorities having jurisdiction.
- 1.7.2.4 Include on drawings, but not limited to, the following:
- 1.7.2.4.1. All materials, sizes, lengths, and connection details.
 - 1.7.2.4.2. Longitudinal, lateral, vertical, dead, live and impact loads used in design.
 - 1.7.2.4.3. Type and weight of equipment (moving or stationary) supported by falsework.
 - 1.7.2.4.4. Safe bearing capacity of soil underneath mud sills.
 - 1.7.2.4.5. Maximum column, post and support loads.
 - 1.7.2.4.6. Indicate sequence of erection and removal of formwork/falsework.
 - 1.7.2.4.7. Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
 - 1.7.2.4.8. Indicate formwork/ falsework for architectural concrete.
 - 1.7.2.4.9. Indicate steel posts, girders, beams, connections, bracing and welding, providing sufficient detail for safe performance of falsework. Full details and locations of splices.
 - 1.7.2.4.10. Indicate method and schedule of construction, shoring, stripping, and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
 - 1.7.2.4.11. Proprietary equipment, adequately identified for checking purposes.
 - 1.7.2.4.12. Deflection diagrams for beams with deflection of 10 mm or more.
 - 1.7.2.4.13. Deflection diagrams indicating initial and final elevation of deck surfaces, roofs and soffits.
- 1.7.3 Submit a written proposal for review by the Consultant as to how the specified cambers will be achieved in the field.
- 1.7.4 Openings and sleeves
- 1.7.4.1 Submit drawings of the structure showing framed holes, recesses, sleeving, and chases required under all Sections.

1.7.5 Surveys

- 1.7.5.1 Submit surveys of the structure showing the position of formwork, cast-in-place inserts, and structural elements in their as-built condition.
- 1.7.5.2 As a minimum the survey shall include:
 - 1.7.5.2.1 Elevations and location of the centerline with respect to grids of all footings;
 - 1.7.5.2.2 Location of centerlines of all columns with respect to grids at each floor level;
 - 1.7.5.2.3 Location with respect to grids and horizontal alignment of all concrete walls at all floor levels;
 - 1.7.5.2.4 Vertical alignment (plumbness) of all columns and walls at all floor levels;
 - 1.7.5.2.5 Elevation of slab formwork and slabs at all columns, walls, centre of bays, midway between columns along gridlines and at cantilever ends, at points of maximum camber on all floor levels at the following times:
 - a. Before concrete placement
 - b. After concrete placement, prior to removal of any formwork and reshores from below.
 - c. Between 7 and 14 days after removal of all reshores immediately above and below the subject floor.
 - 1.7.5.2.6 Location and alignment of edges of slabs with respect to grids at all floor levels.
 - 1.7.5.2.7 Location and elevation of cast-in-place hardware at all levels.
 - 1.7.5.2.8 The date the survey was actually carried out.
 - 1.7.5.2.9 Regular elevation checks of formwork adjacent to shrinkage strips.

1.7.6 Safety Requirements

- 1.7.6.1 Provide safety railings and barricades for the duration when work under this Contract is in progress.

1.7.7 Void Forms

- 1.7.7.1 Review conditions of existing subgrade with geotechnical consultant to confirm the required preparation procedure of the subgrade/base material below void forms, including methods to control any excessive moisture (if applicable), as well to avoid creating a capillary break which could prevent degradation of void form after the concrete has reached the required strength.
- 1.7.7.2 Prior to installing void forms, submit the following information for review by Structural Consultant:
 - 1.7.7.2.1 Diagram/section detail with description of proposed subgrade/base preparation and void form assembly, including moisture barrier and protective board over

corrugated void form.

- 1.7.7.2.2. Documentation of proposed paper void form product, including specific details of degree of moisture protection of various void form panel components (e.g. exterior liner, interior components, adhesive).

1.7.8 As-Built Drawings

- 1.7.8.1 Mark on a complete set of final reproducible drawings any changes, additions, or deletions that occur during construction as a result of the Contractor's work, change orders, or for any other reason.

1.8 DELIVERY, STORAGE AND HANDLING

- 1.8.1 Deliver, store, and handle materials in accordance with Section 01 60 00 and with manufacturer's written instructions.

- 1.8.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.8.3 Storage and Handling Requirements:

- 1.8.3.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- 1.8.3.2 Store and protect formwork and falsework from damage.
- 1.8.3.3 Implement a system of protection to prevent the functional damage of the formwork and to prevent damage of the formwork's faces affecting the appearance of concrete surfaces exposed to view.
- 1.8.3.4 Replace defective or damaged materials with new.
- 1.8.3.5 Store and manage hazardous materials in accordance with Section 01 35 25 & 01 60 00.

1.8.4 Waste Management and Disposal:

- 1.8.4.1 Separate waste materials in accordance with Section 01 35 25 & 01 74 19.
- 1.8.4.2 Place materials defined as hazardous or toxic in designated containers.
- 1.8.4.3 Divert wood materials from landfill to a facility as approved by Departmental Representative.
- 1.8.4.4 Divert plastic materials from landfill to a facility as approved by Departmental Representative.
- 1.8.4.5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

1.9 LEED SUBMITTALS

- 1.9.1 Submit LEED submittals in accordance with Section 01 60 13.
- 1.9.2 Submit documentation to verify compliance with LEED objectives and requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Formwork materials (Areas not designated as Architectural Concrete):

- 2.1.1.1 Use wood and wood product formwork materials to the requirements of CSA A23.1 and CSA S269.3.
- 2.1.1.2 Plywood: Use sound, new, exterior grade Douglas Fir plywood not less than 17mm thick, finished on one side and fabricated especially for use as concrete form panels, with sealed edges. Make-up or patching strips between panels shall be kept to a minimum.
- 2.1.1.3 Exposed Surfaces:
 - 2.1.1.3.1 Form materials for concrete surfaces which require smooth and uniform surfaces for applied finished or other purposes, shall consist of square edged smooth panels of plywood, metal, or plastic. The panels shall be clean, square, and made in a true plane. The panels shall be free of holes, surface makings and/or defects.
 - 2.1.1.3.2 For Architecturally exposed concrete refer also to, and comply with, *Architectural Concrete Form Requirements* below and requirements of *Architectural Concrete* under Section 03 30 00.

2.1.2 Corner, Reglet or Chamfer Fillets: extruded plastic or mill finished white pine, 20 mm width, maximum possible lengths, mitre ends.

2.1.3 Form ties:

- 2.1.3.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

2.1.4 Form liner:

- 2.1.4.1 Plywood: high density overlay and/or medium density overlay, as directed.

2.1.5 Form release agent: Proprietary, non-volatile material which will not stain concrete or impair subsequent application of finishes or coatings to surface of concrete. The agent shall be non-petroleum containing, non-toxic, biodegradable, low VOC.

Acceptable Types:

DUOGARD by W.R. Meadows

EUCOSLIP VOX by Euclid

NCA RICH-COTE VOC by Acrow-Richmond

CRETE-LEASE 727 X-TRA by Cresset

2.1.6 Form stripping agent:

2.1.6.1 Colourless mineral oil, non-toxic, biodegradable, low VOC.

2.1.7 Falsework materials: conform to CSA-S269.1. Materials shall bear grade marks or be accompanied by certificates, test reports, or other proof of conformity.

2.1.8 Dovetail anchor slots shall be minimum 0.6 mm thick galvanized steel with insulation filled slots.

2.1.9 Water-stops:

2.1.9.1 Construction and Control Joints: Provide bentonite water stop RX-101 as manufactured by Cetco Canada Ltd or equivalent approved by the Consultant.

2.1.9.2 Expansion Joints: Provide Durajoint Type 7C (internal type) or Sternseal Type 79 (external type) as manufactured by Sternson Construction Products or approved alternative.

2.1.10 Expansion Joint Filler:

2.1.10.1 Sternboard by Sternson Construction Products or approved equivalent

2.1.11 Construction Joints:

2.1.11.1 Provide PVC waterstop Type GSK580 (internal type) as manufactured by Sika Canada Inc. or Base Seal Type GSK776 (external type) as manufactured by Sika Canada Inc. or an active bentonite/butyl-rubberbased waterstop Type RX-101 by Cetco or approved alternative.

2.1.12 Architectural Concrete Form Materials

2.1.12.1 Plywood sheathing for smooth concrete and concrete to be sandblasted shall be Evans 107 Plywood at least 17 mm thick, or approved alternative.

2.1.12.2 Grooves or reglets: White pine dressed to exact size.

2.1.12.3 Reglet material at junction of circular columns and capitals: Neoprene, unicellular foam. Neoprene shall be sufficiently stiff so that it does not deform during concreting.

2.1.12.4 Form Ties: Williams Shebolt, or approved alternate, threaded internal disconnecting-type adjustable in length. Ties shall be designed to act as spreaders and be of such a type that when the external portion of the tie is removed, no metal is left closer than 40 mm to the surface. Maximum diameter of the external portion of the tie shall be 12.5 mm.

2.1.12.5 Form Release Agent: Form release agent to be waterborne, non-staining, and non-grain raising subject to approval by the Consultant.

- 2.1.12.6 Circular column forms: Round, spirally wound laminated fibre forms, with plasticliner, such that only 1 vertical joint will be visible on finished column.
- 2.1.12.7 Splice waterstops in accordance with the manufacturer's requirements.
- 2.1.13 Void Forms:
 - 2.1.13.1 Void form system shall consist of corrugated paper materials and accessories designed to provide a temporary support for the placement of structural concrete over soils susceptible to frost heave, until the concrete has reached a specified strength, and such that a void is created between the soil and the structural concrete once the void form degrades.
 - 2.1.13.2 Void forms shall have a moisture resistant adhesive and a moisture resistant (wax coated) exterior liner. The interior of the void form shall consist of a uniform, cellular configuration of corrugated paper products. The interior components (liners and mediums) of the void form shall not be wax impregnated, in order to allow the system to gradually degrade with moisture after concrete has been placed and set. Modify the treatment of the void form materials to suit moisture and site conditions, in order to maintain the performance of the void form system described in the previous clause.
 - 2.1.13.3 All void products must be capable of sustaining the self-weight of the fresh concrete plus appropriate construction loads, while maintaining full void depth, until the structural concrete element is self-supporting. As a minimum, the void form must be capable of sustaining a load of 48 kPa (1000 psf).
 - 2.1.13.4 Acceptable Void Form Paper Products:
 - WAXMAT by CaraCor Carton Form
 - SLABVOID by SureVoid Products
 - WALLVOID by SureVoid Products
 - ARCVOID by SureVoid Products
 - BEAMVOID by VoidForm
 - FLOORVOID by VoidForm
 - 2.1.13.5 Backfill retainer to prevent migration of backfill material into the voided area:
 - SURERETAINER by SureVoid Products
 - BACKFILL RETAINER.....by SureVoid Products

PART 3 - EXECUTION

- 3.1 EXAMINATION/ EXISTING CONDITIONS
 - 3.1.1 Before starting the work, examine work performed by others which affects this work. Notify the Consultant of any conditions which prevent the proper completion of this work.
 - 3.1.2 Before starting any work in or adjacent to the existing structure verify that conditions are as indicated on the

drawings. If conditions vary from those shown, do not proceed until the Consultant has provided instruction.

3.1.3 Commencement of work implies acceptance of existing conditions.

3.2 SOIL SURFACE CONDITIONS

3.2.1 Examine the excavation and foundation for adequate working room and support the work of this section. Report discrepancies which affect the work of this Section.

3.3 FOUNDATIONS

3.3.1 Footings and caps to have plywood side forms unless otherwise permitted by the Structural Consultant.

3.3.2 Obtain Consultant's approval for use of earth forms framing openings not indicated on drawings.

3.3.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

3.4 FABRICATION AND ERECTION

3.4.1 Fabricate and erect formwork in accordance with CSA A23.1 and CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations, and levels indicated and within tolerances required by CSA A23.1.

3.4.2 Fabricate and erect falsework in accordance with CAN/CSA-S269.1.

3.4.3 Refer to architectural drawings for concrete members requiring architectural exposed finishes. Refer to Section 3.12 – Architectural Concrete.

3.4.4 Do not place shores and mud sills on frozen ground.

3.4.5 Provide site drainage to prevent washout of soil supporting mud sills and shores.

3.4.6 Provide bracing to ensure the stability of the formwork/falsework as a whole. Provide positive means for adjustment of shores and struts to take up any settlement of works during placement of concrete.

3.4.7 Provide temporary ports or openings where required to facilitate cleaning and inspection. Such openings are to be closed with tight fitting panels so joints will not be apparent in exposed concrete surfaces.

- 3.4.8 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- 3.4.9 Mark building grids, or other lines, on forms to permit the accurate positioning on reinforcing steel.
- 3.4.10 Clearly identify the location and configuration of continuing concrete members so that dowels can be positioned accurately in relation to their position in the continuing members.
- 3.4.11 Construct templates and supports to accurately indicate the location of dowels and/ or anchor rods in the forms prior to concreting. Placement tolerances for anchor rods shall conform with CSA A23.1 Clause 6.7.3.
- 3.4.12 Securely tie anchor rods, templates, steel connection units, hardware, or other inserts to the forms so as to prevent them from becoming displaced during concreting. Set and secure these items to the tolerances specified and required under CSA A23.1.
- 3.4.13 Verify that anchor rods have specified projection above the concrete.
- 3.4.14 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - 3.4.14.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- 3.4.15 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.
- 3.4.16 For sloping slabs apply suitable forming techniques compatible with the concrete placing and compaction techniques to ensure that the completed concrete has the specified design characteristics. Take specific precautionary measures to prevent movement of plastic concrete to prevent cracking, loss of bond, etc., and to achieve a surface equivalent to a fine wood float finish suitable to receive a membrane.
- 3.4.17 Construct top forms on sloping concrete to prevent flow of the concrete out of the forms.
- 3.4.18 Exposed Concrete:
 - 3.4.18.1 Align form joints and make watertight to prevent leakage of cement paste and disfiguration of concrete.
 - 3.4.18.2 Keep form joints to minimum.
 - 3.4.18.3 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.
 - 3.4.18.4 Locate horizontal form joints for exposed columns 2,400 mm above finished floor elevation.
 - 3.4.18.5 Reuse of formwork is not permitted where surfaces have been damaged or patched.
 - 3.4.18.6 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
- 3.4.19 Clean formwork as work proceeds to remove all foreign material. Cleaning shall be completed prior to

placing of concrete in accordance with CSA-A23.1.

- 3.4.20 Coat the inside surface of forms with a form release agent, used in strict accordance with the manufacturer's instructions. Apply the agent prior to placing of reinforcing steel, anchoring devices and embedded parts.
- 3.4.21 Do not apply form release agent to areas where concrete surface will receive special finishes and/or applied coverings which would be affected by the agent. Soak the inside surface of untreated forms, subject to shrinkage or absorption of water, with clear water and keep surface wet prior to placement of concrete.

3.5 CAMBER

- 3.5.1 Where shown on plan, camber formwork as necessary to achieve total camber height required. Maintain specified slab thickness and beam depth across cambered zones.
- 3.5.2 Where camber values are not noted on plans, camber slabs and beams for span/500 at interior bays and cantilever length/250 for cantilevers.

3.6 SLEEVES, OPENINGS, CHASES, SLOTS, AND OTHER PENETRATIONS

- 3.6.1 Form openings where required for pipes, conduits, sleeves, and other work to be embedded in or passing through concrete members.
- 3.6.2 Form all sleeves, slots, chases, recesses, and drips.
- 3.6.3 All sleeves, slots, chases, recesses, drips, and openings are not necessarily shown on the Structural drawings, nor are their sizes or locations necessarily shown. Refer to Architectural, Mechanical, and Electrical drawings and specifications for all such requirements not shown, located, and/or dimensioned on the Structural drawings.
- 3.6.4 No sleeves, chases, slots, chases, recesses, drips and/or openings through structural members shall be formed without the Consultant's approval.

3.7 TREATMENT OF FORMED SURFACES

- 3.7.1 Coat formwork with form release agent before reinforcement, anchors, accessories, and other built-in items are installed.
- 3.7.2 Do not coat plywood forms pre-treated with release agent.
- 3.7.3 Ensure the use of a compatible release agent on surfaces to receive finish materials, adhesives, sealers, paint or other coatings or materials.

3.8 CONSTRUCTION JOINTS

- 3.8.1 Form construction joints at locations indicated and in accordance with the details shown. Obtain approval

from the Consultant for location and details of construction joints not shown on contract documents.

3.8.2 Construction joints shall present appearance of normal form panel joint.

3.8.3 Make form joints tight in order to prevent leakage of mortar. Keep form joints to a minimum.

3.8.4 Install continuous shear key in construction joints in walls and framed floors with thicknesses greater than 152 mm.

3.9 EXPANSION AND CONTROL JOINTS

3.9.1 Form expansion and control joints at location indicated and in accordance with the details shown.

3.9.2 Thoroughly clean and ensure that expansion joints are free of foreign materials that may impair the performance of the joints.

3.9.3 Provide a non-extruding joint filler in expansion joints for the full area between adjacent concrete members. Anchor the filler material to one of the adjacent members or between concrete members and adjacent members of other materials.

3.9.4 Where shown provide water-stops in the expansion joints.

3.10 SEPARATION STRIPS

3.10.1 Form separation strips where shown on the drawings.

3.10.2 Maintain formwork or reshoring in bays containing separation strips and at each adjacent bay until the strip is complete and has reached its 28-day specified strength. Ensure that the forms and shores are

designed so that no settlement of the slab edge may occur during the period that the separation strip remains open.

3.11 WATER-STOPS

3.11.1 Install water-stops where identified on project documents.

3.11.2 Install water-stop to provide a continuous water seal. Securely tie the water-stop in place. Do not distort or piece the water-stop.

3.11.3 Do not displace reinforcing steel or other inserts during installation of water-stop.

3.11.4 Splice water-stops to ensure that water stopping action is not interrupted. Splice water-stop in accordance with manufacturer's requirements.

3.11.5 Where water-stop is to be installed along existing work, sawcut an appropriately sized slot into the existing

work and grout water-stop into the slot. Ensure that the water-stop is continuous along the entire length of the joint.

3.12 ARCHITECTURAL CONCRETE

3.12.1 Formwork

- 3.12.1.1 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- 3.12.1.2 Formwork shall meet the requirements of moulds for precast architectural concrete (CSA A23.4).
- 3.12.1.3 Formwork shall be designed to meet requirements of CAN/CSA-S269.3.
- 3.12.1.4 Deflection of facing materials between studs, as well as deflection of studs and wales shall be limited to 0.0025 times the span or as otherwise specified by the owner.
- 3.12.1.5 Construct forms so that they are watertight at corners, panel joints, construction joints, recesses, etc, to prevent the leakage of cement paste or grout.
- 3.12.1.6 Construct forms so that concrete surfaces shown to be plane are plane and correctly aligned with indentations or protuberances other than those shown.
- 3.12.1.7 Construct butt joints between form ply panels as laid out on architectural drawings.
- 3.12.1.8 Seal, tape, or caulk form panel joints.
- 3.12.1.9 Provide solid backing at all joints between sheathing panels. Ensure that backing is securely and tightly fastened to backing.
- 3.12.1.10 Construct side forms for balustrades, sills, upstand beam and the like to exact height of the member. Align the top edges of the forms to the correct elevation or slope so that the tops of the members can receive a fine wood float finish to a straight line.
- 3.12.1.11 In walls and the like, provide suitable spaced clean-out doors at the bottom of the forms. If possible, place the doors in the side of the element that is not exposed to view. Where this cannot be arranged accurately, construct clean-out doors and install so as to leave no indentations or protuberances and to prevent concrete leakage.
- 3.12.1.12 Board Lining: Undressed, rough, circular sawn, eastern spruce boards with abutting edges smooth sawn. All board lining must be the same species of lumber, and shall conform to the following thicknesses and widths:
 - Thickness: The boards of each width shall be equally divided among the thicknesses of 12 mm (1/2"), 17 mm (11/16") and 28 mm (1-1/8").

- Widths:

Size	Approximate % by area
100 mm (4")	25
150 mm (6")	55
200 mm (8")	12
250 mm (10")	8
- Grooves or reglets: White pine dressed to exact size.

3.12.1.13 The owner may request submission of the formwork design and detailed drawings for review prior to starting the work.

3.12.2 Form Ties

- 3.12.2.1 Form Ties: Shebolt System by Williams Form Engineering Corp., or equivalent approved by the Consultant, threaded internal disconnecting-type adjustable in length. Ties shall be designed to act as spreaders and be of such a type that where the external portion of the tie is removed, no metal is left closer than 40 mm (1-1/2") to the surface. Maximum diameter of external portion of ties shall be 122.5 mm (1/2").
- 3.12.2.2 Form Ties: Removable ties fitted with plastic cones leaving holes not larger than 37 mm (1-7/16") in concrete surface.
- 3.12.2.3 At all vertical outside corners of forms for walls, balustrades, piers and the like, use continuous threaded coil and corner ties with associated corner brackets and coil wing nuts.
- 3.12.2.4 Tie patterns shall be symmetric and shall meet the Architect's requirements.
- 3.12.2.5 Form ties for each element shall be aligned vertically and horizontally.
- 3.12.2.6 Spacing of form ties shall conform to the requirements of the architectural drawings and specifications. Where spacing is not identified in architectural documents form ties shall be typically spaced at 1200 mm.
- 3.12.2.7 Ties shall not be placed closer than 300 mm of a corner, vertical reglet, or opening edge in the horizontal direction, nor shall the be placed closer than 150 mm from an opening edge or horizontal reglet in the vertical direction.
- 3.12.2.8 Ties shall be placed at right angles to the formwork and shall be installed in tight fitting holes to prevent concrete leakage.
- 3.12.2.9 Where re-use of formwork is permitted arrange forms so that tie holes are re-used.
- 3.12.2.10 All form ties shall be fully tightened to eliminate concrete leakage. Specific attention to

tightening shall be paid at corners.

3.12.3 Quality of Finish

- 3.12.3.1 Generally, form surfaces using new, full-size plywood sheets. The arrangement of plywood panels shall be as shown or to the Architect's approval.
- 3.12.3.2 Provide 90-degree corners at all external vertical and horizontal corners at both the interior and exterior of the structure unless otherwise specified by the Architect.
- 3.12.3.3 As per architectural requirements, for exterior concrete provide reglets at all butt joints between form panels, construction joints, and control joints. Seal panel joints with caulking prior to installing reglets.
- 3.12.3.4 Coordinate work with other trades and provide protection to forms as required to prevent damage or staining during work performed by other trades.
- 3.12.3.5 The quality of finish shall be dense, even concrete, free of defects such as deep or extreme honeycombing, inconsistencies in plane, severe cold joint lines and major loss of fines. Minor imperfections may be acceptable. Major defects will necessitate replacement. The judgment as to what constitutes major or minor defects will be the Consultant's alone. Patching of architectural concrete is not permitted and if used will constitute a major defect. Repairs, i.e. removal of sections of a member, may be carried out if approved by the Consultant, but the repair shall match the colour and texture of the surrounding concrete.
- 3.12.3.6 Concrete members shall be uniform in colour.
- 3.12.3.7 Concrete members shall have sharp, accurate definition at corners, and reglets, free of chipped or spalled areas and with dimensional tolerances set out in CSA A23.1 and CSA A23.2.
- 3.12.3.8 Members shall be visually straight, and surfaces shall be flat without protuberances, indentations, ridges or bulges.
- 3.12.3.9 Coordinate locations of construction joint in areas designated as Architectural Concrete with architectural Drawings.
- 3.12.3.10 Repairs to architectural concrete shall not be undertaken without the Consultant's written consent. Concrete members repaired without Consultant's consent will be classified as defective Work, and the Consultant may require their removal and replacement at no expense to the owner.

3.12.4 Construction Joints in Walls

- 3.12.4.1 Horizontal construction joints will be permitted only at locations approved by the Consultant. Build forms to finish flush with the top of construction joints to permit trowelling the surface to accurate alignment. Install and securely fasten reglets as shown.

3.12.4.2 Vertical construction joints will only be permitted at locations approved by the Consultant. Construct the bulkhead in a manner that will prevent leakage of concrete fines.

3.12.4.3 Form construction joints with bulkheads to ensure straight lines. Immediately before subsequent pour at joints, remove bulkhead and tighten forms to ensure concrete surfaces will be on the same plane with no overlapping of concrete.

3.12.5 Construction Joints in Other Members

3.12.5.1 Construction joints shall only be permitted at locations identified on the contract documents, or where not shown, at locations approved by the Consultant. Provide reglets in all construction joints as shown or where directed by the Consultant unless a construction joint without reglets is specifically called for the construction documents.

3.12.6 Tolerances

3.12.6.1 Construct forms so that all concrete surfaces exposed to view will be visually straight.

3.12.7 Release Agent

3.12.7.1 Coat all form surfaces that will be in contact with concrete using an approved material that provides complete bond-breaking action. Apply surface treatment strictly in accordance with manufacturer's requirements. Re-coat surfaces of forms if they are intended for re-use.

3.12.7.2 Release agent shall not discolour, stain, or cause the finished appearance of the concrete to vary from what is specified by the architect.

3.12.8 Stripping of Forms

3.12.8.1 Forms shall not be stripped until a minimum of 7 days after the concrete is poured. Particular care shall be employed during the stripping operation to ensure that no damage occurs at corners, recesses, soffits, and the like.

3.12.8.2 To assist in the avoidance of colour variation on architectural surface stripping operations shall be scheduled on a similar timeline for each portion of the Work.

3.12.8.3 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.

3.12.8.4 Formwork shall be constructed in an easy to remove manner, such that workers need not pry against any finished surfaces or otherwise mark or damage the surface during removal.

3.12.9 Re-Use of Forms

3.12.9.1 Re-use of forms shall not be permitted if formwork is damaged in any way that would result in blemishes on the finished concrete surfaces. Further they may not be re-used if it is not possible to re-use the original tie holes.

3.12.9.2 Thoroughly clean forms and treat with parting agent as required before re-use

3.12.10 Mock Up/Sample Panels

3.12.10.1 Well in advance of constructing Architectural concrete, to prove out the materials and procedures proposed, construct a sample section of each type of Architectural concrete utilizing portions of the concrete structure not exposed to view in the finished building. Panel or area to be sized 900mm x 900mm.

3.12.11 Placing

3.12.11.1 Architectural concrete mixes shall not be contaminated with other mixes during mixing and conveying.

3.12.11.2 Place concrete in a way similar to the placement of the approved mock-up field sample and placing methods shall not be changed without constructing a new field sample for approval.

3.12.11.3 Place concrete in horizontal lifts not exceeding 300mm, avoiding segregation from vibration.

3.12.11.4 Do not touch the formwork surface with vibrators.

3.12.11.5 3.12.11.4 & 3.12.11.5 shall not apply to self-consolidating concrete (SCC).

3.13 REMOVAL AND RESHORING

3.13.1 Do not remove forms, shorings, and bracing until concrete has gained sufficient strength to carry its own weight and construction and design loads which are liable to be imposed on it. The strength of the concrete shall be verified by compressive test results made available to the Structural Consultant.

3.13.2 Subject to requirements of below clause 3.13.3, maintain formwork until concrete has reached 70 % of its 28-day compressive design strength, and immediately replace with adequate reshoring.

3.13.3 Leave formwork in place for following minimum periods of time after placing concrete.

3.13.3.1 2 days for walls and sides of beams.

3.13.3.2 2 days for columns.

3.13.3.3 28 days for beam soffits, slabs, and other structural members, or 3 days when replaced immediately with adequate reshoring to standard specified for falsework.

3.13.3.4 2 days for footings.

- 3.13.4 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- 3.13.5 Forms not directly supporting the weight of concrete may be stripped as soon as the concrete is sufficiently strong to stand unsupported and stripping operation will not damage concrete.
- 3.13.6 Remove formwork progressively so that no shock loads or unbalanced loads are imposed on the structure.
- 3.13.7 No construction or superimposed loads shall be placed on slabs prior to reshoring.
- 3.13.8 Slabs being stripped of formwork shall be reshored without delay.
- 3.13.9 Reshore in two directions so that no large areas of new construction are permitted to support their own weight. Under no circumstances shall reshores be installed at greater than 3000mm centres. Tighten reshores to carry the weight of new construction and any loads imposed thereon. Do not over-stress new construction by over-tightening.
- 3.13.10 As a minimum, for horizontal elements, conduct stripping and reshoring operations to the requirements of S269 and the following:
 - 3.13.10.1 Reshores in the lower storeys shall be capable of safely supporting the full weight of concrete and formwork located above them.
 - 3.13.10.2 Install reshores so that they are supported on members that can safely support the reshore load.
 - 3.13.10.3 Stripping and reshoring shall proceed simultaneously so as not to leave an area greater than 9 square metres unsupported by either formwork or reshoring at any instant. Install reshores tight to construction above and below so that they will not significantly shorten under load, take care not to preload the construction below or raise the construction above by over-tightening.
 - 3.13.10.4 Maintain reshoring or formwork for a minimum of 28 days or for such time as may be required to ensure that the concrete has reached its specified 28-day strength respectively.
 - 3.13.10.5 Base decision to remove reshoring on the results of concrete cylinder tests and on-site conditions.
 - 3.13.10.6 Do not strip within one and a half bays of a construction joint until such time as the new concrete beyond the joint has reached 70% of its specified 28-day strength.
- 3.13.11 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

3.14 VOID FORMS

- 3.14.1 Store void form materials in accordance with manufacturer's recommendations. Store forms and accessories in an elevated area, not in direct contact with the ground, and protected from water and weather. Do not install or use void form materials that have been damaged.

- 3.14.2 Plan the installation of paper void forms to minimize exposure to environmental moisture. Place only as many void form pieces as can be installed and utilized in a reasonable amount of time during controlled pours. Provide protective cover as required to keep water away from work area in the event of bad weather.
- 3.14.3 Follow recommendations of geotechnical consultant regarding moisture control of the surface supporting the void forms, to avoid premature moisture damage to the forms. However, special care must be taken to allow the void forms to make contact with moisture and deteriorate after pouring the concrete, by ensuring that no capillary breaks, such as gravel, plastic sheathing, or fill debris, exist below the void forms.
- 3.14.4 Where excessive soil moisture exists, contractor may take special measures, in consultation with geotechnical consultant and void form supplier, such as using a void form product with higher moisture protection, or modifying the base material supporting the void form. In this case, submit for review by the Geotechnical and Structural Consultants a description of the proposed special procedure for preparing of base material supporting the void form or details of the proposed alternative void form product.
- 3.14.5 Ensure that there is positive drainage away from area where void forms are installed.
- 3.14.6 Install paper void forms per manufacturer's recommendations, ensuring that they are not exposed to standing water, adverse weather conditions or humidity. Replace wet or damaged void form pieces before concrete placement.
- 3.14.7 Void form systems shall be installed on a properly even and level compacted ground surface and in a manner that prevents displacement or flotation of the forms during placement of concrete.
- 3.14.8 Provide end caps to seal exposed ends and seam pads to cover joints of void form to prevent concrete intrusion.
- 3.14.9 The intersection between the void form and supporting concrete elements, such as walls grade beams or caissons, must be properly sealed. Use pre-manufactured, non-field cut, sealed void form elements with curved, radial, vertical edge adjacent to caissons or drilled piers.
- 3.14.10 Provide a protective fiberboard at least 6 mm thick over void forms to distribute construction loads, and to protect them from puncture and other damage during concrete placement.
- 3.14.11 Install 6 mil polyethylene sheeting on top of the void form protective board to prevent fresh concrete moisture from contacting the void forms. Note: avoid installing a continuous moisture retarder (e.g. polyethylene sheeting) under degradable corrugated paper void forms, since it may not allow deterioration of the forms.
- 3.14.12 At grade beams and slab edges, protect exposed corrugated paper void forms after formwork has been stripped with appropriate back-fill retainer, to prevent migration of backfill material into the void space. The retainer shall be installed in accordance with the manufacturer's instructions, vertically or slightly angled, flush against the vertical concrete face, and extending at least 100 mm (4") into native soil

below the void form. Extend vertical back-fill retainers above the void form at least two times the void form depth.

PART 4 – QUALITY CONTROL

4.1 GENERAL

- 4.1.1 Implement a system of quality control to ensure that the minimum standard specified herein are attained.
- 4.1.2 Bring to the attention of the Consultant any defects in the Work or variances from the Contract Documents that may occur during construction. The Consultant shall decide upon corrective action and give recommendations in writing.
- 4.1.3 The Consultant's general review during construction and inspection and testing performed by an Independent Inspection and Testing Company, reporting to the Consultant, are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment or relieve the Contractor of their quality control or contractual responsibilities.
- 4.1.4 Inspect and check the completed formwork, shoring and bracing to ensure that the work is in accordance with the formwork design. The engineer responsible for the design of the formwork shall assist in this inspection, and submit inspection reports and certificates as directed.
- 4.1.5 Obtain the approval of the engineer responsible for the design of the formwork and the general approval of the Structural Consultant before placing concrete.

4.2 NOTIFICATION

- 4.2.1 Prior to commencing construction of significant segments of the Work provide the Consultant and the Independent Inspection and Testing Companies with appropriate notification so as to afford them reasonable opportunity to review the work. Failure to provide this notification may cause the Consultant to classify the work as defective.

4.3 INSPECTION AND TESTING

- 4.3.1 The Owner/Architect will appoint Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant and shall make only such inspections or tests as the directed by the Consultant.
- 4.3.2 Install pull-out inserts where directed by the Owner's Independent Inspection and Testing Company.

4.4 DEFECTIVE WORK

- 4.4.1 Variations in excess of specified tolerances, and failure of materials or workmanship to meet the requirements of this specification, and which cannot be repaired by approved methods, shall be considered

as defective work.

- 4.4.2 Movement and displacement of formwork during construction, variations in excess of specified tolerances, and marked and disfigured surfaces that cannot be repaired by approved methods shall be considered as defective work.
- 4.4.3 Materials or work that fails to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work, regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced to the satisfaction of the Consultant, at no expense to the Owner.
- 4.4.4 Where evidence that defective work has occurred, or where work has been carried out using defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength made, and the like to assist in the determination of whether the work must be corrected or replaced. Tests, inspections or surveys, or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work is found to be acceptable.
- 4.4.5 The Contractor shall replace defective work as directed by the Consultant.
- 4.4.6 The Contractor shall be responsible for all additional costs and expenses associated with the correction of work deemed to be deficient by the Consultant. All corrective work shall be conducted at no additional cost to the Owner.

END OF SECTION 03 10 00

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with the requirements of Division 01 and all documents referenced therein.
- 1.1.2 Provide all labour, materials, plant and equipment to complete the concrete and masonry reinforcement work indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

- 1.1.1 Section 01 60 13 – LEED Product Requirements
- 1.1.2 Section 01 80 00 – Performance Requirements
- 1.2.1 Section 03 10 00 – Concrete Forming and Accessories
- 1.2.2 Section 03 30 00 - Cast-in-Place Concrete
- 1.2.3 Section 03 35 00 – Concrete Finishing
- 1.2.4 Section 05 12 23 – Structural Steel

1.3 REFERENCES

- 1.3.1 Conform with the requirements of the latest edition of the Ontario Building Code (Ontario Regulation 332/12, amended by Ontario Regulations 191/14, 563/17 and 88/19), inclusive of all amendments and Minister's Rulings, and any applicable acts of any authority having jurisdiction.
- 1.3.2 All codes, standard specifications, and by-laws referred to in this Specification shall be current editions, including all latest revisions, addenda, and supplements, unless otherwise noted in the Building Code.
- 1.3.3 American Society for Testing and Materials International (ASTM)
 - 1.3.3.1 ASTM A 108-, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - 1.3.3.2 ASTM A 123/A 123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 1.3.3.3 ASTM A 143/A 143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - 1.3.3.4 ASTM A 641/A 641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 1.3.3.5 ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

- 1.3.3.6 ASTM A 884/A 884M, Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
- 1.3.3.7 ASTM A1044/A1044M, Standard Specification for Steel Stud Assemblies for Shear Reinforcing of Concrete.
- 1.3.3.8 ASTM A1064/A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- 1.3.4 Canadian Standards Association (CSA International)
 - 1.3.4.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - 1.3.4.2 CSA-A23.3, Design of Concrete Structures.
 - 1.3.4.3 CSA A283-[19], Qualification code for concrete testing laboratories.
 - 1.3.4.4 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
 - 1.3.4.5 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - 1.3.4.6 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
 - 1.3.4.7 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - 1.3.4.8 CSA A371, Masonry Construction for Buildings.
 - 1.3.4.9 CSA S304, Design of Masonry Structures.
 - 1.3.4.10 CSA S413, Parking Structures.
- 1.3.5 Reinforcing Steel Institute of Canada (RSIC) .
 - 1.3.5.1 RSIC, Reinforcing Steel Manual of Standard Practice.
 - 1.3.5.2 RSIC Publication – Placing Reinforcing Bars.
- 1.3.6 American Concrete Institute (ACI)
 - 1.3.6.1 SP-66- [04], ACI Detailing Manual 2004.

1.3.7 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.

1.3.8 General

1.3.8.1 In the event of conflict between standards, codes, drawings, and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally, the most stringent provision shall govern. No extras to the contract will be approved due to such clarification.

1.3.8.2 Standards referenced by the Standards noted above are to apply even if they are not included in the above list.

1.4 SUBMITTALS

1.4.1 Prepare reinforcement shop drawings in accordance with the Contract Documents and the RSIC Manual of Standard Practice.

1.4.2 Prepare reinforcement shop drawings and bar lists taking into account all openings and recesses shown on the architectural, structural, mechanical and electrical drawings, and on the sleeving shop drawings. Fully dimension openings, recesses, chases, and sleeves, and relate to suitable grid lines and elevation datum.

1.4.3 The structural drawings shall not be reproduced, in whole or in part, for use as shop drawings.

1.4.4 Submit shop drawings including placing of reinforcement and indicate:

1.4.4.1 Bar bending details.

1.4.4.2 Bar Lists: Identify each reinforcing bar with a code mark corresponding to the bar list.

1.4.4.3 Quantities of reinforcement, welded wire fabric, and mechanical splices.

1.4.4.4 Sizes, lengths, spacings, and locations of reinforcement, welded wire fabric, with identifying code marks to permit correct placement without reference to structural drawings.

1.4.4.5 Sizes, locations, locations and embedment of dowels.

1.4.4.6 Sequence of reinforcing placement at locations such as within two-way slabs, the intersections of beams and beams or beams and slabs.

1.4.4.7 Details to illustrate the placement of reinforcing at locations such as elevation changes, openings, stairs, and wherever else required.

1.4.4.8 Indicate sizes, spacings, and locations of chairs, spacers, hangers, and other support accessories.

- 1.4.4.9 In areas of high steel concentration/ congestion, such as at the intersection of beams and columns or at column splices, provide large-scale details for clarity.
- 1.4.4.10 Sizes, spacings, locations of mechanical splices if approved by the Consultant.
- 1.4.5 Only shop drawings bearing the review Consultants' review stamps, signed and dated, shall be kept on site.
- 1.4.6 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
 - 1.4.6.1 Provide type C tension lap splices where indicated, unless otherwise indicated.
- 1.4.7 Mechanical splices
 - 1.4.7.1 Submit shop drawings detailing sizes, spacings, and locations of mechanical splices. Include summary of materials to be used and installation procedures.
 - 1.4.7.2 Drawings shall list splices with identifying code marks to permit correct placement without reference to structural drawings.
- 1.4.8 Certificates
 - 1.4.8.1 Canadian Manufacture: Provide the Consultant with certified copies of reports of reinforcing steel showing physical and chemical analysis a minimum 4 weeks prior to commencing fabrication.
 - 1.4.8.2 Other than Canadian Manufacture: Provide test data from a Canadian Testing Laboratory proving that each size and grade of reinforcement proposed meets specification requirements. Reinforcement approved for use by the Consultant shall be identified in a manner suitable to the Consultant. Only steel that has been approved will be accepted on job site
 - 1.4.8.3 Weldable Reinforcement: Submit reports of chemical compositions and verification of weldability.
- 1.4.9 As-Built Drawings
 - 1.4.9.1 Mark on a complete set of final reproducible drawings any changes, additions or deletions that occur during construction as a result of the Contractor's work, change orders, or for any other reasons.
 - 1.4.9.2 For all shop drawings marked "Reviewed as Noted" or "Resubmit", update and submit a record set of these drawings at the completion of the structural work. Ensure that these drawings reflect the changes and are coordinated with the final reproducible drawings noted above.

1.4.10 Quality Assurance (refer also to LEED Requirements earlier in this Section):

- 1.4.10.1 Comply with Section 03 30 00.
- 1.4.10.2 When requested, provide certified copies of mill test reports of steel supplied and samples of reinforcing bars to be used on this project for testing by the appointed Inspection and Testing Company before delivery to the site.
- 1.4.10.3 If requested, for unidentified reinforcing steel or reinforcing steel from non- Canadian mills, submit test data from an approved testing company verifying that each size and grade of reinforcing steel meets the Specification requirements. Pay for the cost of such testing.
- 1.4.10.4 Any reinforcing which fails to conform with the Specification requirements shall be removed from the site and replaced at no additional expense to the Contract.

1.5 TOLERANCES

- 1.5.1 Perform fabrication and setting so that completed work will be within the tolerances set out in CSA A23.1. These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.6 QUALIFICATIONS

1.6.1 Welding Reinforcement

- 1.6.1.1 All individuals and firms undertaking welding of reinforcement shall be qualified by the Canadian Welding Bureau under the requirements of W186.

1.7 DELIVERY, STORAGE AND HANDLING

- 1.7.1 Ship bundles of reinforcement clearly identified to coordinate with bar schedules.
- 1.7.2 Reinforcement shall be stored in bundles with identifying tags or markings that will permit easy access for identification and handling.
- 1.7.3 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- 1.7.4 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- 1.7.5 Storage and Handling Requirements:
 - 1.7.5.1 Store materials off the ground and in accordance with manufacturer's recommendations.

Keep free of mud and foreign matter.

1.7.5.2 Replace defective or damaged materials with new

1.7.6 Handle, transport, store and install epoxy coated reinforcing steel bars to prevent damage to coating. Prevent bar-to-bar abrasion and excessive sagging. Do not drop or drag bars. Store on suitable non-metallic supports. For lifting use nylon lifting slings, padded slings, separators or other means recommended by epoxy coated reinforcing steel supplier.

1.7.7 Waste Management and Disposal:

1.7.7.1 Separate waste materials in accordance with Section 01 74 19.

1.7.7.2 Place materials defined as hazardous or toxic in designated containers.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Substitute different size bars only if permitted in writing by the Consultant.

2.1.2 Reinforcing steel: billet steel, grade 400R, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

2.1.3 Weldable reinforcing steel: grade 400W, weldable low alloy steel deformed bars to CAN/CSA-G30.18.

2.1.4 Ties wires: No. 16 gauge (1.5mm), black annealed wire or heavier unless otherwise noted. For epoxy coated reinforcement, provide non-metallic wire.

2.1.5 Welded steel wire fabric: to ASTM A1064/A1064M.

2.1.5.1 Provide in flat sheets only unless noted otherwise on Contract Documents.

2.1.6 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M. Galvanized reinforcing bars: to conform to CSA G164.

2.1.8 Chairs, bolsters, bar supports, spacers:

2.1.8.1 As a minimum to CSA-A23.1/A23.2.

2.1.8.2 Provide quantity for strength and support of the construction conditions such that there is no possibility of displacement or derform of the reinforcing during construction.

2.1.8.3 Use plastic chairs and/or side wall spacers for all concrete.

2.1.8.4 Provide all necessary support bars and spacers in accordance with recommendations of the RSIC Manual.

2.1.8.5 When used, support bars shall not be less than 15M in size.

2.1.9 Mechanical splices:

2.1.9.1 Use of mechanical splices are subject to the approval of the Engineer.

2.1.9.2 Tension Splices: provide Lendon coupler, complete with bar end protectors and coupler end protectors, as supplied by Erico Canada Inc or approved alternative.

2.1.10 Plain round bars: to CSA-G40.20/G40.21.

2.2 MISCELLANEOUS

2.2.1 Provide reinforcing bars for all miscellaneous items as shown or implied by the drawings and/or specifications, to include but not be limited to the following:

2.2.1.1 REINFORCED MASONRY LINTELS: Provide for installation by the Mason, reinforcing bars in accordance with the Typical Notes and Details on the drawings.

2.2.1.2 VERTICAL MASONRY WALL REINFORCING BARS: Provide for installation by the Mason, bars as required by the drawings and Typical Details.

2.2.1.3 PLANTERS, BENCHES, RETAINING WALLS, CURBS & SIDEWALKS: As required or implied by the drawings.

2.2.1.4 MECHANICAL, ELECTRICAL, ARCHITECTURAL WORK: As required or implied by the drawings.

2.2.1.5 TRIMMER BARS, FILL IN BARS: Provide and place bars at openings for cranes, rakers, tie backs, stressing pockets, precast supports, cladding supports, and stair supports.

2.3 FABRICATION

2.3.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

2.3.2 Obtain Consultant's approval for locations of reinforcement splices other than those shown on placing drawings.

2.3.3 Upon approval of the Consultant, weld reinforcement in accordance with CSA W186.

2.3.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3.4.1 Ship epoxy coated bars in accordance with ASTM A 775A/A 775M.

- 2.3.5 Bend reinforcement once only and at room temperature of 18°C. Do not straighten or rebend reinforcement. Do not use bars with kinks or bends not shown on the drawings.
- 2.3.6 Replace bars that develop cracks or splits.
- 2.3.7 Galvanizing when specified shall conform to CSA G164 with a minimum zinc coating of 610 g/m² [18 oz/yd²].

PART 3 - EXECUTION

3.1 PREPARATION

- 3.1.1 Galvanizing to include chromate treatment.
 - 3.1.1.1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- 3.1.2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

3.2 FIELD BENDING

- 3.2.1 Do not field bend or field weld reinforcement except where indicated or authorized by Consultant.
- 3.2.2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- 3.2.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

- 3.3.1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.
- 3.3.2 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- 3.3.3 Support and secure reinforcement against displacement in accordance with CSA A23.1. Tack welding of reinforcement to secure in place will not be permitted.
- 3.3.4 Secure reinforcement in columns and walls using sufficient spacers on each face to maintain the requisite distance between reinforcement and column or wall face and so that vertical bars are plumb.
- 3.3.5 Where continuous drop panels or slab thickenings are noted on the drawings, place bottom slab reinforcement in the bottom of the continuous drop panel or slab thickening, unless noted otherwise on the drawings.

- 3.3.6 Where 10M top bars and welded wire fabric are shown, provide adequate chairs, bolsters or supports to ensure that these bars are not bent or displaced prior to or during the concreting operation.
- 3.3.7 Where toppings are placed on waterproof membranes, vapour barriers and the like, prevent reinforcement or tie wire contacting these items.
- 3.3.8 Ensure that longitudinal bars in beams have adequate vertical spacing between layers in accordance with CSA A23.1.
- 3.3.9 Pre-assemble column and beam cages as necessary. Do not bend ties and stirrups in order to place longitudinal reinforcement.
- 3.3.10 Pre-tie reinforcement for footings and lower into place so as not to disturb the soil at founding elevation.
- 3.3.11 Provide splices only where shown on the Contract Drawings. No other splices will be permitted without approval of the Consultant.
- 3.3.12 'Waste' reinforcement shall not be placed in beams, slabs, etc.
- 3.3.13 Ensure all dowels and embedded members are securely tied to slab reinforcement
- 3.3.14 Prior to placing concrete, obtain Consultant's approval of reinforcing material and placement.
- 3.3.15 Ensure cover to reinforcement is maintained during concrete pour.
- 3.3.16 Do not drive or force reinforcement into fresh concrete.
- 3.3.17 Protect epoxy-coated portions of bars with covering during transportation and handling.
- 3.3.18 Field cutting shall be done using an abrasive wheel or band saw.

3.4 CONSTRUCTION JOINTS

- 3.4.1 Obtain approval from the Consultant for details of construction joints not shown.
- 3.4.2 Continue reinforcement through the joint in its normal position. Add additional reinforcement across the joint as shown or directed.

3.5 FIELD TOUCH-UP

- 3.5.1 Touch up damaged and cut ends of epoxy coated reinforcing steel with compatible finish to provide continuous coating.

3.6 WELDED WIRE FABRIC

3.6.1 Where reinforcement is not specifically identified on the drawings, provide the following:

3.6.1.1 152 x 152 MW18.7 x MW18.7 welded wire fabric (in flat sheets only) in slabs on grade or walks 60 mm (2½) in thickness or greater, unless noted otherwise on drawings.

3.6.1.2 Lap ends and sides of fabric not less than 300 mm (12").

3.7 REQUIREMENTS FOR ARCHITECTURAL CONCRETE

3.7.1 Strictly maintain bar clearances for architectural concrete. Place spacers regularly and squarely against forms except that spacers shall not be used between reinforcement and an exposed vertical concrete face.

3.7.2 The location of spacers shall not cause constriction adjacent to other inserts which may impede the placing of concrete.

3.7.3 The cover to reinforcement shall be taken from the deepest penetration of arises or reglets.

3.7.4 Use spacers and support accessories so that no metal comes closer than 40 mm (1⁵/₈") to an exposed surface.

3.7.5 Ensure that no tie wires project within 40 mm (1⁵/₈") of an exposed face.

3.7.6 Take particular care not to damage form sheathing surfaces during installation of reinforcement.

PART 4 - QUALITY CONTROL

4.1 GENERAL

4.1.1 Provide a system of quality control to ensure that the minimum standards specified herein are attained.

4.1.2 Bring to the attention of Consultant any defects in the work or departures from the Contract Documents which may occur during Construction. The Consultant will decide upon corrective action and give recommendations in writing.

4.1.3 The Consultant's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility.

4.1.4 When requested by the Consultant, in order to confirm compliance with the Specification, specimens of reinforcing steel shall be tested. The cost of this inspection and testing shall be paid for by the Contractor.

4.2 NOTIFICATION

- 4.2.1 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

4.3 INSPECTION AND TESTING

- 4.3.1 The Owner will appoint the Independent Inspection and Testing Company to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Company shall be responsible only to the Consultant and shall make only such inspections or tests as the Consultant may direct.
- 4.3.2 In advance of construction, provide inspection and testing company with the following:
- 4.3.2.1 Mill test reports appropriate for each major shipment of reinforcing steel.
- 4.3.2.2 If mill test reports are not provided, Contractor shall pay for physical tests to certify the grade of reinforcing. Provide Inspection and Testing Company with required samples at no extra cost to Owner.
- 4.3.3 When defects are revealed, the Consultant may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.
- 4.3.4 Inspecting and Testing company shall ensure that materials conform to the requirements of this specification.
- 4.3.5 Forward mill test reports provided by Contractor, ensuring they are correlated with the materials on site.

4.4 DEFECTIVE MATERIALS AND WORK

- 4.4.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength made, and the like, in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- 4.4.2 All testing shall be conducted in accordance with the requirements of the Ontario Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.
- 4.4.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 03 20 00

PART 1 - GENERAL

1.1 RELATED SECTIONS

- 1.1.1 Section 01 80 00 – Performance Requirements
- 1.1.2 Section 03 10 00 – Concrete Forming and Accessories
- 1.1.3 Section 03 20 00 – Concrete Reinforcing
- 1.1.4 Section 03 35 00 – Concrete Finishing
- 1.1.5 Section 03 39 00 – Concrete Curing
- 1.1.6 Section 05 12 23 – Structural Steel for Buildings

1.2 REFERENCES

1.2.1 American Society for Testing and Materials International (ASTM)

- 1.2.1.1 ASTM C260/C260M – 10a (2016), Standard Specification for Air-Entraining Admixtures for Concrete.
- 1.2.1.2 ASTM C 309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- 1.2.1.3 ASTM C330-C330M – 17a, Standard Specification for Lightweight Aggregates for Structural Concrete.
- 1.2.1.4 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.
- 1.2.1.5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- 1.2.1.6 ASTM D 412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- 1.2.1.7 ASTM D 624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- 1.2.1.8 ASTM D 1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- 1.2.1.9 ASTM D 1752-18, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- 1.2.1.10 ASTM F1554-18, Standard Specification for Anchor Bolts, Steel 36, 55, and 105-ksi Yield Strength.

1.2.2 Canadian General Standards Board (CGSB)

- 1.2.2.1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Damp proofing and Waterproofing and for Roof Coatings.

- 1.2.2.2 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.2.3 Canadian Standards Association (CSA International)

- 1.2.3.1 CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- 1.2.3.2 CSA A23.3-14, Design of Concrete Structures.
- 1.2.3.3 CSA A283-19, Qualification Code for Concrete Testing Laboratories.
- 1.2.3.4 CAN/CSA-A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - 1.2.3.4.1. CSA-A3001-13, Cementitious Materials for Use in Concrete.

1.2.4 General

- 1.2.4.1 Where differences exist between the Project Documents and the referenced Codes, Standards, or Acts, the most stringent shall govern.
- 1.2.4.2 Standards referenced by the Standards noted above are to apply even if they are not included in the above list.

1.3 ACRONYMS AND TYPES

1.3.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

- 1.3.1.1 Type GU or GUb - General use cement.
- 1.3.1.2 Type MS or MSb - Moderate sulphate-resistant cement.
- 1.3.1.3 Type MH or MHb - Moderate heat of hydration cement.
- 1.3.1.4 Type HE or Heb - High early-strength cement.
- 1.3.1.5 Type LH or LHb - Low heat of hydration cement.
- 1.3.1.6 Type HS or HSb - High sulphate-resistant cement.

1.3.2 Fly ash:

- 1.3.2.1 Type F - with CaO content less than 8%.
- 1.3.2.2 Type CI - with CaO content ranging from 8 to 20%.
- 1.3.2.3 Type CH - with CaO greater than 20%.

1.3.3 GGBFS - Ground, granulated blast-furnace slag.

1.4 DESIGN REQUIREMENTS

1.4.1 Performance: in accordance with CSA-A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

1.5 SUBMITTALS

1.5.1 Submittals in accordance with Section 01 33 00.

1.5.2 Submit WHMIS Safety Data Sheets (SDS) in accordance with Section 01 60 00.

1.5.3 Submit surveys in accordance with Section 03 10 00, Concrete Formwork and Falsework.

1.5.4 Concrete Mix Designs

1.5.4.1 Well in advance of the first supply of concrete to the project submit, using the standard RMCAO form for Concrete Mix Design Submissions, all concrete mix designs for review. The mix designs shall include, as a minimum the following information:

- concrete strength
- exposure class
- water-cement ratio
- maximum aggregate size
- maximum SCM replacement
- additional durability and architectural requirements
- slump range
- plastic air range
- method of placement
- other specific information regarding the source and type of all materials being proposed source of Supplementary Cementing Materials (SCM's).

1.5.4.2 Describe in detail on the mix design summary, the location(s) where each mix is to be placed in the structure.

1.5.4.3 Distribute electronic certificates, mill test reports and reports of inspections and tests as follows:

Owner
Architect
Consulting Structural Engineer
Construction Manager
Concrete Supplier

1.5.5 Quality Control Plan

1.5.5.1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to the Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.5.5.2 Submit to Consultant, minimum four weeks prior to starting concrete work, valid and

recognized certificate from plant delivering concrete.

1.5.5.2.1. When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements.

1.5.5.3 Minimum four weeks prior to starting concrete work, submit proposed quality control procedures for review by Consultant on following items:

- 1.5.5.3.1. Falsework erection.
- 1.5.5.3.2. Hot weather concrete.
- 1.5.5.3.3. Cold weather concrete.
- 1.5.5.3.4. Curing.
- 1.5.5.3.5. Finishes.
- 1.5.5.3.6. Formwork removal.
- 1.5.5.3.7. Joints.

1.5.6 At least four weeks prior to beginning Work, submit to the Consultant samples of following materials proposed for use:

- 1.5.6.1 5 L of curing compound.
- 1.5.6.2 2 m length of each type of joint filler.
- 1.5.6.3 2 m length of each type of waterstops.

1.5.7 Concrete pours: submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

1.5.8 Concrete hauling time: submit for review by the Consultant deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.6 SAMPLES AND ASSISTANCE

Supply samples of all materials and the following, the cost of which shall be paid for by this trade.

1.6.2 Concrete Test Cylinders

1.6.2.1 Cooperate in the execution of the concrete quality testing program. Furnish concrete required, protect specimens against injury and loss, assist in the sampling and storage of specimens.

1.6.2.2 For all Portland cement concrete compressive strength tests, 100 x 200mm (4 x 8 inch)

cylinders shall be used.

- 1.6.2.3 In accordance with requirements of CSA A23.1, provide storage facilities with continuous power supply for site storage containers for test cylinders.

- 1.6.3 Assist the geotechnical investigation agency in making their inspections or tests of soil conditions.

1.7 QUALITY ASSURANCE

- 1.7.1 Quality Assurance: in accordance with Section 01 40 00.

- 1.7.2 Site Meetings: in accordance with Section 01 31 19.

- 1.7.2.1 Ensure key personnel, site supervisor, Consultant specialty contractor - finishing, forming concrete producer and testing laboratories attend.

- 1.7.2.2 Verify project requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- 1.8.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

- 1.8.1.1 Modifications to the maximum time limit must be agreed to Consultant, laboratory representative and concrete producer as described in CSA A23.1/A23.2.

- 1.8.1.2 Deviations to be submitted for review by Consultant.

- 1.8.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

- 1.8.3 Waste Management and Disposal:

- 1.8.3.1 Separate waste materials in accordance with Section 01 35 25 & 01 74 19.

PART 2 – PRODUCTS

2.1 MATERIALS

Cement: to CAN/CSA-A3001, Type GU.

- 2.1.2 Concrete: normal density concrete with an air-dry density between 2350 and 2450 kg/m³. Conform to CSA A23.1.

- 2.1.3 Water: to CSA-A23.1.

- 2.1.4 Aggregates: 20 mm, except as noted below and approved by Consultant:

- 2.1.4.1 Use pea gravel (5 mm to 10 mm) where concentration of reinforcement requires the use of a smaller diameter aggregate, at no additional cost to the Owner.
- 2.1.4.2 Use 10 mm (maximum) aggregate in toppings that are less than or equal to 75 mm in thickness, and 20 mm aggregate in toppings greater than 75 mm in thickness, at no additional cost to the Owner.
- 2.1.5 Admixtures:
 - 2.1.5.1 Air entraining admixture: to ASTM C 260.
 - 2.1.5.2 Corrosion inhibitors – DCI corrosion inhibitor as manufactured by W. R. Grace & Co. of Canada Ltd. or approved equal.
 - 2.1.5.3 Air Entraining Agent - Darex AEA as manufactured by W.R. Grace & Company of Canada Limited, conforming to ASTM C260-86 or approved equal in all concrete permanently exposed to weather or the action of salts in solution.
- 2.1.6 Non premixed dry pack grout: non-shrink composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 35 MPa at 28 days.
- 2.1.7 Curing compound: to CSA-A23.1/A23.2.
- 2.1.8 Bonding Agent: Use Sika Sikdur 32 epoxy bonding agent for all bonded topping installations.
- 2.1.9 Shrinkage Control Fibres: “Dramix” steel fibres by Bekaert or approved alternative, 60/1.05.
- 2.1.10 Mechanical waterstops: ribbed extruded PVC of sizes indicated with shop welded corner and intersecting pieces with legs as recommended by the manufacturer.:
 - 2.1.10.1 Tensile strength: to ASTM D 412.
 - 2.1.10.2 Elongation: to ASTM D 412
 - 2.1.10.3 Tear resistance: to ASTM D 624.
- 2.1.11 Premoulded joint fillers:
 - 2.1.11.1 Bituminous impregnated fiber board: to ASTM D 1751.
 - 2.1.11.2 Sponge rubber: to ASTM D 1752, Type I.
- 2.1.12 Weep hole tubes: plastic.
- 2.1.13 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.
- 2.1.14 Unshrinkable Fill: Cement type-General Use GU Portland.

- 2.1.15 Polypropylene fibres: Fibremesh Canada Limited, fibrillated polypropylene MD fibres, added at the batching plant at 0.9 kg/cubic metre, meeting ASTM Standard C1116-91, Section 4.1.3.
- 2.1.16 All concrete slabs, beams, curbs, columns and walls in parking garage, planters, and the like, exposed to weather, or the application of de-icing chemicals, shall satisfy the requirements of exposure classification "C-1" concrete in accordance with CSA-A23.1-19. All exposed portions of foundation walls and retaining walls shall be cast with concrete satisfying the requirements for exposure classification "F-2" concrete in accordance with CSA-A23.1-14.
- 2.1.17 All concrete slabs and roofs in parking garages subject to vehicular access shall be proportioned to include corrosion inhibitors at a ratio of 10 litres/cubic metre.

2.2 MIXES

- 2.2.1 Alternative 1 - Performance Method for specifying concrete: to meet Consultant performance criteria in accordance with CAN/CSA-A23.1/A23.2.
 - 2.2.1.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
 - 2.2.1.2 Provide concrete mix to meet following hard state requirements:
 - 2.2.1.2.1 Durability and class of exposure.
 - 2.2.1.2.2 Minimum compressive strength at 28 days.
 - 2.2.1.2.3 Intended application.
 - 2.2.1.2.4 Volume stability.
 - 2.2.1.2.5 Surface texture.
 - 2.2.1.2.6 Geometrical requirements.
 - 2.2.1.2.7 Pre-Qualification.

PART 3 - EXECUTION

3.1 PREPARATION

- 3.1.1 Pre-Construction Meeting: in accordance with the Concrete Supplier's Concrete Quality Plan, convene a pre-installation meeting one week prior to beginning concrete works.
 - 3.1.1.1 Ensure key personnel attend.
 - 3.1.1.2 Verify project requirements.
- 3.1.2 Obtain Consultant's approval before placing concrete.
 - 3.1.2.1 Provide 24 hours' notice prior to placing of concrete.
- 3.1.3 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

3.1.4 During concreting operations:

- 3.1.4.1 Development of cold joints is not allowed.
- 3.1.4.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

3.1.5 Pumping of concrete is permitted only after approval of equipment and mix and shall only be used if the velocity of discharge is reduced to a point where no separation or scattering of the concrete occurs, and the consistency of the mix has been designed to allow such a system with no adverse effects on the quality of concrete.

- 3.1.5.1 Excess grout or mortar used to lubricate pipelines, or washout water, must not be discharged into the forms.

3.1.6 Ensure reinforcement and inserts are not disturbed during concrete placement.

3.1.7 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.

3.1.8 Protect previous Work from staining.

3.1.9 Immediately before placing concrete, clean forms and reinforcement of foreign matter.

3.1.10 Remove concrete spilled onto forms around hoisting equipment before depositing concrete in these areas.

3.1.11 Clean and remove stains prior to application for concrete finishes.

3.1.12 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

3.1.13 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

- 3.1.13.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

3.1.14 Do not place load upon new concrete until authorized by Consultant.

3.2 CONSTRUCTION

3.2.1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2 and as specified herein.

3.2.2 Do not use concrete mixed more than 120 minutes after the introduction of mixing water.

- 3.2.2.1 During hot weather conditions, do not use concrete mixed more than 1 hour after

introduction of mixing water.

- 3.2.3 Allow 24 hours minimum to elapse after placing concrete in columns, piers or walls before placing concrete in beams or slabs supported thereon.
- 3.2.4 Place concrete on steel joist and steel deck floors in a manner that avoids piling up of concrete. Do not drop concrete directly from buckets, but employ suitable means of distribution. Wet down deck during hot weather prior to concreting.
- 3.2.5 Sleeves and inserts:
 - 3.2.5.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.
 - 3.2.5.2 Where approved by Consultant set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - 3.2.5.3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Consultant.
 - 3.2.5.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Consultant before placing of concrete.
 - 3.2.5.5 Check locations and sizes of sleeves and openings shown on drawings.
 - 3.2.5.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- 3.2.6 Anchor bolts (Anchor rods):
 - 3.2.6.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
- 3.2.7 Drainage holes and weep holes:
 - 3.2.7.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
 - 3.2.7.2 Install weep hole tubes and drains as indicated.
- 3.2.8 Dovetail anchor slots: in accordance with Section 04 05 19 – Masonry Anchorage and Reinforcement.
 - 3.2.8.1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - 3.2.8.2 Install continuous vertical anchor slots at 800 mm on centre where concrete walls are masonry faced.

- 3.2.9 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- 3.2.10 Finishing and curing:
 - 3.2.10.1 Finish concrete in accordance with CSA-A23.1/A23.2.
 - 3.2.10.2 Use procedures as reviewed by Consultant or those noted in CSA-A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
 - 3.2.10.3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete. Provide written declaration that compounds used are compatible.
- 3.2.11 Toppings:
 - 3.2.11.1 Topping mixture to meet following requirements: Monolithic, Un-Bonded overlay.
- 3.2.12 Waterstops:
 - 3.2.12.1 Install waterstops to provide continuous water seal.
 - 3.2.12.2 Do not distort or pierce waterstop in way as to hamper performance.
 - 3.2.12.3 Do not displace reinforcement when installing waterstops.
 - 3.2.12.4 Use equipment to manufacturer's requirements to field splice waterstops.
 - 3.2.12.5 Tie waterstops rigidly in place.
 - 3.2.12.6 Use only straight heat-sealed butt joints in field.
 - 3.2.12.7 Use factory welded corners and intersections unless otherwise approved by Consultant.
- 3.2.13 Joint fillers:
 - 3.2.13.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant.
 - 3.2.13.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - 3.2.13.3 Locate and form isolation, construction, and expansion joints as indicated.
 - 3.2.13.4 Install joint filler.
 - 3.2.13.5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- 3.2.14 Dampproof membrane:
 - 3.2.14.1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - 3.2.14.2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - 3.2.14.3 Seal punctures in dampproof membrane before placing concrete.
 - 3.2.14.4 Use patching material at least 150 mm larger than puncture and seal.

3.3 PROTECTION

3.3.1 Protect all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified herein; to prevent freshly deposited concrete from freezing, being exposed to abnormally high temperatures or temperature differentials, premature drying, and moisture loss for a period of time necessary to develop the specified properties of the concrete.

3.3.2 Cold Weather Concreting:

- 3.3.2.1 Between the 15th of October of any year and the 15th of April of the following year, or where the air temperature is below 4 degrees celsius, provide on hand and ready for use all equipment necessary for adequate cold weather protection and curing before concrete placement is begun. When fresh concrete is to be cast against existing concrete, prevent the loss of heat by extending the protection for the fresh concrete at least 600 mm (24") over the existing.
- 3.3.2.3 Insulate, or enclose within the protective housing, tie rods, reinforcement, or metal which projects from the concrete being protected.
- 3.3.2.4 Construct enclosures tight and safe for wind and snow loadings.
- 3.3.2.5 Maintain housing, enclosures, and supplementary heat in place for entire period of protection, except that sections may be temporarily removed as required to permit placing additional forms or concrete provided the uncovered concrete is not permitted to freeze. Make up time lost from the required period of protection at the required temperature before protection is discontinued and removed.
- 3.3.2.6 Locate heating units to avoid heating concrete locally or drying it excessively. Avoid high temperature and dry heating within enclosures.
- 3.3.2.7 Take particular care to maintain edges and corners of concrete at the required temperature owing to their greater vulnerability to freezing.
- 3.3.2.8 Provide sufficient insulation, and heat as necessary, to prevent freezing of frost susceptible soil which lies against structural elements; in particular protect soil beneath footings and behind foundation walls until the building is completed.
- 3.3.2.9 For cold weather protection requirements for placing concrete slabs on grade, see also SLABS ON GRADE clause.

3.3.3 Hot Weather Concreting:

- 3.3.3.1 When rate of moisture evaporation exceeds 1.0 kg/m² per hour, employ the following measures in addition to the requirements of CSA A23.1
- 3.3.3.2 Use ice as mixing water, or an alternate temperature reducing or set retarding admixture, (subject to review by the Consultant), to lower the concrete temperature.
- 3.3.3.3 Maintain temperature of concrete at time of placement as close to possible to 15 degrees celsius, and not in excess of 32 degrees celsius.
- 3.3.3.4 Dispatch ready-mix trucks and organize work to keep mixing time to a minimum. Minimize exposure of mixing trucks to the hot sun while waiting.
- 3.3.3.5 Provide adequate personnel and organize work to keep placing time to a minimum.
- 3.3.3.6 Place concrete in layers thin enough and areas small enough so that the time interval

for placing is reduced and compaction will ensure complete union of adjacent portions.

- 3.3.3.7 With formed concrete, reliance shall not be placed on the forms alone to provide curing. Spray formwork with water to keep it tight and free from cracking.

3.3.4 Protection of Completed Work

- 3.3.4.1 At all times during the work, protect exposed concrete, exposed masonry and other exposed members from staining or becoming coated with concrete leakage due to continuing concrete operations. Members which become coated may be classed as defective by the Consultant.
- 3.3.4.2 Protect exposed members from staining due to rusting of reinforcement projecting beyond construction joints.
- 3.3.4.3 Take suitable measures to prevent spalling and cracking damage occurring to the structure due to water freezing in expansion joints, small holes, slots, depressions and take suitable measures to prevent damage occurring to foundations and the like due to frost action in the soil or backfill.
- 3.3.4.4 The application of deicing salts on completed work is not permitted.

3.4 FOOTINGS

- 3.4.1 Note the geotechnical report that states that the soil is frost susceptible. During cold weather conditions, carefully protect footing bases from frost since they will weaken quickly on exposure to freezing and thawing temperatures.
- 3.4.2 Found footings on naturally consolidated undisturbed soil capable of safely supporting the allowable bearing capacity shown on the drawings within acceptable limits of settlement.
- 3.4.3 Founding elevations shown are based upon geotechnical investigation.
- 3.4.4 Founding elevations and allowable bearing capacities must be verified by the geotechnical Consultant before footing concrete is placed.
- 3.4.5 If, upon excavating to the elevations shown, the required soil bearing capacities are not achieved, or if they are achieved at a higher elevation, inform the Consultant who will provide instructions as to how to proceed.
- 3.4.6 Note actual footing founding elevations on the reproducible as-built drawings.
- 3.4.7 Construct footings in a particular area commencing from the lowest footing elevation and proceeding to the higher elevations.
- 3.4.8 Proceed in a similar manner for continuous footings.
- 3.4.9 Remove water, disturbed soil and foreign matter from footing excavations before placing

concrete. Do not permit the soil at founding elevations to soften due to the presence of water in the excavations or construction activity.

- 3.4.10 Provide a skim slab beneath all footings, where identified in the geotechnical report. Skim slab is to be placed after all loose material, foreign matter and water has been removed from the excavation and after the geotechnical engineer has inspected the soil at the founding elevation.
- 3.4.11 During cold weather, prevent soil adjacent to and beneath all footings from freezing. Do not pour footings on frozen soil or soil which has been allowed to freeze and thaw. If the soil at founding elevations is frozen or was frozen and thawed, remove affected material and found footings on unaffected soil with the required characteristics at no extra cost to the Owner.
- 3.4.12 Where excavations for mechanical or electrical services, pits adjacent foundations and the like encroach upon a 7 in 10 slope (or as indicated by the geotechnical consultant) between corners of footings and bottom corners of excavations, lower footings a suitable amount so as not to exceed the 7 in 10 slopes (or as indicated by the geotechnical consultant) at no extra cost to the Owner.

3.5 CONDUITS

- 3.5.1 Conduit 30mm diameter or less is to be placed in the middle third of slab thickness. Maintain a minimum of 80 mm of concrete clear between adjacent conduits. Conduit of diameter larger than 30mm is not permitted in slab unless approved by consultant. Use of aluminum conduit is not permitted.

3.6 CONSTRUCTION JOINTS

- 3.6.1 Obtain approval from the Consultant for location and details of construction joints not shown.
- 3.6.2 The maximum length of a concrete slab pour shall be 40 m (120'-0).
- 3.6.3 The maximum length of a concrete foundation wall pour shall be 15 m (50').
- 3.6.4 The maximum height of a concrete pour shall be 5 m (15'-0).

3.7 SLABS ON GRADE

- 3.7.1 Do not place concrete slabs on grade until the specified sub-floor material has been placed, inspected and approved.
- 3.7.2 Do not place concrete on a sub-grade that has been frozen and thawed until the sub-grade has been reviewed by the Geotechnical Consultant and approved. If, in the Consultant's opinion, the safe bearing capacity of the sub-grade has been reduced to below 25 kPa (500psf), remove the affected materials and replace with compacted granular fill at no additional cost to the Owner.
- 3.7.3 Place clear crushed stone over the sub-base, to depths shown or specified. Thoroughly roll and

consolidate to the lines and levels required, with a maximum surface variation of +/- 10mm.

- 3.7.4 Upon approval of the placement of the sub-floor material and setting of reinforcement, place and consolidate concrete and finish and cure as specified herein.
- 3.7.5 Place a bond breaker, minimum 1 layer of building paper, between edges of slab on grade and abutting surfaces. Where slab on grade is exposed to de-icing chemicals, provide an approved sealant at the joint between the slab on grade and abutting surfaces.
- 3.7.6 Saw-Cuts
- 3.7.6.1 Saw-cut slabs on grade as shown with a maximum length between saw-cuts of 4.5m (15' 0"). Arrange panels as shown or for the Consultant's approval.
 - 3.7.6.2 Carry out cutting in accordance with recommendations contained in CSA A23.1, but in any event between 6 and 18 hours after placement of concrete.
 - 3.7.6.3 After a period of at least 28 days, fill saw-cuts with mortar containing cement, sand, and latex bonding agent. Ensure that joints to be filled are clean, dry and free of foreign matter.
 - 3.7.6.4 Mask edges of saw-cuts as required, to prevent concrete floors from becoming stained.

OPENINGS THROUGH COMPLETED MEMBERS

- 3.8.1 Do not cut openings through completed members without the Consultant's approval.
- 3.8.2 Where the location of openings is approved, locate the reinforcement by x-ray, cover meter or other positive means as required by the Consultant and adjust the location of the opening so that no reinforcement is cut unless specifically approved otherwise in writing by the Consultant.
- 3.8.3 In the case of precast concrete slabs, holes shall be cut or drilled only by the precast concrete fabricator.

3.9 GROUTING BENEATH BASE PLATES

- 3.9.1 Grout beneath plates bearing on concrete with an approved non-shrink flowable grout. Conform with the manufacturer's directions for mixing and placing grout. Completely fill voids below plates. Fill voids left by shims after shims are removed.
- 3.9.2 During cold weather, preheat base plates and footings and maintain temperature at minimum 12 degrees C. for 6 days after grouting.

3.10 CONCRETE WORK AT EXISTING STRUCTURE

3.10.1 Before proceeding with any work in or adjacent to the existing structure, verify that conditions are as indicated in the drawings. If they are not, advise the Consultant of discrepancies and do not proceed until the Consultant has given instructions.

3.10.2 Prior to proceeding with the work, determine the exact founding elevations of existing footings adjacent to the new work. Report these findings to the Consultant before proceeding further.

3.11 SURFACE TOLERANCES

3.11.1 Concrete tolerance in accordance with CSA-A23.1/A23.2.

3.11.2 Tubular forms (columns): Multiple layers of 100 percent recycled paperboard, spirally wound, and laminated with adhesive. Forms free of dents and other irregularities, complete with seamless plastic liner, internally treated with form release agent; 'Finish Free' by Sonotube or approved alternative.

PART 4 – QUALITY CONTROL

4.1 GENERAL

4.1.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

4.1.2 Adhere to the requirements of the project "Concrete Quality Plan" prepared and submitted as required under the Submittals section of this specification.

4.1.3 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during Construction. The Consultant will decide upon corrective action and give his recommendations in writing.

4.1.4 The Consultant's general review during construction and inspection and testing by independent inspection and testing agencies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility.

4.2 NOTIFICATION

4.2.1 Prior to commencing significant segments of the work, give the Consultant and independent inspection and testing agencies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective

4.3 INSPECTION AND TESTING

4.3.1 Inspection or testing by Consultant and the Inspection and Testing Company will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

4.3.2 Appointment of Independent Inspection and Testing Companies

4.3.2.1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by consultant for review in accordance with CSA-A23.1/A23.2.

4.3.2.1.1 Ensure the testing laboratory is certified in accordance with CSA A283.

4.3.2.2 When defects are revealed, the Owner may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.

4.3.3 Concrete Quality Tests

4.3.3.1 Conduct concrete quality tests in accordance with CSA A23.1, and Section 01 40 00. Tests shall include the following:

- Slump
- Air content of fresh concrete
- Temperature of fresh concrete
- Compressive strength
- Density (for low-density and semi-low-density concrete only)

4.3.3.2 Compressive Strength Tests: Compressive cylinder testing will be carried out in accordance with CSA A23.1 and as follows: Three companion laboratory cured concrete standard compression test cylinders; one tested at 7 days and two tested at 28 days, constitute a strength test unless directed otherwise. Make one cylinder and strength test for every 100 cubic meters of each class of concrete, and no less than one cylinder and strength test for every class of concrete each day it is used. Store specimens at site for first 24 hours in an enclosure specifically provided for this purpose. Maintain curing conditions (temperature and moisture loss) similar to that of the concrete placed. Move all cylinders to laboratory and cure under standard moisture and temperature conditions.

4.3.3.2.1 Additional test cylinders during cold weather concreting. One additional field cured test cylinder will be made and tested at 7 days. Cure cylinders on job site under same conditions as concrete which they represent.

4.3.3.3 Where air entrained concrete is specified, make one air content determination test of each 200 cu meters of concrete placed, or at least one test per day in which concrete is cast.

4.3.3.4 No individual strength test shall fall below 3.5 MPa of the specified strength indicated on the structural drawings. The average of any set of three consecutive strength tests for each class of concrete shall exceed the specified strength indicated on the

structural drawings.

4.3.3.5 Grout Under Baseplates: At least one strength test may be made each day that grout is placed under baseplates.

4.3.4 Ensure test results are distributed as described in PART 1 – SUBMITTALS and as agreed at pre-pouring concrete meeting between testing laboratory and Consultant.

4.4 VERIFICATION

4.4.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - Products, by the Consultant and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

4.5 DEFECTIVE MATERIALS AND WORK

4.5.1 Where evidence exists, that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, concrete coring, inspections, or surveys performed, analytical calculations of structural strength made and the like in order to help determine whether the work must be repaired or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

4.5.2 All testing shall be conducted in accordance with the requirements of the Ontario Building Code, except where this would in the Consultant's opinion cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

4.5.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 03 30 00

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for topping work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM C472, Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete.
- .2 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 **SUBMITTALS**

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Sections, details, materials, dimensions, thicknesses of each layer, maximum and minimum thicknesses, 3, 7, and 28 day load characteristics, and surface finishes
- .3 Certificates: Submit certification from manufacturer, stating that materials proposed for use are compatible with specified floor finishes.

1.4 **QUALITY ASSURANCE**

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in 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.

1.5 **SITE CONDITIONS**

- .1 Do not install work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
 - .1 Concrete temperature: 10°C minimum.
 - .2 Ambient air temperature: 16 C to 30⁰C
 - .3 Precipitation: None.
 - .4 Relative Humidity: If applicable.

- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 48 hours after installation.

2 Products

2.1 **MATERIALS**

- .1 Rubber underlayment: ASTM E989; 4 mm thick mat consisting of 100% recycled rubber, with profiled bottom surface and reinforced fibreglass scrim facing sheet. 'AcoustiGuard Iso-Sep PM' by Wilrep Ltd. or approved alternative.
- .2 Gypsum based self-levelling compound:
 - .1 Compressive strength to ASTM C472: 14 Mpa minimum.
 - .2 Surface burning characteristics: ASTM E84: flame spread 0; fuel contribution 0; smoke development 0.
 - .3 Acceptable material: 'Gyp-Crete 2000' by Maxxon Corporation or approved alternative by Sika Canada.
- .3 Metal mesh: 3.4 lb galvanized, expanded, diamond metal lath mesh.
- .4 Water: potable.

2.2 **MIXES**

- .1 Mix toppings in accordance with manufacturer's written instructions.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

- .1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.
- .2 Prohibit traffic on prepared areas until work of this Section is completed.
- .3 Supply and install temporary protection to adjacent surfaces, floor drains, and steel angles to prevent damage resulting from work of this Section.

- .4 Prior to application of topping, remove all debris by vacuuming.

3.3 WOOD SUBFLOOR PREPARATION

- .1 Examine wood subfloors and ensure they confirm to the topping manufacturers requirements.
- .2 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.
- .3 Prohibit traffic on prepared areas until work of this Section is completed.
- .4 Supply and install temporary protection to adjacent surfaces, floor drains, and steel angles to prevent damage resulting from work of this Section.
- .5 Prior to application of topping, remove all debris by vacuuming.
- .6 Fill any open joints with product as approved by topping manufacturer.
- .7 Install acoustical underlayment in accordance with reviewed shop drawing and manufacturer's written instructions.

3.4 INSTALLATION

- .1 Apply primer to subfloors and allow to dry.
- .2 Install metal mesh, stapling every 150 mm and overlapping adjacent sheets by minimum 25 mm.
- .3 Install topping in accordance with reviewed shop drawings and manufacturer's written instructions.
- .4 Bonding agent:
 - .1 Mix and apply bonding agent in accordance with manufacturer's written instructions.
 - .2 Mix only as much material as can be applied within 15 to 25 minutes.
- .5 Levelling topping:
 - .1 Install levelling material in accordance with manufacturer's instructions.
 - .2 Let cure in accordance with manufacturer's, recommendations.

3.5 PROTECTION

- .1 Provide temporary protection for surfaces subjected to concentrated loads before they have cured sufficiently to carry them without damage.

- .2 Prevent traffic over completed areas, and protect work of this Section from precipitation, freezing, and debris after final installation.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with Division 01 and all documents referred to therein.
- 1.1.2 Provide all labour, materials, plant and equipment to complete the masonry anchorage and reinforcing work indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

- 1.2.1 Section 01 60 13 – LEED Product Requirements
- 1.2.2 Section 03 20 00 – Concrete Reinforcing
- 1.2.3 Section 03 30 00 – Cast-in-Place Concrete
- 1.2.4 Section 04 05 00 - Common Work Results for Masonry: Installation of Anchors
- 1.2.5 Section 05 12 23 – Structural Steel

1.3 REFERENCES

- 1.3.1 Conform to the requirements of the 2012 Ontario Building Code (Ontario Regulation 332/12, amended by Ontario Regulations 191/14, 563/17 and 88/19).
- 1.3.2 ASTM International Inc.
 - 1.3.2.1 ASTM A 36/A 36M-19, Standard Specification for Carbon Structural Steel.
 - 1.3.2.2 ASTM A 307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 1.3.2.3 ASTM A 580/A 580M-18, Standard Specification for Stainless Steel Wire.
 - 1.3.2.4 ASTM A 641/A 641M-19, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 1.3.2.5 ASTM-A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 1.3.2.6 ASTM A1064/A1064M-18a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- 1.3.3 Canada Green Building Council (CaGBC)
 - 1.3.3.1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
 - 1.3.3.2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0-[Addendum 2007].
 - 1.3.3.3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors

1.3.4 Canadian Standards Association (CSA International)

- 1.3.4.1 CAN/CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- 1.3.4.2 CAN/CSA A179-14 (R2019), Mortar and Grout for Unit Masonry.
- 1.3.4.3 CAN/CSA A370-14 (R2018), Connectors for Masonry.
- 1.3.4.4 CAN/CSA A371-14 (R2019), Masonry Construction for Buildings.
- 1.3.4.5 CAN/CSA G30.18-09 (2014), Billet-Steel Bars for Concrete Reinforcement.
- 1.3.4.6 CSA-S304-14 (R2019), Design of Masonry Structures.
- 1.3.4.7 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

1.4.1 Provide submittals in accordance with Division 01.

1.4.2 Product Data:

- 1.4.2.1 Provide manufacturer's printed product literature, specifications and datasheets illustrating products to be incorporated into project for specified products.

1.4.3 Shop Drawings:

1.4.3.1 Provide shop drawings in accordance with Division 01.

- 1.4.3.1.1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada

1.4.3.2 Provide shop drawings detailing bar bending details, anchorage details, lists and placing drawings.

1.4.3.3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

1.4.3.4 Samples:

- 1.4.3.4.1 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

1.4.3.5 Manufacturer's Instructions

- 1.4.3.5.1 Provide manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

1.5.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1.5.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified

performance characteristics and criteria and physical requirements.

1.5.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 04 05 00 - Common Work Results for Masonry.

1.5.4 Mock-ups:

1.5.4.1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control and requirements of Section 04 05 00 - Common Work Results for Masonry: Installation of Anchors, supplemented as follows:

1.5.4.1.1 Construct mock-up panel of reinforcement installation.

1.5.4.1.2 Sample panel: 1500 mm x 1500 mm using proposed procedures, anchorage material, connectors, reinforcement material, and workmanship.

1.6 FIELD MEASUREMENTS

1.6.1 Make field measurements necessary to ensure proper fit of members.

1.7 DELIVERY, STORAGE, AND HANDLING

1.7.1 Deliver, store and handle masonry anchorage and reinforcing materials in accordance with Division 01, supplemented as follows:

1.7.1.1 Deliver reinforcement and connectors, identified in shop and placement drawings.

1.7.2 Packaging Waste Management:

1.7.2.1 Separate and recycle waste materials in accordance with Division 01.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Bar reinforcement: Steel to CAN/CSA A371 and CAN/CSA G30.18, Grade 400R

2.1.2 Connectors: to CAN/CSA A370 and CSA-S304.

2.1.3 Corrosion protection: to CSA-S304

2.1.4 Fasteners: installed post-construction:

2.1.4.1 Bolts and Screws: size and type to suit application, locate where indicated.

2.1.4.2 Nails: case-hardened cut or spiral nails, size and type to suit fastening application.

2.1.4.3 Powder-Driven Fasteners: pin styles and lengths to suit fastening application in accordance with manufacturers use, load and hold recommendations.

- 2.1.4.4 Adhesives: epoxies, mastics and contact cements for fastening applications, use in accordance with manufacturers' printed installation instructions, ACI 355.4, CSA A23.3-14, and the contract documents.

- 2.1.5 Ties: hot dip galvanized to CAN/CSA A370 Table 5.2 steel finish.

- 2.1.5.1 Unit ties, to CAN/CSA A370: size to suit application.
- 2.1.5.2 Adjustable Unit Ties: to CAN/CSA A370: proprietary type ties, type, style and size to suit application in accordance with manufacturer's recommendations.
- 2.1.5.3 Joint Reinforcement Ties: to CAN/CSA A370.

- 2.1.6 Anchors: to CAN/CSA A370:

- 2.1.6.1 Conventional Anchors: type steel bolts with bent bar anchors sized to suit application.
- 2.1.6.2 Wedge Anchors: expansion anchors type wedge, sized to suit application.
- 2.1.6.3 Sleeve Anchors: type sleeve and bolt, sized to suit application.
- 2.1.6.4 Dovetail Anchors: bent steel strap, galvanized to CAN/CSA A370 Table 5.2 coated finish.
- 2.1.6.5 Spiral Anchors: 8 mm stainless steel spiral anchors to Grade 304.
- 2.1.6.6 Stone Anchors: series 300 stainless steel conforming to ASTM A 666.
- 2.1.6.7 Anchor Bolts: conventional (unpatented) anchors.

- 2.1.7 Conventional Bolts:

- 2.1.7.1 Bolts: to ASTM f1554.
- 2.1.7.2 Plate anchors: steel to ASTM A 36, weld square of circular steel plate perpendicular to axis of steel bar threaded on opposite end.
- 2.1.7.3 Through bolt rods: to ASTM A 307 threaded rod or threaded ASTM A 36 bar stock.

- 2.1.8 Adhesive Anchors: proprietary systems, as per contract documents.

2.2 FABRICATION

- 2.2.1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- 2.2.2 Fabricate connectors in accordance with CAN/CSA A370.
- 2.2.3 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.
- 2.2.4 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.
- 2.2.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

- 2.3.1 Upon request, provide Consultant with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement

work.

2.3.2 Upon request inform Consultant of proposed source of material to be supplied.

PART 3 – EXECUTION

MANUFACTURER'S INSTRUCTIONS

3.1.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PREPARATION

3.2.1 Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

3.3 INSTALLATION

3.3.1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA A370, CAN/CSA A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.

3.3.2 Prior to placing mortar/grout, obtain Consultant's approval of placement of reinforcement and connectors.

3.4 BONDING AND TYING

3.4.1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304.1, CAN/CSA A371 and as indicated.

3.4.2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CAN/CSA A371 and as indicated.

3.4.3 Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with [CAN/CSA A370 and CAN/CSA A371] [manufacturer's instructions]:

3.4.3.1 Bond walls of two or more wythes in accordance with CAN/CSA A371 and as indicated.

3.4.3.2 Install horizontal joint reinforcement as per the contract documents.

3.4.3.3 Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 400 mm each side of opening.

3.4.3.4 Place joint reinforcement continuous in first and second joint below top of walls.

3.4.3.5 Lap joint reinforcement ends minimum 150 mm.

3.4.3.6 Connect stack bonded unit joint corners and intersections with strap anchors 400 mm on centre.

3.5 REINFORCED LINTELS AND BOND BEAMS

- 3.5.1 Reinforce masonry beams, masonry lintels and bond beams as indicated.
- 3.5.2 Place and grout reinforcement in accordance with CSA-S304.1, CAN/CSA A371, and CAN/CSA A179.
- 3.5.3 Support and position reinforcing bars in accordance with CAN/CSA A371.

3.6 GROUTING

- 3.6.1 Grout masonry in accordance with CSA-S304.1, CAN/CSA A371 and CAN/CSA A179 and as indicated.

3.7 ANCHORS

- 3.7.1 Supply and install metal anchors in accordance with CAN/CSA A370 and CAN/CSA A371.

3.8 LATERAL SUPPORT AND ANCHORAGE

- 3.8.1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.9 MOVEMENT JOINTS

- 3.9.1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.10 FIELD BENDING

- 3.10.1 Do not field bend reinforcement and connectors except where indicated or authorized by Consultant.
- 3.10.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- 3.10.3 Replace bars and connectors which develop cracks or splits.

3.11 FIELD QUALITY CONTROL

- 3.11.1 Site inspections in accordance with Section 04 05 00 - Common Work Results for Masonry.
- 3.11.2 Obtain Consultant approval of placement of reinforcement and connectors, prior to placing mortar or grout.

3.12 FIELD TOUCH UP

- 3.12.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.13 CLEANING

- 3.13.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

- 3.13.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction & Waste Management and Disposal and 01 60 13 - LEED Requirements.

END OF SECTION 04 05 19

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for masonry work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- .2 ASTM A1064/A1064-M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
- .4 ASTM C207, Specification for Hydrated Lime for Masonry Purposes.
- .5 CAN/CSA A82, Fired Masonry Brick Made From Clay or Shale.
- .6 CSA A165 Series, CSA Standards on Concrete Masonry Units.
- .7 CSA A179, Mortar and Grout for Unit Masonry.
- .8 CSA A370, Connectors for Masonry.
- .9 CSA A371, Masonry Construction for Buildings.
- .10 CAN/CSA A3001, Cementitious Materials for Use in Concrete.
- .11 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.
- .12 CSA S304.1, Design of Masonry Structures.

1.3 **DESIGN REQUIREMENTS**

- .1 Design unit masonry in accordance with following Climatic Design Data for Toronto contained in the Ontario Building Code:
- .1 Design temperature: January 1%, July 2 1/2%.
- .2 Hourly wind pressures: 1 in 50 year occurrence.
- .3 Seismic design: Class "D".

1.4 **SUBMITTALS**

- .1 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating.
- .2 Wall sections details and plan details, reinforcing and anchors, special detailing, patterning, locations and details of control joints and window/door headers.

- .3 Information in the shop drawings should also include material standards, design criteria (i.e. depth of members, deflection limits etc.) and design loads to be used for the design).
- .4 Seismic anchors, supports and accessories for complete installation.
- .2 Samples:
 - .1 Submit samples in accordance with Section 01 33 00:
 - .2 Submit samples of each type and colour of masonry unit used prior to placing order.
 - .3 Submit samples of coloured mortar to match masonry samples.
 - .4 Submit samples of masonry anchors, and ties.
 - .5 Submit 250 x 200 mm samples of dampproof course and flashing.
 - .6 Submit samples in tandem with those of sections 07 41 13, 07 46 19, 07 62 00, 07 71 23, 08 44 00, 08 53 13, 08 91 00 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .3 Reports and certificates:
 - .1 Submit manufacturer's certificates stating that materials supplied are in accordance with this Specification.
 - .2 Submit copy of membership in good standing of OMCA.
 - .3 Submit written certificate of Contractor's work experience.

1.5 QUALITY ASSURANCE

- .1 Qualification: Perform work of this Section by a company that is a member in good standing of the OMCA. Company and foreman, with minimum 10 years demonstrated experience, and; any laborer, with minimum 2 years demonstrated experience, in masonry work of comparable complexity and scope.
 - .1 Provide proof of current OMCA membership.
 - .2 Provide résumés of company, foreman and all and any laborers that will be performing the work. No foreman and or laborers for which résumé is not provided will be admissible on site.
- .2 Provide plain and reinforced masonry in accordance with CSA A370, CSA A371, and CSA S304.1.
- .3 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for unit masonry work:
 - .1 Design of unit masonry work.
 - .2 Design of brick ties and anchors, including requirements necessary to meet seismic requirements.
 - .3 Review, stamp and sign shop drawings.
 - .4 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA standards and any other applicable standards and regulations related to the work".

- .5 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of the Work is in accordance with Contract documents and reviewed shop drawings.
- .6 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .4 Cold Weather Protection:
 - .1 To CAN/CSA-A371 and as follows:
 - .1 Maintain temperature of mortar between 5°C and 50°C until batch is used or becomes stable.
 - .2 Maintain ambient temperature of masonry work and its constituent materials between 5°C and 50°C and protect site from windchill.
 - .3 Maintain temperature of masonry above 0°C for minimum of 3 days, after mortar is installed.
 - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10°C, before applying mortar.
 - .5 Do not use scorched aggregate. Do not use salts or anti-freezes. Only use approved smokeless heaters.
- .5 Hot Weather Requirements:
 - .1 To CAN/CSA-A371 and as follows:
 - .1 Plan in advance for hot weather construction. Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Avoid using dry masonry in hot weather conditions. Use predampened masonry unit nominally saturated, but surface dry at time of laying. Do not dip masonry unit in bucket of water.
 - .3 Spread only enough mortar to permit soft setting of masonry units; do not over mix mortar materials; do not retemper mortar after 2 hours of use; do not retemper pigment coloured mortar; do not spread more than 900 mm of mortar for placement of masonry unit.
- .6 Mock-up:
 - .1 Construct mock-up panels of unit masonry construction for each colour and/or bond pattern listed below, 1200 mm wide x 1200 mm high in a location accepted by Consultant.
 - .2 Each panel to incorporate one brick and architectural block colour and pattern as selected by the Consultant. Refer to elevation for details on pattern:
 - .1 **BR-1** or **BR-11**: Running Bond, Modular (45mm Vented Cavity).
 - .2 **BR-1a** or **BR-11a**: Running Bond, ¾" Recessed, Modular (25mm Vented Cavity).
 - .3 **BR-1b** or **BR-11b**: Soldier Course, ¾" Recessed, Modular (25mm Vented Cavity).
 - .4 **BR-1c** or **BR-11c**: Stacked Bond, ¾" Recessed, Modular (25mm Vented Cavity).
 - .5 **BR-2** or **BR-22**: Soldier Course, ¾" Recessed, 2-1/4" Meridian (25mm Vented Cavity). Use solid core bricks at building corners.
 - .6 **BR-2a** or **BR-22a**: Stacked Bond, ¾" Recessed, 2-1/4" Meridian (25mm Vented Cavity).

- .7 **BR-3 or BR-33:** Rowlock Course, angled minimum 15°, @ Brick windowsills, Modular. Use solid core bricks at both ends of each windowsill.
 - .3 Demonstrate use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, coping and sills, mortar, bonding, control joints, and workmanship.
 - .4 Rejected mock-ups: Correct rejected mock-ups and requested re-review by Consultant.
 - .5 Once accepted by the consultant, apply anti-graffiti coating in accordance with Section 09 91 00 to half of the mock-up areas for consultant review.
 - .6 Mock-ups may not form part of Work unless expressively accepted in writing by the consultant.
 - .7 Mock-ups not forming part of Work are to remain in place until masonry work is complete.
 - .8 Mock-ups which do not form part of Work are to be removed from Site during final cleanup, or when directed by Consultant.
- .7 Pre-installation meeting:
- .1 Arrange meeting on Site to be attended by Consultant and Contractor to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.6 **DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle Products in accordance with the Conditions of the Contract and as specified herein.
- .2 Remove unacceptable materials from Site and replace to acceptance of Consultant. Store materials off ground protected from wetting by rain, snow or ground water, or inter-mixture with earth or other materials. Store metal ties and reinforcement to prevent corrosion.
- .3 Do not concentrate storage of materials on any part of structure beyond design load, take particular care not to overload unsupported portions of structure which may have not attained their full design strength.
- .4 Comply with CSA A371. Do not use salt or calcium-chloride to remove ice from masonry surfaces.
- .5 Deliver mortar materials in original unbroken and undamaged packages with the maker's name and brand distinctly marked thereon. Prevent damage to units.
- .6 Keep masonry materials free from ice and frost. Keep units protected from concrete, mortar and other materials which could cause staining.

1.7 MAINTENANCE

- .1 Submit extra masonry units which are part of the same production run as installed Products, in the following percentages of gross area covered:
 - .1 5% additional brick veneer and 2.5% architectural block in all colours, finishes shapes and sizes from manufacturer's standard range.
 - .2 Provide one unopened grout sac or each colour provided.
 - .3 Deliver to address as instructed by Owner for storage.
- .2 Provide one unopened grout sac or each colour provided.
- .3 Deliver to address as instructed by Owner for storage.

1.8 EXTENDED WARRANTY

- .1 General Framework: The warranty clauses specified herein are extended warranties and shall be executed in accordance with the requirements of the General Conditions of the Contract.
- .2 Contractor / Installer Warranty: Submit an extended warranty, co-signed by the Masonry Subcontractor and the General Contractor, warranting the work of this Section in accordance with General Conditions, except that warranty period is extended for a period of two (2) years from date of Substantial Performance of the Work:
 - .1 Warrant against defects include, but not be limited to: water penetration through the masonry assembly; systemic cracking or joint degradation; failure of masonry ties, anchors, or structural attachments; failure of flashings, weep holes, or venting components; and displacement or detachment of brick units from the structural backing.
 - .2 The Contractor shall remedy all defects, including the full cost of labor, scaffolding, staging, removal, and replacement of affected materials, at no additional cost to the Owner.
- .3 Manufacturer's Product Warranty: Submit a written warranty issued by the brick manufacturer, warranting the brick masonry units against structural degradation, structural spalling, and disintegration due to normal weathering or freeze-thaw cycles for a period of ten (10) years from the date of Substantial Performance
 - .1 Manufacturer's warranty shall comply with physical property requirements specified in CSA A179 and CSA A82.
 - .2 Warranty shall specify the provision of replacement material matching original specifications for any units found defective within the warranty period.

2 Products

2.1 MASONRY UNITS

- .1 Concrete block units (**CMU1**): Normalweight units, CSA A165 Series, with gaseous carbon dioxide sequestered into concrete as solid calcium carbonate during formation of units. Thickness as indicated on Contract Drawing, classifications as follows:
 - .1 H/15/A/M.
 - .2 SS/15/A/M.
 - .3 SF/15/A/M
- .2 Burned clay brick: CAN/CSA A82, Type X, Grade EG, 57 x 92 x 194 mm (3-5/8 x 2-1/4 x 7-5/8 in), in the following types:
 - .1 Brick Type **BR-1** and **BR-3**: Medium Ironspot #46, Smooth, Modular, by Endicott Clay Products Co., as supplied by Thames Valley Brick and Tile.
 - .2 Brick Type **BR-2**: Medium Ironspot #46, Smooth, 2-1/4" Meridian, by Endicott Clay Products Co., as supplied by Thames Valley Brick and Tile.
 - .3 Brick Type **BR-11** and **BR-33**: Medium Ironspot #46, Velour, Modular, by Endicott Clay Products Co., as supplied by Thames Valley Brick and Tile.
 - .4 Brick Type **BR-22**: Medium Ironspot #46, Velour, 2-1/4" Meridian, by Endicott Clay Products Co., as supplied by Thames Valley Brick and Tile.
- .3 Architectural Block 4 x 16 **ACB1**: Smooth finish, normal weight units, 90 x 190 x 390 mm (3 9/16 x 3 9/16 x 15 3/8 in), colour Charcoal, running bond layout pattern, unless otherwise indicated in Drawings, CAN/CSA A371, CAN/CSA A165 series; H/15/A/M; S/15/A/M; Sc/15/A/M; Refer to Exterior Elevations shown on Drawings for architectural concrete block type. Profiled concrete block to have profile on face and on exposed end where special shaped are required. Manufactured by Techo-Bloc or approved alternative by Brampton Brick.
- .4 Concrete block units: Normal weight units, CSA A165 Series, 250 mm thick unless otherwise indicated on Contract Drawing, classifications as follows:
 - .1 H/15/A/M.
 - .2 SS/15/A/M.
 - .3 SF/15/A/M.
- .5 Special shapes: Unless indicated otherwise, supply and install corner returns, bull-nosed or double bull-nosed units for exposed and external corners, bond beams, sash blocks for control joints, solid block where noted, concrete block lintels over openings in concrete block walls and any additional special shapes as indicated.
- .6 Obtain each masonry unit type from same manufacturer. Supply and install units of uniform texture and colour for each kind required.
- .7 Supply masonry units with exposed surfaces free of cracks, chips, blemishes, and broken corners.

2.2 ACCESSORIES

- .1 Reinforcement: CSA A370, CSA A371, and ASTM A1064/A1064-M, all components to be stainless steel Type 304 unless otherwise specified, complete with separator or isolator or prevent galvanic reaction:
 - .1 This specification is based on products manufactured by Blok-Lok Limited. Products by Hohmann & Barnard, Inc. and Fero Corporation
 - .2 Type 1 (single wythe): Truss type; 'Blok-Trus BL30'.
 - .3 Type 2 (cavity wall block back-up).
 - .4 Type 3 (cavity wall stud and cast in place back -up): Anchors fabricated from 1.5mm plate with 4.76 mm wire, complete with screws; 'BL-407S Shear Anchor' with 'Flex-O-Lok tie' – lengths as required to accommodate different vented cavity dimensions -, and 'Wedge-Lok' insulation retainer. Insulation retainer to straddle anchor bridging the cavity. 'Thermal 2-Seal Wing Nut Anchor' by Hohmann & Barnard, Inc. is an approved alternative.
 - .5 Anchors to be thermally separated (broken) to prevent thermal bridging.
 - .6 Connectors: CSA A370 and CSA S304.1.
 - .7 Reinforcing steel: CSA G30.18, Grade 400, refer to Contract Drawings for number, size, and location.
 - .8 Design of anchors, supports and accessories to meet seismic requirements.
- .2 Z-girts: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized. Depth as indicated on Contract Drawings. Z-girts to be thermally broken at mid-point of insulation thickness.
- .3 Cavity wall insulation: In accordance with Section 07 21 00.
- .4 Loose steel lintels and lateral support angles: Supplied as part of work of Section 05 50 00.
- .5 Through wall flashings: Prefinished metal flashings in accordance with Section 07 62 00, continuous strips with a 19 mm folded drip edge.
- .6 Dampproof course and flashing: Reinforced SBS rubberized asphalt compound laminated to cross-laminated polyethylene film, 40 mils thick; 'Blueskin TWF' by Henry or 'Airshield Thru Wall Flashing' by W.R. Meadows or approved alternative, complete with primer and adhesive recommended by flashing manufacturer.
- .7 Compressible filler: 75 x 6 mm thick preformed, polyurethane foam; 25V by Emseal Joint Systems Ltd.
- .8 Control joint filler: Prefabricated extruded rubber joint to suit wall thickness; RS Series Rubber Control Joint by Blok-Lok or approved alternative.
- .9 Mortar mesh: 250 mm high x thickness to suit cavity, 90% open HDPE mesh; 'Mortar Trap' by Blok-Lok Limited or 'Mortar Net' by Hohmann & Barnard, Inc.

- .10 Weep hole vents:
 - .1 Flexible ultra-violet resistant polypropylene-copolymer plastic, 'Cell-Vent' by Blok-Lok, 'Mortar Maze Cell Vents' by Advanced Building Products Inc. or approved alternative.
 - .2 Provide manufacturer recommended clear silicone adhesive for suspended applications.
 - .3 Colour: To match brick colour, as selected by Consultant.
 - .4 Size to match height of brick units.
- .11 Parging: Cement based coating for concrete or masonry, above or below grade 'MasterSeal 581' by BASF or approved alternative. Colour: Grey.
- .12 Anti-graffiti coating: In accordance with Section 09 91 00.

2.3 MORTAR MATERIALS

- .1 Loadbearing masonry: CSA A179, Type S, proportion method.
- .2 Interior non-loadbearing masonry: CSA A179, Type N, proportion method.
- .3 Exterior non-loadbearing masonry: CSA A179, Premixed 1-1-6 Type N, portland cement/lime, proportion method.
- .4 Cement: CAN/CSA A3001, normal Portland, Type GU. Provide white cement where required for white or light coloured mortars.
- .5 Masonry aggregate: CSA A179. Provide white aggregate where required for white or light coloured mortars.
- .6 Hydrated lime: ASTM C207, Type S.
- .7 Water: Clean potable, free from deleterious elements and free from salts that can cause efflorescence.
- .8 Mortar pigment: 'Bay Ferrox' by Bayer Inc. or approved alternative by Huntsman Pigments and Additives and Solomon Colors, Inc. Colour to later selection by Consultant.
- .9 Concrete fill and grout: 20 Mpa concrete in accordance with CSA A179.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PROTECTION

- .1 Supply and install temporary waterproof, non-staining coverings, secured against displacement, to extend over walls and down sides to protect masonry Work from snow and wind driven rain, and from drying too quickly, until masonry work is completed and protected by flashings or other permanent construction.
- .2 Supply and install non-staining, protective coverings on horizontal and vertical surfaces to protect work of this Section from damage, staining, marking, and mortar droppings.

3.3 WORKMANSHIP

- .1 Perform masonry work in accordance with CSA A371 and as indicated .
- .2 Supply and install masonry work plumb, level and true to line, with vertical joints in alignment and horizontal courses level, uniform, and straight.

3.4 MASONRY - GENERAL INSTALLATION

- .1 Construct masonry work as required by jurisdictional authorities.
- .2 Before commencing masonry work, verify required limitations for wall heights, wall thicknesses, openings, bond, anchorage, and compressive strengths of masonry units and mortars.
- .3 Construct masonry fire protection and fire separations of the thickness indicated on Drawings for the fire resistant ratings as noted on Drawings, and conforming to the Fire-Performance Ratings, Appendix 'D' to the National Building Code of Canada.
- .4 Fire Separations and Fire Separations with Fire Resistance Ratings: Construct walls tightly to construction above and at perimeter, and without openings or voids. Do not reduce the thickness of walls to less than the thickness indicated on the Drawings or for the required fire resistance rating where required.
- .5 Do not butter corner units, throw mortar droppings into joints, or excessively furrow bed joints. Do not shift or tap units after mortar has taken initial set. If adjustment is necessary after mortar has started to set, remove and replace with fresh mortar.
- .6 Do not use admixtures without Consultant's written acceptance.
- .7 Tool mortar joints slightly concave with non-staining tools unless indicated otherwise. Strike joints flush in non exposed areas or where shown on Contract Drawings. Use sufficient force to press mortar tight against masonry units on both sides of joints. Remove excess, remaining mortar material and burrs.
- .8 Install masonry walls 25 mm clear of underside of steel building frames, roof or floor deck. Install masonry with a 19 mm space beneath shelf angles and install compressible filler.

- .9 Cut masonry units with a wet saw to obtain straight, clean, even, unchipped edges. Cut units as required to fit adjoining work neatly or for flush mounted electrical outlets, grilles, pipes, conduit, leaving 3 mm maximum clearance. Use full-size units without cutting wherever possible.
- .10 Reinforce veneer walls with adjustable wall reinforcing at maximum 400 mm o.c. vertically and 600 mm o.c. horizontally. Install reinforcing in accordance with manufacturer's instructions. In veneer walls extend reinforcement from support wall, spanning cavity into exterior wythe. Place at maximum 75 mm o.c. each way around perimeter of openings, within 300 mm of openings.
- .11 Reinforce block walls with continuous wire reinforcement in every second block course. Supply and install prefabricated L and T sections. Cut, bend and lap reinforcing units as per manufacturer's printed directions for continuity at returns, offsets, pipe enclosures, and other special conditions. Bending of masonry reinforcement is not permitted.
- .12 Reinforce masonry walls with reinforcing steel as indicated on Drawings. Vertical reinforcing shall be fully grouted in masonry cores with grout.
- .13 At openings in block walls install extra reinforcement, so that first and second courses above and below openings are reinforced. Extend extra reinforcement 600 mm beyond opening in each direction.
- .14 Reinforce joint corners and intersections with strap anchors 400 mm o.c.
- .15 Do not place reinforcement across masonry wythes at control joints.
- .16 Install masonry with 10 mm thick joints unless indicated otherwise. Make vertical and horizontal joints equal and of uniform thickness.
- .17 Build control joints in masonry walls at intervals and in locations shown. Form joints for block walls using sash block units in accordance with details shown. Form joints for veneer walls by leaving head joints between stacked units void of mortar. Fill chase and joint with joint filler full height of control joints. Leave a depth of 13 mm for sealing unless otherwise shown.
- .18 Install control joints in masonry walls where indicated on drawings and at projections and changes in direction. Where control joints have not been indicated provide joints at 6100 mm o.c. for exterior walls and 9150 mm o.c. for interior walls.
- .19 If required, provide movement joints, similar to building control joints, installed between areas with different support conditions.
- .20 Supply and install solid block or metal lath under block, and fill block cells solid for lintel bearing and as required to secure built-in anchor bolts and/or anchors shown.
- .21 Do not cut intersections of walls except as otherwise indicated.
- .22 Install weep hole vents in accordance with manufacturer's directions, in exterior wythe of masonry above dampproof courses and flashings and at tops of walls using

adhesive. Space weep hole vents maximum 600 mm o.c. horizontally. Prevent weep hole vents from becoming plugged with mortar or debris.

- .23 Coordinate installation of masonry with installation of air barrier and vapour retarder to ensure continuity of these systems.
- .24 Install seismic anchors, supports and accessories in accordance with reviewed shop drawings.

3.5 DAMPPROOF COURSES AND FLASHING

- .1 Install dampproof courses beneath first masonry bearing course on slabs-on-grade. Trim dampproofing to conceal it.
- .2 Install flashings in masonry in accordance with CSA A371.
- .3 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings and elsewhere as indicated. Where flashings occur over openings in walls extend them past openings a minimum of 200 mm and turn up minimum 150 mm at each end to create a waterproof dam to prevent water draining into cavity.
- .4 In veneer walls install flashings continuously from front edge of masonry, under outer wythe, turn up backing minimum 200 mm and provide watertight seal against support wall.
- .5 Lap dampproofing and flashing 150 mm and seal in accordance with manufacturer's instructions.
- .6 At bottom of cavity install mortar mesh to manufacturer's instructions. Apply additional mortar mesh layer as required to fill cavity thickness. Place mesh in continuous layer.
- .7 Before masonry work begins, place specified dampproofing under first course of masonry. Install continuous dampproofing with ends lapped and cut flush with exterior face of wall. Place similar dampproofing over top course.

3.6 MORTAR MIXING.

- .1 Thoroughly mix mortar ingredients in proper quantities needed for immediate use to requirements of CSA A179.
- .2 Measure and batch mortar materials either by volume or weight, to accurately control and maintain proportions. Do not measure materials by shovel.
- .3 Mix mortar with maximum amount of water consistent with workability for maximum tensile bond strength within capacity of mortar.

- .4 Do not use mortar which has begun to set. Use mortar within 2 hours after initial mixing. Re-temper mortar during 2 hour period only as required to restore workability.
- .5 For colours use only factory included pigment as supplied by Bulk Mortar Supplier.
- .6 Add mortar colour and admixtures to requirements of manufacturer's instructions.
- .7 Provide uniformity of mix and colouration.

3.7 **BLOCK**

- .1 Lay blocks in running bond except as indicated otherwise. Align block webs vertically and install thicker ends of face shells up.
- .2 Install a full bed of mortar for first courses of masonry, for masonry units 100mm thick and less, and between solid units. For remaining courses bed face shells, including vertical end joints, fully in mortar.
- .3 Install special shaped and sized concrete block units as indicated and as required for a complete and coordinated assembly and to minimize cut units.
- .4 After tooling but before mortar hardens, remove surplus mortar from glass block faces, clean glass block using soft, clean cloths, sponges and bristle brushes, and wipe glass blocks dry.
- .5 Supply and install two courses of solid block beneath lintel bearing.
- .6 Stagger end joints in every course. Align joints plumb over each other in every other course.
- .7 Bond intersecting block walls in alternate courses. Where block work abuts concrete, anchor each block course to concrete

3.8 **MASONRY VENEER**

- .1 Prior to installation of masonry veneer, coordinate installation of air and vapour retarder with Section 07 27 00.
- .2 Prior to installation of cavity insulation, examine air and vapour retarder and make good damage. Install cavity wall insulation in accordance with Section 07 21 00.
- .3 Lay masonry veneer in bond pattern as indicated on Drawings, and in a full bed of mortar.
- .4 Form angle corners with special shaped units; cutting of units is not permitted.
- .5 Erect exterior cavity wall construction as shown on Contract Drawings.
- .6 Install masonry veneer to prevent mortar droppings and protrusions from impeding drainage and pressure equalization of rainscreen cavities and drained walls.

- .7 Apply sufficient mortar on end of stretchers to ensure end joints are compressed full when masonry unit is pressed into place.

3.9 PRECAST SHAPES

- .1 Install dampproofing or flashings continuous under full length of precast shapes.
- .2 Install precast shapes in full mortar bed and secure units to each other with stainless steel dowels and to masonry units with stainless steel hook anchors, fully grouted.

3.10 LINTELS

- .1 Install concrete block lintels over openings in masonry except where steel lintels are indicated.
- .2 Set lintels with minimum of 200 mm uniformly distributed bearing at each end. Provide bond breaker under bearing ends.
- .3 Install reinforcing steel and concrete fill in block lintels.
- .4 Install loose steel lintels, as indicated in Contract Drawings. Centre over opening width.

3.11 BUILT-IN ITEMS

- .1 Coordinate and locate build-in items required to be built into masonry or supplied under work of other Sections including hollow metal doors, windows, lintels, sleeves, inserts, etc. Build-in items to present a neat, rigid, true and plumb installation.
- .2 Build wall openings, slots, and recesses required for ducts, grilles, pipes and other items.
- .3 Coordinate installation of conduit, outlet boxes and other mechanical and electrical built-ins with work of Divisions 21, 22, 23 and 26.
- .4 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as Work progresses.
- .5 Brace door jambs to maintain plumbness. Set anchors between metal frames and masonry and fill voids between hollow metal frames and masonry walls with mortar.

3.12 INSTALLATION TOLERANCES

- .1 Install masonry work to a plane flatness and exposed end tolerance of 3 mm in 3000
- .2 Variation in Alignment from Unit to Adjacent Unit: 1.5 mm maximum.
- .3 Plumb within 6 mm in 3 m, or in 6 mm in 6 m at external corners, expansion joints, or other conspicuous lines.

- .4 Level within 6 mm in any bay or 6 m maximum distance, and 12 mm in 12 m or more.
- .5 Located from position shown, and from related position of columns, walls, and partitions within 12 mm in any bay or 6 m maximum distance, and 19 mm in 12 m or more.
- .6 Opening sizes within 6 mm of designated dimension.
- .7 Column and wall cross-section dimensions within minus 6 mm and plus 12 mm.
- .8 Joint widths to dimensions indicated or specified herein, but in no case greater than 12 mm. Variation of Mortar Joint Thickness: 1 mm every metre.

3.13 **PARGING**

- .1 Provide parging over substrates and in locations indicated on drawing in accordance with manufacturer's written instructions.
- .2 Apply parging in two coats to minimum dry film thickness of 2.5 mm unless otherwise recommended by manufacturer for specific conditions.

3.14 **ANTI-GRAFFITI COATING**

- .1 Apply anti-graffiti coating in accordance with Section 09 91 00.

3.15 **REPAIR AND POINTING**

- .1 Remove and replace masonry units which are loose, chipped, broken, cracked, marked, stained, discoloured, or otherwise damaged. Supply and install new units to match adjoining units and install in fresh mortar, and point to eliminate evidence of replacement.
- .2 During tooling of joints, enlarge any cracks, holes, or other defects, point and completely fill with mortar.
- .3 Point-up joints including corners, openings and adjacent Work for a neat, uniform appearance, properly prepared for application of sealant compounds.

3.16 **CLEANING**

- .1 Obtain and follow unit masonry manufacturer's written instructions for cleaning of masonry.
- .2 Clean exposed, masonry surfaces, removing excess mortar as work progresses. Allow mortar droppings to partially dry then dry brush with a stiff fibre brush.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with Division 01, General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, plant, and equipment to complete the structural steel work indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

- 1.2.1 Section 03 20 00 – Concrete Reinforcing
- 1.2.2 Section 03 30 00 – Cast-in-Place Concrete
- 1.2.3 Section 09 91 00 – Painting

1.3 REFERENCES

- 1.3.1 Conform with the requirements of the latest edition of the Ontario Building Code, inclusive of all amendments and Minister's Rulings, and any applicable acts of any authority having jurisdiction.
- 1.3.2 American Society for Testing and Materials International, (ASTM)
 - 1.3.2.1 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - 1.3.2.2 ASTM A307-14e1, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - 1.3.2.3 ASTM A325M-14, Specification for High-Strength Bolts for Structural Steel Joints [Metric].
 - 1.3.2.4 ASTM A490M-14a, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
 - 1.3.2.5 ASTM A500/A500M-18, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 1.3.2.6 ASTM A992/A992M-11(2015), Standard Specification for Structural Steel Shapes.
 - 1.3.2.7 ASTM D6386-16a, Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 - 1.3.2.8 ASTM F1554-18, Standard Specification for Anchor Bolts, Steel 36, 55, and 105-ksi Yield Strength.
- 1.3.3 Canadian General Standards Board (CGSB)
 - 1.3.3.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- 1.3.4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

- 1.3.4.1 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
- 1.3.4.2 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.
- 1.3.5 CISC Code of Standard Practice for Structural Steel, Eighth Edition, adopted 2015.
- 1.3.6 Canadian Standards Association (CSA International)
 - 1.3.6.1 CAN/CSA G40.20/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - 1.3.6.2 CAN/CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - 1.3.6.3 CAN/CSA-S16-14, Limit States Design of Steel Structures.
 - 1.3.6.4 CAN/CSA-S136-16, Cold Formed Steel Structural Members.
 - 1.3.6.5 CSA-S136.1-12, Commentary on CSA Standard S136.
 - 1.3.6.6 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel Structures.
 - 1.3.6.7 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - 1.3.6.8 CSA W55.3-08 (R2018), Certification of companies for resistance welding of steel and aluminum.
 - 1.3.6.9 CSA W59-18, Welded Steel Construction (Metal Arc Welding).
- 1.3.7 Master Painters Institute
 - 1.3.7.1 MPI-INT 5.1-[98], Structural Steel and Metal Fabrications.
 - 1.3.7.2 MPI-EXT 5.1-[98], Structural Steel and Metal Fabrications.
- 1.3.8 The Society for Protective Coatings (SSPC)
 - 1.3.8.1 SSPC-SP 2, Hand Tool Cleaning
 - 1.3.8.2 SSPC SP 6/NACE No. 3-[00], Commercial Blast Cleaning.
 - 1.3.8.3 SSPC-SP 7/ NACE No. 4, Brush-Off Blast Cleaning
 - 1.3.8.4 SSPC-SP 10/ NACE No. 2, Near-White Blast Cleaning
- 1.3.9 Where there are differences between the specifications and the drawings and the standards, codes, or acts, the most stringent shall govern.
- 1.3.10 Standards and publications referenced by the Standards noted above are to apply even if they are not included in the list except as noted below. Where such reference is made, it shall be to the latest edition and revision published.
- 1.4 CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL
 - 1.4.1 The CISC's Code of Standard Practice for Structural Steel shall govern the work, subject to the modifications noted below.

- 1.4.1.1 Revise Clause 1.4 Responsibility for Design as follows:

Responsibility for Design. *When the Client provides the structural drawings and specifications, the Fabricator and the Erector shall not be responsible for determining the adequacy of the design nor be liable for the loss or damage resulting from an inadequate design. Should the Client desire the fabricator to assume any responsibility for design beyond that of proposing adequate connections and details, and when required, components, members or assemblies standardized by the Fabricator, the Client shall state clearly his requirements in the invitation to tender or in the accompanying Tender Drawings and Tender Specifications. Even though proposed connections and design details may be prepared by the Fabricator's technical staff, the overall behaviour of the structure remains the responsibility of the design of the structure (see also Clause 5.6).*

- 1.4.1.2 With respect to Clause 3.3 **Revisions to Contract Documents**, the following additional provisions apply:

Unless agreed otherwise, the issuance of revised documents or changes indicated on drawing approvals are not to be construed as authorization from the Owner to release these revisions for construction. Any and all revisions to the contract shall be made in accordance with the provisions set out in the contract documents and will be based on the fabricator and/or erector's assessment of the impact of the proposed revisions on the contract price and schedule for completion of the work. The fabricator and/or erector shall review proposed revisions to the work in accordance with the contract documents and shall provide their assessment as to the impact of the revisions within the time period indicated in the contract documents.

- 1.4.1.3 Revise Clause 3.4, Discrepancies as follows:

Discrepancies. In case of discrepancies between contract documents, the provisions of Standard Construction Document – CCDC2 shall govern, unless agreed or instructed otherwise. In case of discrepancies between the structural documents and those of other trades, the documents for the trade responsible for deriving the required information shall govern.

- 1.4.1.4 Revise Clause 4.1.1 as follows:

At the time tenders are called, the steel fabricator shall receive a complete set of contract documents (including drawings and specifications) for the following disciplines: architectural, mechanical, electrical, structural and any additional specialty consultants engaged on the project. When appropriate, these documents shall include complete structural drawings, conforming to the requirements for design drawings of the governing technical standard. Structural steel specifications should include any special requirements controlling the fabrication and erection of the structural steel, surface preparation and coating, and should indicate the extent of non-destructive examination, if any, to be carried out.

Delete "1" and accompanying note at bottom of page 7-21 of CISC Code of Standard Practice for structural steel.

- 1.4.1.5 Revise Clause 4.2 as follows:

Architectural, Mechanical, Electrical and Additional Specialty Consultants Drawings. Architectural, mechanical, electrical and additional specialty consultants drawings may be used as a supplement to the structural drawings to define detail configurations and construction information.

- 1.4.1.6 Revise Clause 5.6 as follows:

Review of Fabrication and Erection Documents. Erection diagrams, connection design details, shop details and fieldwork details *shall be submitted for review by the Engineer of Record. The documents will be reviewed and returned in accordance with the provisions of the contract documents. The documents will be reviewed on a sampling basis for general conformity with the contract documents only. The Engineer of Record's review does not relieve the fabricator, erector, or their engineer(s) of any responsibility for same.*

1.5 QUALIFICATIONS

- 1.5.1 Fabricator, erector, and all subcontractors performing structural steel work shall be certified under the requirements of Division 1, or Division 2.1 of W47.1.

- 1.5.2 Design calculations shall be carried out by a qualified Professional Engineer licensed in the Province of Ontario, with a minimum of 5 years Canadian experience in the design of structural steel work, connections including design of weldments, or joist systems, as appropriate.

- 1.5.3 Engineers responsible for welding design, procedures and practice shall be certified in accordance with CSA W47.1, section 6.1.

- 1.5.4 Professional engineers responsible for the design of steel work, connections, joist systems and the like, shall be insured in accordance with section 74(1) of Regulation 941 of the Ontario Professional Engineers Act or shall be covered under the Contractor's General Liability Insurance Policy. Note: If the professional engineer is insured in accordance with Regulation 941 of the Ontario Professional Engineers Act, the alternative outlined in section 74(2) is not acceptable.

1.6 DESIGN REQUIREMENTS

- 1.6.1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 to resist loads shown or implied and allow for movements indicated.

- 1.6.2 Should the fabricator's engineer require additional information or clarification to aid in the design of their work, they shall request this information in a timely and appropriate manner.

- 1.6.3 Connections

- 1.6.3.1 Unless otherwise noted, the fabricator's engineer shall design and be solely responsible for all connections between all steel members including, but not limited to columns, beams, girders, trusses and braces, and between such members as spandrel angles and beams, hangers, stiffeners, etc., and their supporting members be they steel or concrete.
- 1.6.3.2 Unless otherwise noted, the fabricator's engineer shall also design and be responsible for specifying stiffeners, doubler plates and the like, required to maintain the local strength and stability of a member and where these stiffeners and doubler plates become an integral part of the connection or where they affect the connection of other steel framing members. Typical examples include, but are not limited to, cranked sections, moment connections between columns and beams, connections to hollow structural sections and the like. Where connections are exposed to view, the detailing of stiffeners, double plates and the like is subject to review by the Architect.
- 1.6.3.3 Design connections to safely withstand the combined primary effects of axial forces, shear, moment and torque and any secondary effects due to welding.
- 1.6.3.4 Shear connections:
 - 1.6.3.4.1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
- 1.6.3.5 Where no axial force is shown for beam to column connections, connect beams framing into column such that the combined capacities of the connection are able to resist a total horizontal force of 1% of the factored axial load in the column, in each direction.
- 1.6.3.6 Unless otherwise noted, the design of all beams and girders assumes that fastener holes through flanges will not exceed 15% of the gross flange area. If the area of holes exceeds 15%, the member size shall be altered or reinforced accordingly.
- 1.6.3.7 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada for non-standard connections.

1.7 SHOP DRAWINGS

- 1.7.1 Submit shop drawings including fabrication and erection documents and materials list to the Consultant for review.
- 1.7.2 The Professional engineer(s) responsible for the structural steel work, connections, and the like shall either:
 - 1.7.2.1 Seal and sign all shop drawings, or
 - 1.7.2.2 Submit a sealed and signed letter prior to commencement of shop drawing preparation stating that he has been retained by the steel fabricator to carry out the design of steel connections, joist systems and the like AND shall submit a second letter after shop drawing preparation is complete stating that the design of the steel work, for which he is responsible, has been completed in accordance with the contract documents and relevant building codes, standards and acts.

- 1.7.3 The structural drawings shall not be reproduced in whole or in part, for use as shop, erection or setting drawings.
- 1.7.4 Shop drawings shall be submitted for all structural steel work and shall be submitted in complete packages so that individual parts and the assembled unit can be reviewed together. This section and the applicable drawings used in the development of the shop drawings shall be clearly referenced on each shop drawing to facilitate review. Detail member marks shall be cross referenced on the erection drawings to facilitate a quick identification of the members.
- 1.7.5 When shop drawings are revised and resubmitted, all revisions to the drawings shall be clearly identified by means of “bubbles”, “clouds” or other obvious means.
- 1.7.6 Erection drawings: indicate details and information necessary for assembly and erection purposes including:
 - 1.7.6.1 Description of methods;
 - 1.7.6.2 Sequence of erection;
 - 1.7.6.3 Type of equipment used in erection;
 - 1.7.6.4 Temporary bracings;
 - 1.7.6.5 Dimensions tied into relevant grid lines wherever possible;
 - 1.7.6.6 Elevations of column bases;
 - 1.7.6.7 Member marks.
- 1.7.7 Shop Drawings
 - 1.7.7.1 Submit detailed shop drawings for all structural members.
 - 1.7.7.2 As a minimum, show the following:
 - 1.7.7.2.1 Layout;
 - 1.7.7.2.2 Member sizes;
 - 1.7.7.2.3 Member marks;
 - 1.7.7.2.4 Connection details;
 - 1.7.7.2.5 Bearing details;
 - 1.7.7.2.6 Splice locations and details;
 - 1.7.7.2.7 Truss details;
 - 1.7.7.2.8 Holes;
 - 1.7.7.2.9 Camber;
 - 1.7.7.2.10 Finishes;
 - 1.7.7.2.11 Grades of steel;
 - 1.7.7.2.12 Size, orientation, and type of bolts and bolt installation requirements;
 - 1.7.7.2.13 Shop and field welds;
 - 1.7.7.2.14 Elevation of column bases;
 - 1.7.7.2.15 All necessary dimensions and details for setting of anchor rods;
 - 1.7.7.2.16 Sliding expansion joint bearing pad details including materials, size and thickness of pads, setting out dimensions and load capacity.
 - 1.7.7.2.17 Architectural clearance lines and finishes where connections and the like may encroach with other work;

1.7.7.2.18 Any other information necessary for the assembly of the structure.

1.7.8 Field Work Details

- 1.7.8.1 Submit details for all field work in accordance with the requirements of Division 1.
- 1.7.8.2 The location of field work details shall be clearly identified or referenced on the erection drawings.
- 1.7.8.3 Prepare setting drawings showing dimensions and details for setting structural steel bearings, anchorages, assemblies and the like where they interface with other building components.
- 1.7.8.4 Co-ordinate structural steel shop and erection drawings with shop drawings of other interfacing work.
- 1.7.8.5 Submit all non-prequalified welding procedures, stamped as approved by the Canadian Welding Bureau and correlated to the appropriate shop and erection drawings.
- 1.7.8.6 Submit details of method proposed to achieve and verify the specified tension to bracing members within the specified tolerances.

1.8 DRAWINGS FOR INSPECTION AND TESTING COMPANY

- 1.8.1 Furnish the inspection and testing company with a copy of each shop, erection, and setting drawing bearing the Consultant's shop drawing stamp marked reviewed.

1.9 CALCULATIONS

- 1.9.1 Submit calculations bearing the seal and signature of a qualified Professional Engineer licensed in the Province of Ontario and such further proof as may be necessary to show that non-standard connections and steel joist systems and the like conform to the requirements set forth herein.

1.10 MILL TEST REPORTS

- 1.10.1 Submit to the Consultant copies of mill test reports covering chemical and physical properties of steel used in this work, including mill test reports for all structural bolts, a minimum of 4 weeks prior to commencing fabrication

1.11 SURVEYS

- 1.11.1 Preconstruction Survey: Where interface with existing construction occurs, the existing construction shall be surveyed, and such survey submitted before related shop drawings are prepared.
- 1.11.2 Work by Others: Examine all work prepared to receive work of this section and report any defects affecting installation to Consultant for correction. Commencement of work will be construed as complete acceptance of preparatory work by others. This section alone shall be responsible for checking of the dimensions and coordination of the structural steel work with other trades.
- 1.11.3 Submit surveys showing position of structural steel members. Submit survey results on any

given floor before concrete is placed on the floor.

1.11.4 As a minimum include the following:

- 1.11.4.1 Location of centreline of all columns with respect to grids at each floor level;
- 1.11.4.2 Elevation of tops of girders, joists, trusses, and beams at ends, midspan and at cantilevered ends, at all floors and roof, before and after placing of concrete.

1.12 AS BUILT DRAWINGS

- 1.12.1 Mark on a complete set of final reproducible drawings any changes, additions, or deletions that occur during construction as a result of the Contractor's work, change orders or for any other reason.
- 1.12.2 For all shop drawings marked "Reviewed as Noted" or "Revise and Resubmit", update and submit a record set of these drawings at the completion of the structural work. Ensure that these drawings reflect the changes and are coordinated with the final reproducible drawings noted above.

1.13 SAMPLES

- 1.13.1 Submit samples in accordance with Submittal Procedures.
- 1.13.2 Prepare sample of typical exposed structural connections in accordance with AISC Specifications of Architecturally exposed structural steel for approval of Consultant. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness, and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance, and material acceptable for entire project.

1.14 QUALITY ASSURANCE

- 1.14.1 Submit copies of mill test reports 4 weeks prior to fabrication of structural steel.
 - 1.14.1.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
 - 1.14.1.2 Provide mill test reports certified by metallurgists qualified to practice in Province of Ontario,
 - 1.14.1.3 Canada.
- 1.14.2 Provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

PART 2 – PRODUCTS

MATERIALS

- 2.1.1 Provide only new material manufactured in North American mills. New materials are to be in accordance with the Referenced Standards. Where sections identified are not available from North American mills or where the Contractor chooses to use sections produced by other mills, provide new materials of minimum strength and minimum quality noted. For sections that are not produced by North American mills, the Contractor shall submit written requests for review of the alternate mill to the Consultant before proceeding with material procurement. The Consultant reserves the right to require physical test data (in addition to the mill test reports) proving that the steel from the proposed mill meets the specification requirements. Provide such data for each 100 tonnes of material supplied.
- 2.1.2 Structural steel:
 - 2.1.2.1 Structural wide flange shapes (W) to conform to CAN/CSA-G40.20/G40.21 grade 350W or ASTM A992/A992M grade 50 (ksi), unless otherwise noted.
 - 2.1.2.2 Structural welded wide flange shapes (WWF) to conform to CAN/CSA-G40.20/G40.21 grade 350W, unless otherwise noted.
 - 2.1.2.3 Rolled angles and channels (L, C) to conform to CAN/CSA-G40.20/G40.21 grade 350W, unless otherwise noted.
 - 2.1.2.4 Steel plate, bars, and rods to conform to CAN/CSA-G40.20/G40.21, grade 300W, unless otherwise noted.
 - 2.1.2.5 Hollow structural sections (HSS) to conform to ASTM A500 GRADE C, unless otherwise noted.
 - 2.1.2.6 Seamless pipe: conform to ASTM A53.
- 2.1.3 Anchor rods: to ASTM F1554.
- 2.1.4 Bolts, nuts and washers: to ASTM A 325M and ASTM A 490/A 490M], where specified. Galvanized A325 bolts over 22mm (7/8") diameter shall have a dry lubricant on threads such as Johnson's Stick Wax #140 before installation].
- 2.1.5 Welding materials: to CSA W48 Series, CSA W59 and certified by Canadian Welding Bureau.
- 2.1.6 Shop paint primer:
 - 2.1.6.1 Ensure that the shop primer or paint is compatible with spray fireproofing and/or the topcoat paint system specified, where applicable
 - 2.1.6.2 Shop paint to CISC/CPMA 1
 - 2.1.6.3 Shop primer to CISC/CPMA 2.
- 2.1.7 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m².
- 2.1.8 Zinc-Rich Touch-up Paint: Galvafruid as supplied by W. R. Meadows Limited or approved

alternative.

2.2 FABRICATION

- 2.2.1 Fabricate structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136, and in accordance with reviewed shop drawings.
- 2.2.2 Prior to fabrication of structural steel, take field measurements where connections are to be made to existing work, Phase 1, open all areas to allow the installation of the new structural work, as well as the connection of new work to the existing work. Take any and all necessary field measurements. Modify installation methods and methods for connecting to suit site conditions found and to the approval of the consultant.
- 2.2.3 Splices, other than those shown, shall not be permitted in members without Consultant's approval. If approval is given to permit welded splices, they shall be non-destructively tested at no extra cost to the Owner.
- 2.2.4 Continuously seal members by continuous welds, where indicated. Grind smooth.
- 2.2.5 Provide holes in top and bottom flanges as required, to permit the attachment of other materials. Ensure cross sectional area of section is not reduced by more than 10% at any point on its length.
- 2.2.6 Unless noted otherwise on the drawings, provide a 10 mm (3/8") cap plate for all hollow built-up members. Cap plate is to be continuously seal welded to built-up member.
- 2.2.7 Seal all hollow built-up members exposed to weather with continuous seal welds, incorporating structural welds where shown or required.
- 2.2.8 Provide drain holes in closed sections to prevent water build-up during erection.
- 2.2.9 Where masonry walls are shown built into structural steel columns and beams, provide, and install masonry anchors on columns at 600 mm (24") on centres and anchors on beams at 1500mm (5'-0") on centres.
- 2.2.10 Thickness of baseplates 100 mm or greater is nominal and allows for a maximum reduction of 6 mm for milling to the requirements of CAN S16.
- 2.2.11 Cambers
 - 2.2.11.1 Provide the indicated camber to beams and girders in such a manner as to provide a uniform parabolic profile. Ensure that the method used to provide camber does not reduce the safe load carrying capacity or cause distortion of the members.
 - 2.2.11.2 Camber stated on the drawings is the required camber after erection.

2.2.12 Openings

- 2.2.12.1 Conform to the requirements shown for location, size, reinforcement and cutting of openings through structural steel.
- 2.2.12.2 No openings through structural steel members will be permitted without the Consultant's approval.

2.2.13 Bending Steel Sections

- 2.2.13.1 Bend sections to the geometry noted on the contract documents in such a manner as to provide a smooth uniform profile. Ensure that the method used to bend the steel sections does not reduce the safe load carrying capacity or cause distortion of the members.

2.2.14 Stiffeners

- 2.2.14.1 Provide welded stiffeners in all girders, columns, and beams at points of concentrated loads where required by S16, or where specifically shown on the drawings. Fitted stiffeners shall be ground to fit closely against bearing surfaces.

2.2.15 Galvanizing

- 2.2.15.1 All structural steel exposed to exterior conditions shall be galvanized.
- 2.2.15.2 Detail and fabricate steel such that it will not trap galvanizing material.
- 2.2.15.3 Detail so that welding of galvanized steel is not required.
- 2.2.15.4 Clean up all weld slab prior to galvanizing.
- 2.2.15.5 Upon completion of erection, touch up with zinc-rich primer at all locations where galvanizing is damaged.

2.3 SHOP PAINTING

- 2.3.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.

- 2.3.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC-SP-6.

- 2.3.3 Apply one coat of primer in shop to steel surfaces, except:

- 2.3.3.1 Surfaces to be encased in concrete.
- 2.3.3.2 Surfaces to receive field installed stud shear connections.
- 2.3.3.3 Surfaces and edges to be field welded.
- 2.3.3.4 Faying surfaces of friction-type connections.
- 2.3.3.5 Below grade surfaces in contact with soil.

- 2.3.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5°C.

2.3.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

2.3.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

2.3.7 Give the parts which are inaccessible after assembly two coats of primer coat paint, of different colors.

2.4 PROTECTION

2.4.1 Steel ST-1

2.4.1.1 This steel type applies to all structural steel concealed from view in the finished building and not exposed to weather or high humidity environments including:

2.4.1.2 No cleaning or painting is required for this steel type.

2.4.2 Steel ST-2

2.4.2.1 This steel type applies to all structural steel concealed from view in the finished building and not exposed to weather or high humidity environments including:

2.4.2.2 Clean structural steel in accordance with SSPC SP2, Hand Tool Cleaning.

2.4.2.3 Within one hour following cleaning, apply one coat of paint conforming to CISC/CPMA 1-73a.

2.4.3 Steel ST-3

2.4.3.1 This steel type applies to all structural steel which is to be encased in spray applied fire proofing or concrete including:

2.4.3.2 Clean structural steel in accordance with SSPC SP2, Hand Tool Cleaning to remove loose mill scale, rust, and other detrimental foreign matter.

2.4.3.3 No painting is required for this steel type.

2.4.4 Steel ST-4

2.4.4.1 This steel type applies to all interior structural steel which is exposed to view in the finished building, whether it is to receive a finish coat of paint, but not designated as "architectural steel" including:

2.4.4.2 Clean structural steel in accordance with SSPC SP7, Brush off Blast Cleaning.

2.4.4.3 Within one hour following cleaning, apply one coat of shop primer conforming to CISC/CPMA 2-75.

2.4.5 Steel ST-5

2.4.5.1 This steel type applies to all interior structural steel which is exposed to view in the finished building, whether it is to receive a finish coat of paint, and designated as "architectural steel" including:

2.4.5.2 Clean structural steel in accordance with SSPC SP6, Commercial Blast Cleaning.

2.4.5.3 Within one hour following cleaning, apply one coat of shop primer conforming to CISC/CPMA 2-75.

2.4.6 Steel ST-6

2.4.6.1 This steel type applies to all exterior structural steel which is exposed to view in the

- finished building, and designated as “architectural steel” including:
- 2.4.6.2 Clean structural steel in accordance with SSPC SP6, Commercial Blast Cleaning.
 - 2.4.6.3 Within one hour following cleaning, apply a primer coat of Reinforced Inorganic Zinc to a dry film thickness of 50-100 microns.
 - 2.4.6.4 Following drying of the primer, apply a mid-coat of High Build Epoxy Coating to a dry film thickness of 100 to 200 microns.
 - 2.4.6.5 A final coat of Aliphatic Urethane is to be done in the field by the paint contractor. Ensure compatibility of primer and mid-coat with topcoat.
- 2.4.7 Steel ST-7
- 2.4.7.1 This steel type applies to all structural steel which is exposed to weather or moisture in the finished building but is not designated as “architectural” such as steel within the cavity of cavity walls, not protected by a vapour barrier including:
 - *Lintels*
 - *Shelf angles*
 - *Plates, hangers, braces, etc. outside the building envelope.*
 - *Exterior beams*
 - *Exterior columns*
 - *Connection materials and inserts associated with the above*
 - 2.4.7.2 Fully galvanize, in accordance with CSA Standard G164 to a minimum zinc coating of 600 g/m².
- 2.4.8 Steel ST-8
- 2.4.8.1 This steel type applies to all exterior structural steel which is exposed to view in the finished building, designated as “architectural steel” and intended to receive a galvanized coating including:
 - 2.4.8.2 Clean structural steel in accordance with SSPC SP6, Commercial Blast Cleaning.
 - 2.4.8.3 Fully galvanize, in accordance with CSA Standard G164 to a minimum zinc coating of 600 g/m².
- 2.4.9 Except for steel which is to be left uncoated, upon completion of erection, apply primer to welds, bolts and at locations where original primer is damaged. Primer to match the primer of the base steel. For galvanized steel, touch up with zinc rich coating.
- 2.4.10 Protect all steel from damage during storage, transportation and erection.
- 2.4.11 For steel designated as “architectural” and areas where the coating has been damaged and “feather” into the surrounding field prior to touching up.
- 2.4.12 Protect weep holes at base of closed column sections that have base plates, but no cap plates.
- 2.4.13 During cold weather, protect members from damage due to water freezing in confined areas.
- 2.4.14 Provide drain holes in closed sections to prevent water build-up during erection.

PART 3 - EXECUTION

3.1 GENERAL

- 3.1.1 Structural steel work: in accordance with CAN/CSA-S16.
- 3.1.2 Welding: in accordance with CSA W59.
- 3.1.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 CONNECTION TO EXISTING WORK

- 3.2.1 Before proceeding with the work verify dimensions and condition of existing work, report discrepancies and potential problem areas to Consultant for direction before commencing fabrication.
- 3.2.2 Make site measurements as required to verify dimensions of existing work before proceeding with the work. The Contractor shall be responsible for extra costs incurred due to proceeding without verifying site dimensions.
- 3.2.3 Adequately shore existing structure to ensure that no movements or damage occurs until the permanent structure shown is installed.

3.3 MARKING

- 3.3.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- 3.3.2 Match marking: shop mark for fit and match.

3.4 ERECTION

- 3.4.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.
- 3.4.2 Bracing members and anchor rods shown are for the finished structure and may not be adequate to resist forces present during construction.
- 3.4.3 Maintain erection bracing until completion of entire structure including floor and roof decks and slabs, masonry walls and/or other elements which are part of the wind resisting system.
- 3.4.4 Carry out erection operations, including installation of any temporary guying and shoring required, ensuring that the existing structure or members already erected are not loaded in excess of their safe load carrying capacity.

- 3.4.5 Erection bracing must be adequate to restrict lateral drift per storey to 1/500 under maximum design wind load during construction.
- 3.4.6 During erection, forces or reactions in the steel frame members and their connections might exceed those on which the design is based. Determine the magnitude of such erection forces and reactions and take such measures as are necessary to ensure that the safety and stability of the structure is maintained until the entire structure, including floor and roof slabs is complete.
- 3.4.7 Nuts on bolts shall be prevented from working loose by use of lock washers, lock nuts, jam nuts, thread burring or other approved methods.
- 3.4.8 Splices, other than those shown, shall not be permitted in members without the Consultant's approval. If approval is given to permit welded splices, they shall be non-destructively tested at no extra cost to the Owner.
- 3.4.9 Field cutting or altering structural members: to approval of Consultant.
- 3.4.10 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- 3.4.11 Continuously seal members by continuous welds where indicated. Grind smooth.
- 3.4.12 Bracing
 - 3.4.12.1 Install permanent bracing members by applying a nominal tension such that they will be initially under tension in the completed building.
 - 3.4.12.2 When the structural steel is plumb and level, erect the frame bracing so that, at the time of installation, bracing members are under a stress of 35 MPa (5 ksi) plus or minus 6 MPa (0.9 ksi). Tensioning by drifting will not be permitted.
- 3.4.13 Bearing on Concrete or Masonry
 - 3.4.13.1 Set steel baseplates and bearing assemblies true and level at the proper elevation so that upon grouting, they will have full bearing.
 - 3.4.13.2 Unless a specific method is shown, steel shimming may be used to support bases prior to grouting. Subsequent to grouting, loosen the levelling devices so that all load passes through the entire area of the bases. Remove the steel shims so that the resulting voids can be fully grouted.
- 3.4.14 Lintels
 - 3.4.14.1 Unless a reinforced block or concrete lintel is noted, provide loose steel lintels, to the details shown, over openings and recesses including those for mechanical or electrical services in masonry walls or partitions.
- 3.4.15 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC-SP-6 except as

specified otherwise. Apply in accordance with CAN/CGSB 85.10.

3.4.16 Exposed Steel

3.4.16.1 General

- i) The following applies to all steel which is left exposed to view in the completed building that is within 3 m of a floor.

3.4.16.2 Fabrication

- i) All exposed edges of plates shall be universal mill or guided flame cut. Exposed cut edges of beam flanges shall be guided flame cut. Cut surfaces shall be equal in smoothness to a mill finish.
- ii) Where bolted connections are shown, ensure that connections are neatly arranged with tight joints.
- iii) Remove mill marks, identification, and surface imperfections by grinding smooth and flush with adjacent surfaces.

3.4.16.3 Welding

- i) Continuously weld joints exposed to view.
- ii) Grind smooth all welds that are within the reach of the public.

3.4.16.4 Galvanizing

- i) Ensure that the galvanizing process leaves a smooth and uniform surface.
- ii) During galvanizing, use procedures to ensure that members do not deform excessively.

3.4.16.5 Do not use marking paint, crayons or other marking materials on exposed surfaces.

3.4.17 Architecturally Exposed Structural Steel (AESS)

3.4.17.1 General

- i) Architecturally exposed steel (AESS) is all steel which is left exposed to view in the completed building.
- ii) This section applies to any structural steel members noted on the contract drawings as AESS. All AESS members must also be identified by their Category.
- iii) This section pertains to the appearance, surface preparation and integration of AESS. Refer to the preceding sections for all technical requirements.

3.4.17.2 Submittals

- i) Shop Drawings detailing fabrication of AESS components.
 - a. Provide erection drawings clearly indicating which members are considered as AESS members and their Category.
 - b. Include details that clearly identify all the requirements listed in subsections 3.4.17.5 "Fabrication" and "Erection" of this section. Provide connections for AESS consistent with concepts, if shown on the Structural Design Documents.
 - c. Indicate welds by standard CWB symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Identify grinding,

finish and profile of welds as defined herein.

- d. Indicate type, finish of bolts. Indicate which side of the connection bolt heads should be placed.
- e. Indicate any special tolerances and erection requirements.

3.4.17.3 Quality Assurance

- i) Fabricator Qualifications: In addition to those qualifications listed in other subsections of Division 5 "Structural Steel" Section, engage a firm competent in fabricating AESS similar to that indicated for this Project with sufficient production capacity to fabricate the AESS elements.
- ii) Erector Qualifications: In addition to those qualifications listed in other Subsections of Division 5 "Structural Steel" Section, engage a competent Erector who has completed comparable AESS work.
- iii) Comply with applicable provisions of the following specifications and documents.
 - a. CISC Code of Standard Practice, latest edition
- iv) Visual Samples when specified may include any of the following:
 - a. 3-D Rendering of specified element;
 - b. Physical sample of surface preparation and welds;
 - c. First off inspection: First element fabricated for use in finished structure subject to alterations for subsequent pieces;
 - d. Mockups: As specified in Structural Design Document. Mockups are either scaled or full-scale. Mockups are to demonstrate aesthetic effects as well as qualities of materials and execution
 - Mockups may have finished surface (including surface preparation and paint system);
 - Architects approval of mockups is required before starting fabrication of final units;
 - Mockups are retained until project is completed;
 - Approval full-scale mockups may become part of the completed work.

3.4.17.4 Delivery, Storage, and Handling

- i) Ensure that all items are properly prepared, handled and/or packaged for storage and shipping to prevent damage to product.
- ii) Erect finished pieces using softened slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the architect.

3.4.17.5 Fabrication

- i) For the special fabrication characteristics, see Table 1 – AESS Category Matrix.
- ii) Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect.
- iii) Fabricate AESS with surface quality consistent with AESS Category and visual samples, if applicable.
- iv) Perform fabrication with special care and necessary straightening to maintain the

condition of the material as described herein.

- v) Clearly show the required fabrication tolerances on shop drawings. Show the required tolerances for setting embedded items on erection drawings.
- vi) Make copes, mitres and butt cuts in surfaces exposed to view within the closest possible tolerances consistent with structural shop equipment and practice. Plan erection sequence so that these tolerances can be maintained.
- vii) Where the fit-up of adjacent members is such that permissible tolerances specified above may result in any unsightly joint, take special care to obtain a visual plane on the exposed surfaces. If both surfaces are exposed, detail joints in such a way as to minimize these unavoidable variations.
- viii) All exposed edges of plates shall be universal mill or guided flame cut. Exposed cut edges of beam flanges shall be guided flame cut. Cut surfaces shall be equal in smoothness to a mill finish.
- ix) Where bolted connections are shown, ensure that connections are neatly arranged with tight joints.

3.4.17.6 Shop Connections

- i) Bolted Connections: Make in accordance with Section 05 12 23. Provide bolt type and finish as specified and place bolt heads as indicated on the approved shop drawings.
- ii) Welded Connections: Comply with CSA W59-03 and Section 05 12 23. Appearance and quality of welds shall be consistent with the category and visual samples if applicable. Assemble and weld built-up sections by methods that will maintain alignment of members to the tolerance of this subsection.

3.4.17.7 Field Connections

- i) Bolted Connections: Make in accordance with this section. Provide bolt type and finish as specified and place bolt heads as indicated on the approved shop drawings.
- ii) Welded Connections: Comply with CSA W59-03 and Section 05 12 23. Appearance and quality of welds shall be consistent with the Category and visual samples if applicable. Assemble and weld built-up sections by methods that will maintain alignment of members to the tolerance of this Subsection.
 - a. Assemble and weld built-up sections by methods that will maintain alignment of axes. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.

3.4.17.8 Welding

- i) Form and weld all joints exposed to weather to exclude water using "seal" welds.
- ii) Exposed welds, except filler welds and concealed welds, where clearances or fit of other items may so necessitate, shall be ground smooth and otherwise finished flush and even with adjacent surfaces. Grinding is not required for well-formed fillet welds.
- iii) Grind bevel welds smooth, forming neat, well-made corners.

3.4.17.9 Erection

- i) Set AESS accurately in locations and to elevations indicated, and according to CSA S16.

- ii) In addition to the special care used to handle and erect AESS, employ the proper erection techniques to meet the requirements of the specified AESS Category;
 - a. AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per CSA S16-01, unless noted otherwise;
 - b. Bolt Head Placement: All bolt heads shall be placed as indicated on the structural design. Where not noted, the bolt heads in each connection shall be placed to one side.
 - c. Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up and welding in the field shall be removed from the structure. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth where specified;
 - d. Filling of connection access holes: Filling shall be executed with proper procedures to match architectural profile, where specified;
 - e. Field Welding: Weld profile, quality, and finish shall be consistent with Category and visual samples, if applicable, approved prior to fabrication.

3.4.17.10 Painting

- i) After inspection and before leaving the shop, clean all steel work exposed in the finished work by grit-blasting of all mill scale, rust, weld slag or flux deposit, oil, dirt, and other foreign matter, to a "Commercial Bright" finish.
- ii) Remove mill marks, identification, and surface imperfections by grinding smooth and flush with adjacent surfaces.
- iii) Immediately after cleaning, apply a shop coat paint to all steel work, except as follows, to dry surfaces by spray, to a minimum dry film thickness of 2 mils. Allow to dry in dust free areas.
- iv) Do not paint metal items that are to be encased in concrete and surfaces that are to have concrete placed against them.
- v) Apply 1 additional shop coat of paint as specified to parts of shop coated steel surfaces that will be inaccessible after erection.
- vi) Clean surfaces within 50 mm of any field weld location of materials that would prevent proper welding or produce objectionable fumes while welding is being done.
- vii) After erection and immediately after grinding welds, etc. touch up and paint with 1 coat of same paint as shop coat, all damaged and abraded spots, including any unpainted areas. Completely remove anti-spatter coating, if used before field touch-up painting
- viii) After erection and immediately after grinding welds, etc. touch up and paint with 1 coat of same paint as shop coat, all damaged and abraded spots, including any unpainted areas. Completely remove anti-spatter coating, if used before field touch-up painting

3.4.17.11 Galvanizing

- i) Ensure that the galvanizing process leaves a smooth and uniform surface.
- ii) During galvanizing, use procedures to ensure that members do not deform excessively.

3.4.17.12 Rusted Steel

- i) Where indicated, treat exposed faces of the structural steel to obtain a rusty brown appearance.
- ii) The appearance shall conform to the colour and texture of samples available for inspection at the office of the Consultant. In addition to these samples, colour photographs may be obtained on request from the Consultant.
- iii) Shot blast the exposed faces of the steel to be of rusty appearance to remove the major mill scale but leaving about 10% of the mill scale on the surfaces.
- iv) In order to accelerate the rusting process, the following method is suggested:
 - a. Spray surfaces with saltwater as many times as required after fabrication;
 - b. Thoroughly wash down the salt before application of the final protective coating specified.
- v) No erection markings are permitted on the exposed faces. Use tags for markings.
- vi) Take care to avoid soiling of the exposed faces with footprints, tire marks, oil patches, etc. which when wiped off may leave patches of a different colour on the exposed surfaces.
- vii) Provide suitable protection to all work adjacent to or below steel framing with rusty surfaces to prevent staining of other exposed construction. Make good any stained surfaces to the Consultant's approval.

3.4.17.13 Architectural Review

- i) The Architect shall review the AESS steel in place and determine acceptability based on the Category and visual samples (if applicable). The Fabricator/Erector will advise the consultant the schedule of the AESS work.

3.4.17.14 Adjusting and Cleaning

- i) Provide suitable protection to all work adjacent to or below steel framing with rusty surfaces to prevent staining of other exposed construction. Make good any stained surfaces to the Consultant's approval.
- ii) Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.4.17.15 Protection

- i) Prevent staining of architecturally exposed steel by concrete, mortar, plaster, oils, paints, or other foreign substances.
- ii) Do not use marking paint, crayons, or other marking materials on exposed surfaces.

Table 1 – AEES Category Matrix

<i>Category</i>	<i>AEES C Custom Elements</i>	<i>AEES 4 Showcase Elements</i>	<i>AEES 3 Feature Elements</i> Viewed at a Distance ≤ 6 m	<i>AEES 2 Feature Elements</i> Viewed at a Distance > 6 m	<i>AEES 1 Basic Elements</i>	<i>SSS Standard Structural Steel</i> CSA S16
Characteristics						
1.1 Surface Preparation to SSPC-SP 6		X	X	X	X	
1.2 Sharp Edges ground smooth		X	X	X	X	
1.3 Continuous weld appearance		X	X	X	X	
1.4 Standard Structural bolts		X	X	X	X	
1.5 Weld spatters removed		X	X	X	X	
2.1 Visual Samples		*Optional	*Optional	*Optional		
2.2 One-half standard fabrication tolerances		X	X	X		
2.3 Fabrication marks not apparent		X	X	X		
2.4 Welds uniform and smooth		X	X	X		
3.1 Mill marks removed		X	X			
3.2 Butt and plug welds ground smooth and filled		X	X			
3.3 HSS weld seam oriented for reduced visibility		X	X			
3.4 Cross sectional abutting surface aligned		X	X			
3.5 Joint gap tolerances minimized		X	X			
3.6 All welded connections		*Optional	*Optional			
4.1 HSS seam not apparent		X				
4.2 Welds contoured		X				
4.3 Surfaces filled and sanded		X				
4.4 Weld show-through minimized		X				
C.1						
C.2						
C.3						
C.4						
C.5						

Notes

- 1.1** Prior to blast cleaning, any deposits of grease or oil are to be removed by solvent cleaning, SSPC-SP 1.
- 1.2** Rough surfaces are to be deburred and ground smooth. Sharp edges resulting from flame cutting, grinding and especially shearing are to be softened.
- 1.3** Intermittent welds are made continuous, either with additional welding, caulking or body filler. For corrosive environments, all joints should be seal welded. Seams of hollow structural sections shall be acceptable as produced.
- 1.4** All bolt heads in connections shall be on the same side, as specified, and consistent from one connection to another.
- 1.5** Weld spatter, slivers, surface discontinuities are to be removed. Weld projection up to 2 mm is acceptable for butt and plug welded joints.
- 2.1** Visual samples are either a 3-D rendering, a physical sample, a first off inspection, a scaled mock-up or a full-scale mock-up, as specified in Contract Documents.
- 2.2** These tolerances are required to be one-half of those of standard structural steel as specified in CSA S16.
- 2.3** Members marked with specific numbers during the fabrication and erection processes are not to be visible.
- 3.1** All mill marks are not to be visible in the finished product.
- 3.2** Caulking or body filler is acceptable.
- 3.3** Seams shall be oriented away from view or as indicated in the Contract Documents.
- 3.4** The matching of abutting cross-sections shall be required.
- 3.5** This characteristic is similar to 2.2 above. A clear distance between abutting members of 3 mm is required.
- 3.6** Hidden bolts may be considered.
- 4.1** HSS seams shall be treated so they are not apparent.
- 4.2** In addition to a contoured and blended appearance, welded transitions between members are also required to be contoured and blended.
- 4.3** The steel surface imperfections should be filled and sanded.
- 4.4** The backface of the welded element caused by the welding process can be minimized by hand grinding the backside of the weld. The degree of weld-through is a function of weld size and material.

PART 4 – QUALITY CONTROL

4.1 GENERAL

- 4.1.1 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.
- 4.1.2 The Consultant's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility.
- 4.1.3 Visual inspection: As a minimum, carry out visual inspection of all shop and field welds in accordance with CSA W59.
- 4.1.4 Test shear studs in accordance with CSA W59.

4.2 TESTING

4.2.1 Non-Destructive Testing

- 4.2.1.1 Non-destructive testing to be carried out by radiography, magnetic particle, or ultra-sonic methods, whichever is more appropriate.
- 4.2.1.2 In addition to visual inspection, the Contractor is to include the following requirements for non-destructive testing:
- 4.2.1.3 Any deficient welds identified by means of NDT, shall be repaired at the Contractor's expense.
- 4.2.1.4 Welds found deficient in dimensions, but not in quality may be enlarged by additional welding. Any weld found deficient in quality shall be removed by chipping or gouging and the weld shall be remade.
- 4.2.1.5 Include for full NDT of all shop welded splices.
- 4.2.1.6 Include for an additional 20% random NDT of remaining shop welded connections.

4.2.2 Additional Testing for Steel Produced by "Other Mills".

- 4.2.2.1 Physical samples of the finished structural steel material shall be taken at the Consultant's discretion for verification or determination of either the mechanical properties and or the chemical composition. All physical samples tested shall meet the requirements set out in CAN/CSA G40.20 and G40.21.

4.3 NOTIFICATION

- 4.3.1 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review work previously completed. Failure to meet this requirement may be cause

for the Consultant to classify the work as defective.

4.4 INSPECTION AND TESTING

- 4.4.1 The Owner will appoint the Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Company shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct.
- 4.4.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Consultant.
- 4.4.3 Submit copies of all test and inspection reports to the Consultant within one (1) week of completion of inspection.
- 4.4.4 When defects are revealed, the Consultant may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.
- 4.4.5 Inspection and testing may include the non-destructive testing of full butt welds and of headed studs on connections to be cast into concrete.

4.5 DEFECTIVE MATERIALS AND WORK

- 4.5.1 Where evidence exists, that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength made and the like in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- 4.5.2 All testing shall be conducted in accordance with the requirements of the Ontario Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.
- 4.5.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 05 12 23

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for the miscellaneous and metal fabrication work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- .2 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).
- .3 ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .4 ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- .5 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.
- .6 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .7 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .8 ASTM A563M, Specification for Carbon and Alloy Steel Nuts [Metric].
- .9 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .10 ASTM F436, Specification for Hardened Steel Washers.
- .11 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.
- .12 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.
- .13 CAN/CSA S16.1-M, Limit States Design of Steel Structures.
- .14 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.
- .15 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .16 CSA W48, Filler Metal and Allied Materials for Metal Arc Welding.
- .17 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

- .18 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.
- .19 CAN/CGSB 1.40-M, Primer, Structural Steel, Oil Alkyd Type
- .20 CGSB 85-GP-16M, Painting Galvanized Steel.
- .21 NAAMM, The National Association of Architectural Metal Manufacturers.
- .22 Steel Structures Painting Council (SSPC), Steel Structures Painting Manual, Vol. 2.

1.3 **DESIGN REQUIREMENTS**

- .1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.4 **SUBMITTALS**

- .1 Shop drawings:
 - .1 Submit shop drawings for fabrication and erection of miscellaneous and metal items in accordance with Section 01 33 00 indicating:
 - .1 Materials, core thicknesses, class of finish (AMP 555), connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .2 Ensure shop drawings are of one uniform size and based on field measurements.
 - .3 Information in the shop drawings should also include material standards, design criteria, (i.e. depth of members, deflection limits etc.) and design loads to be used for the design.

1.5 **QUALITY ASSURANCE**

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
 - .1 Design: Interior and exterior steel handrails, guards and railings; Cane guard; Lintels; Masonry lateral support angles; Shelf angles; Elevator pit ladder and hoist beam; Auto Door Operator pedestals; HVAC outdoor units screen/fence and gate; Bollards (protection posts); columns; Support framing for doors; Support framing for interior walls and glazed screens; Support framing for millwork counters, and; metal fabrication items that are required to resist live, dead, lateral, wind, or seismic loads.
 - .2 Review, stamp, date and sign shop drawings.
 - .3 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .4 Review mill test reports, welded connections, member sizes and thicknesses, screwed and bolted connections, erection tolerances, and general inspection of field cutting, and alterations required by other trades.

- .5 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of the Work is in accordance with Contract documents and reviewed shop drawings.
- .6 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .2 Workmanship: Fabricate work of this Section to meet the required class of workmanship indicated below in accordance with AMP 555, Section 8.
 - .1 Class 1: for use on direct exposed to view fabricated items:
 - .1 Exposed surfaces are finished smooth with pits, mill marks, nicks, burrs, sharp edges, and scratches filled or ground off. Defects should not show when painted, polished, or finished.
 - .2 Welds should be concealed where possible. Exposed welds are ground to small radius with uniform sized cove unless otherwise noted.
 - .3 Distortions should not be visible to the eye.
 - .4 Exposed joints are fitted to a hairline finish.
- .3 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.
- .4 Perform stainless steel work in accordance with NAAMM, Code of Standard Practice for the Metal Industry, Workmanship, Class 1.

2 Products

2.1 MATERIALS

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, primers and paints are to have low VOC content limits.
 - .2 Unless detailed or specified herein, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
 - .3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.
 - .4 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.

- .2 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W. Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.
- .3 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.
- .4 Bollards (protection posts): ASTM A53/A53-M, Schedule 40 standard weight steel pipe in quantity and sizes shown.
- .5 Welding materials: CSA W48 and CSA W59-M.
- .6 Fasteners: Conforming to ASTM A307, Grade A, in areas not exposed to view, use unfinished bolts with hexagon heads and nuts. In areas exposed to view, use bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts Z275 zinc coated in accordance with ASTM A653/A653M. Supply bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
- .7 Primer paint: CPMA 1.73a.
- .8 Galvanized primer paint: Inorganic zinc rich primer. For use on galvanized fabrications where touch up is to remain unpainted in finished work; Carbozinc 11WB by Carboline Company, Catha-Coat 305 by Devoe Coatings or Zinc Clad XI by Sherwin Williams.
- .9 Drilled inserts: Mega by ITW Construction Products or HSL by Hilti Inc. heavy-duty anchors, sizes as shown.

2.2 FABRICATION

- .1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to the Consultant.
- .2 Fit and assemble work in shop where possible. Execute work in accordance with details and reviewed shop drawings.
- .3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use screws for interior metal work. Use welded connections for exterior metal work unless otherwise found acceptable by the Consultant.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.
- .5 Execute shop welding to requirements specified.

- .6 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Consultant's acceptance.
- .7 Assemble members without twists or open joints.
- .8 Correctly size holes for connecting work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.
- .9 Draw mechanical joints to hairline tightness and seal countersunk screw and access holes for locking screws with metal filler where these occur on exposed surfaces.

2.3 FABRICATED ITEMS

- .1 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.
- .2 Where work is required to be built into work of other Sections supply such members to respective Sections.
- .3 Provide metal fabrication items indicated below and items not indicated to be supplied under other Sections. The following items includes miscellaneous and metal fabrication including but not limited to the items listed below.
- .4 Handrails, guardrails, and posts:
 - .1 Design railings to withstand minimum horizontal and vertical loads as required to meet requirements of CSA A500 and authorities having jurisdiction. In no instance shall load design of railings be less than 3.0 kN/m horizontally and 1.5 kN/m vertically.
 - .2 Close open ends of steel handrails with 1.9 mm thick closure neatly welded. Fabricate railings, handrails, and guardrails as shown on drawings.
 - .3 Handrail bracket: Fabricate as shown. After fabrication, galvanized bracket in accordance with ASTM A123.
 - .4 **Galvanized steel for all exterior locations.**
 - ~~.5 Wood handrail: Coordinate with Section 06 20 00 as required for sizing and installation of brackets for use in conjunction with wood handrail.~~
- .5 Lintels: Fabricated from CAN/CSA-G40.20/G40.21-M, Grade 350W, size and location as shown, width to be not less than 25 mm less than width of wall and extend 200 mm beyond opening at each end. Unless otherwise shown, fabricate lintels in block walls of steel sections.
- 6. Masonry lateral support angles:
 - .1 Supply only, to Section 04 20 00 for installation, all horizontal lateral support anchors at top of non-load-bearing masonry walls.
 - .2 Refer to Structural Drawings for size and spacing of required support anchors. Provide drilled holes as required for anchorage.
 - .3 Galvanized for all exterior wall and unheated and high humidity locations.
- 7. Shelf angles: Of size indicated on Drawings and as specified in structural steel specifications, with adjustable inserts for vertical adjustment and slotted holes for horizontal; galvanized **steel**.

8. Steel ladders:
 - .1 Fabricate complete with steel stiffeners, rungs, angle rails, bent plate straps or angle brackets as shown.
 - .2 Provide safety cages around ladders where indicated on Drawings, in accordance with Ministry of Labour requirements.
9. Bollards (protection posts):
 - .1 Provide bollards as indicated on drawings, complete with bolt-down plates and insert sleeves as shown. Posts to be 150 mm diameter with a wall thickness of 8 mm. Fill posts with 20 Mpa concrete and round top. Project pipes 1200 mm above the finished floor level, unless otherwise indicated. Finish prime coat.
 - .2 Weld on 300 x 300 x 12 mm thick steel plate to pipe bottom. Bolt to concrete slab with anchor bolts.
 - .3 Finish: Provide paint finish in accordance with Section 09 91 00, colour to be selected by Consultant.
10. Millwork counter supports:
 - .1 Provide triangular supports for millwork counters. Construct supports of 38 mm x 38 mm x 6 mm steel angles. Where indicated, conceal supports within cavity of drywall partition.
 - .2 Provide all drill holes required for concealed anchorage of counters and for anchoring to building structure.
11. Miscellaneous steel brackets, supports and angles:
 - .1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.
 - .2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.
 - .3 Scope, sizing and installation of metal fabrications required for mechanical work to be coordinated with work of that Division.
12. Principal entrance canopy: Of size indicated on Drawings and as specified in structural steel specifications; galvanized steel.
13. Refer to section 09 97 13 for Exterior Steel Coatings.

2.4 ANCHORS AND FASTENING

- .1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.
- .2 Use self drilling expansion type concrete anchors for attaching to masonry and concrete
- .3 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

2.5 WELDING

- .1 Perform welding by electric arc process.
- .2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
 - .1 CSA W48 - for Electrodes. If rods are used, only coated rods are allowed.
 - .2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.
 - .3 CAN/CSA W117.2-M - for safety.
- .3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish paint.
- .4 Test welds for conformance and remove work not meeting specified standards and replace to Consultant's acceptance.

2.6 SHOP PAINTING

- .1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.
- .2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.
- .3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.
- .4 Clean but do not paint surfaces being welded in field.
- .5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.
- .6 Do not prime steel to be fireproofed or to receive intumescent paint coating.
- .7 Do not prime machine finished surfaces, but apply an effective anti-rust compound.
- .8 Take precautions to avoid damage to adjacent surfaces.

2.7 HOT DIP GALVANIZING

- .1 After fabrication, hot dip galvanize specific miscellaneous steel items as indicated. After galvanizing, plug relief vents air tight with appropriate aluminum plugs as suitable and required for intended metal fabricated item. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.

- .2 Hot-dip galvanize members in accordance with requirements of the following ASTM, with minimum coating weights or thicknesses as follows:
 - .1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/etre of actual surface, for 4.8 mm and less thickness members 600 g/m² for 6 mm and heavier members 640 g/m².
 - .2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153, Table 1 for the various classes of materials used in the Work.

3 Execution

3.1 **EXAMINATION**

- .1 Examine previously installed Work, upon which this Section depends, verify dimensions and condition of existing Work, and coordinate repairs, alterations, and rectification if necessary. Commencement of work of this Section is deemed to signify acceptance of existing, prior conditions.
- 2 Obtain Consultant's written approval prior to field cutting or altering of structural members.

3.2 **ERECTION**

- .1 Install metal fabrications in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Fit joints and intersecting members accurately. Make work in true planes with adequate fastenings. Build and erect work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.
- .3 Perform drilling of concrete and steel as required to fasten work of this Section.
- .4 Erect rails and handrails in true vertical and horizontal planes, rigid, and free from whip.
- .5 Continuously weld connections for railings, and anchor directly to steel stringers.

3.3 **TOUCH UPS**

- .1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

END OF SECTION

PART 1. GENERAL

1.1. DEFINITIONS

- 1.1.1. Environmental Product Declaration (EPD): Third-party verified documentation with supporting Product Category Rule (PCR) and life-cycle assessment (LCA) information, including at least a cradle-to-gate scope. Prepared in accordance with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930.
- 1.1.2. Industry-wide (generic) EPD with third-party certification (Type III), including external verification where the manufacturer is explicitly recognized as the participant by the program operator.
- 1.1.3. Product-specific Type III EPD Products with third-party certification (Type III), including external verification where the manufacturer is explicitly recognized as the participant by the program operator.

1.2. REFERENCE STANDARDS

- 1.2.1. Conform to editions referenced by the authority having jurisdiction (AHJ); where not specified, use the latest edition in effect at the time of tender.
- 1.2.2. The American Society of Mechanical Engineers (ASME):
 - 1.2.2.1. ASME B18.6.17 Wood Screws (Inch Series)
- 1.2.3. ASTM International (ASTM):
 - 1.2.3.1. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
 - 1.2.3.2. 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
 - 1.2.3.3. ASTM D7612, Standard Practice for Categorizing Wood and Wood-Based Products According to their Fiber Sources
 - 1.2.3.4. ASTM F1482, Standard Practice for Installation and Preparation of Panel Type underlayments to Receive Resilient Flooring
 - 1.2.3.5. ASTM F1667, Standard Specification for Driven Fasteners: Nails, Spikes and Staples
- 1.2.4. CSA Group (CSA):
 - 1.2.4.1. CSA O89, Engineered Design in Wood
 - 1.2.4.2. CSA O112.9, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)

1.2.4.3. CSA O121, Douglas Fir Plywood

1.2.4.4. CSA O141, Softwood Lumber

1.2.4.5. CSA O325, Construction Sheathing

1.2.4.6. CAN/CSA-Z809, Sustainable Forest Management

1.2.5. Canadian Wood Council:

1.2.5.1. Wood Design Manual 2010 edition

1.2.5.2. Engineering Guide for Wood Frame Construction 2014

1.2.6. National Lumber Grades Authority (NLGA):

1.2.6.1. Standard Grading Rules for Canadian Lumber 2017

1.2.6.2. NLGA SPS-2, Machine Graded Lumber

1.2.7. ULC Standards/UL Canada (ULC):

1.2.7.1. CAN/ULC-S101, Standard Methods for Fire Endurance Tests of Building Construction and Materials

1.2.7.2. CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.3. ACTION AND INFORMATIONAL SUBMITTALS

1.3.1. Submit in accordance with Section [01 33 00 - Submittal Procedures].

1.3.2. Action Submittals (to be submitted before starting any work of this Section):

1.3.2.1. Product Data:

1.3.2.1.1. Submit manufacturer's instructions, product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

1.3.2.1.2. Submit certified test reports for prefabricated structural members from an approved independent laboratory indicating compliance with specifications for specified performance characteristics and physical properties.

1.3.2.1.3. Submit Canadian Construction Materials Centre (CCMC) Product Evaluation Report / Certificate number for engineered wood products.

1.3.2.1.4. Submit manufacturer's installation instructions.

1.3.2.2. Shop Drawings:

- 1.3.2.2.1. For structural applications, submit drawings stamped and signed by a Professional Engineer licensed in Ontario in accordance with the Professional Engineers Act (R.S.O. 1990).
- 1.3.2.2.2. Include on drawings:
 - 1.3.2.2.2.1. Design data in accordance with CSA O86-24 and CWC Engineering Guide for Wood Frame Construction.
 - 1.3.2.2.2.2. Indicate configuration and spacing of pre-engineered timber members, hanger and connector types, fasteners, locations and design values; bearing details.
 - 1.3.2.2.2.3. Indicate allowable load and stress increase.
- 1.3.2.3. Provide a comprehensive set of engineering calculations or computer analysis and design outputs demonstrating the adequacy of the proposed system when requested by the Consultant. Calculations shall reference CSA O86-24 and CWC Wood Design Manual 2020 or latest.
- 1.3.3. Informational Submittals (to be submitted during the course of Work):
 - 1.3.3.1. Material Certificates: Submit certificates for machine-graded dimensional lumber indicating species and grade selected for each use and design values approved by the NLGA.
- 1.4. DELIVERY, STORAGE, AND HANDLING
 - 1.4.1. Delivery and Acceptance Requirements: Protect materials from weather conditions while in transit and while on the jobsite.
 - 1.4.2. Storage and Handling Requirements:
 - 1.4.2.1. Store materials using pallets or blocking a minimum of 150 mm from the ground and covered with protective waterproof sheets allowing for air circulation and ventilation under the covering.
 - 1.4.2.2. Protect edges and corners of sheet materials from damage during handling and storage.
 - 1.4.2.3. Protect kiln-dried and seasoned wood materials from conditions that will cause an increase in moisture content.
 - 1.4.2.4. Store engineered lumber on its edge and supported at intervals to prevent sagging or distortion.
 - 1.4.2.5. Stack, lift, brace, cut and notch engineered lumber products in accordance with manufacturer's instructions and recommendations.
 - 1.4.2.6. Store separated reusable wood waste convenient to cutting station and work areas.
 - 1.4.3. Packaging Waste Management: Perform In accordance with Section 01 74 19 - Waste Management and Disposal.

PART 2. PRODUCTS

1.5. DESCRIPTION

1.5.1. This Section covers non-structural or minor rough carpentry items not included under Section 06 10 00 – Rough Carpentry.

1.5.2. Regulatory Requirements:

1.5.2.1. Lumber Grades: Provide lumber products that are all sides finished (S4S) in nominal dimensions required for the project; grade-marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and that conform to National Grading Rules published by the NLGA.

1.5.2.1.1. Grading: Machine Grading, Visual Grading, or Both

1.5.2.1.2. Moisture Content: Air Dry, 19% or less

1.5.2.1.3. Structural Design Properties: Strength and related properties in accordance with CSA O86-24

1.5.2.1.4. Sizes: Nominal dressed dimensions described in CSA O141 for surfaced dry conditions and wood species.

1.5.2.2. Panel Grades: Provide panel products that are grade-marked by agencies recognized by CSA O325 and National Institute of Standards and Technology, Voluntary Product Standard PS 2 04 Performance Standard for Wood-Based Structural-Use Panels as modified by other listed CSA panel standards.

1.5.3. Sustainability Characteristics:

1.5.3.1. Environmental Product Declaration (EPD): Submit an Industry-wide EPD or Product specific EPD for each lumber specified. Provide EPD with at least a cradle to gate scope, identifying the following impact categories:

1.5.3.1.1. Global Warming Potential (GWP): All GWP information submitted in the form of kgCO₂ eq/kg.

1.5.3.1.2. Ozone Depletion Potential (ODP): All ODP information submitted in the form of kgCFC-11/kg.

1.5.3.1.3. Acidification Potential (AP): All AP information submitted in the form of kgSO₂ /kg.

1.5.3.1.4. Eutrophication Potential (EP): All EP information submitted in the form of kg N/kg.

1.5.3.1.5. Photochemical Ozone Creation/Smog Formation Potential (SFP): All SFP information submitted in the form of kgO₃ /kg.

1.5.3.2. Certified Wood Sourcing: Wood products (dimensional lumber, plywood, and similar materials) used for the Project must be sourced from forests certified to programs recognized under LEED v4 MR Credit 3 (Sourcing of Raw Materials) or equivalent.

1.5.3.3. Alternative to Certified Sourcing Requirements: Consultant will consider the use of an Alternate Compliance Path (ACP) based on certification requirements described in ASTM D7612, using defined third party certified sourcing categories as follows:

1.5.3.3.1. Legally Compliant (Non-controversial) Sources

1.5.3.3.2. Responsible Sources

1.5.3.3.3. Certified Sources (Chain of Custody)

1.5.3.4. Material Toxicity:

1.5.3.4.1. Low Emitting Materials: Materials must demonstrate volatile organic compound (VOC) emissions equal to or less than the maximum permitted for the materials described in this Section, meeting formaldehyde emissions for composite wood products for ultra-low emitting formaldehyde or no added formaldehyde in accordance with California Air Resources Board (CARB) ATCM and U.S. EPA TSCA Title VI requirements.

1.6. PERFORMANCE CRITERIA

1.6.1. Plywood Grades: Provide plywood products in nominal dimensions required for the project; grade-marked by accredited agencies of the APA and that conform to the Canadian Plywood Grading Guide, and tolerances described for specific plywood Products below, and identified as follows:

1.6.1.1. Name of Standard: CSA O121.

1.6.1.2. Manufacturer's Mill Identification;

1.6.1.3. Bond Quality (Exterior or Interior);

1.6.1.4. Commercial Species Grouping (DFP, CSP, ASP or HEM-FIR);

1.6.1.5. Product Grade (SHG, SEL, SEL TF, G1S or G2S);

1.6.1.6. Nominal Thickness; and

1.6.1.7. Additional Grade or Product Designations (if applicable).

1.6.2. Lumber Grades: Provide lumber products that are all sides finished (S4S) in nominal dimensions required for the project; grade marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and conform to National Grading Rules published by the National Lumber Grades Authority, and as follows:

1.6.2.1. Grading: Machine Grading, Visual Grading, or Both.

1.6.2.2. Moisture Content: Air Dry, 19% or less.

1.6.2.3. Structural Design Properties: Strength and related properties in accordance with O86-24 and NLGA SPS 2.

1.6.2.4. Sizes: Nominal dressed dimensions described in CSA O141 for surfaced dry conditions and wood species.

1.6.2.5. Acceptable Alternative Products: Lumber products meeting requirements of the American Lumber Standards Committee designated ALS Program Lumber and that are accepted by the Canadian Lumber Standards Accreditation Board, may be acceptable for the Project when proof of compliance with strength and related properties meeting O86-24 are submitted before purchasing any lumber products.

1.7. MATERIALS

1.7.1. Lumber Materials:

1.7.1.1. Stud Framing: Provide stud grade with the following minimum properties:

1.7.1.1.1. Sizes: As noted on drawings.

1.7.1.1.2. Species Group: Spruce-Pine-Fir (SPF).

1.7.1.1.3. Alternative species groups may be accepted if design values comply with CSA O86-24.

1.7.1.2. Miscellaneous Framing: Provide furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers, and other materials matching lumber used within framed construction; or use Light Framing, No. 2 Grade or better materials where lumber grade is not indicated.

1.7.1.3. Roof Sheathing: Provide plywood roof sheathing 2R Roof Sheathing with Edge Support; thickness as required by span rating and meeting requirements of CSA O325 and as follows:

1.7.1.3.1. Span Rated Plywood: Exterior rated, sheathing grade tongue and groove edged Douglas Fir or Canadian Softwood Plywood meeting requirements of CSA O121 or CSA O151 and CSA O325-20

1.7.1.3.2. Span Rated OSB: Exposure 1 Rated, sheathing grade tongue and groove edged or square edged with H-Clips OSB or waferboard meeting requirements of CSA O437.

1.7.1.3.3. H-Clips: Galvanized steel or extruded aluminum; 38-mm x 38-mm blocking securely nailed between framing members will be considered as an acceptable alternative

to tongue and groove material and H-Clip materials.

1.7.1.4. Plywood Blocking: Douglas Fir and Canadian Softwood Plywood using exterior grade adhesives meeting requirements of CSA O121 or CSA O151; kiln dry plywood to moisture content of 15% or less, and as follows:

1.7.1.4.1. Concealed Blocking: Select Grade Canadian Softwood Plywood (CSP), Exterior bond.

1.7.1.4.2. Exposed Panels and Panel Boards: Good One Side (G1S) Douglas Fir Plywood.

1.8. ACCESSORIES

1.8.1. Driven Fasteners: Steel nails, spikes, brads and staples meeting requirements of ASTM F1667. Ensure length is sufficient to penetrate connecting solid wood materials. Fastener design values shall comply with CSA O86-24.

1.8.1.1. All fasteners shall comply with O86-24 requirements for fastener design values.

1.8.1.2. Exterior Work: Hot-dipped galvanized.

1.8.1.3. Interior High Humidity Work: Hot-dipped galvanized.

1.8.1.4. Interior Work: Electroplated zinc plated, or cadmium plated.

1.8.1.5. Pressure Treated Materials: Refer to Section 06 05 73 – Wood Treatment.

1.8.2. Rough Hardware (Bolts, Nuts and Washers): Provide per drawings and manufacturer recommended fastening devices and anchors meeting requirements of ASTM A307 and as follows:

1.8.2.1. Ground Contact Materials: Stainless steel.

1.8.2.2. Exterior Work: Hot-dipped galvanized.

1.8.2.3. Interior High Humidity Work: Hot-dipped galvanized.

1.8.2.4. Interior Work: Electroplated zinc plated, or cadmium plated.

1.8.2.5. Pressure Treated Materials: Refer to Section 06 05 73 – Wood Treatment.

1.8.3. Wood Screws: Steel screws meeting requirements of ASME B18.6.1 and as follows:

1.8.3.1. Exterior Work: Galvanized, ceramic coated or stainless steel.

1.8.3.2. Interior Work: Galvanized.

1.8.4. Prefabricated Metal Anchoring Systems, Framing Connectors and Hangers: Prefabricated hot-dipped zinc coated steel products tested or designed in accordance with O86-24; types and configurations as indicated on drawings.

- 1.8.5. Sill Gaskets: Flexible, self-adhering closed-cell foam membrane that bridges gaps and irregularities between top of concrete foundation and sill components; nominal 10-mm thickness x 89-mm width x manufacturer's maximum length.
- 1.8.6. General Purpose Adhesive: CSA O112.9.
- 1.8.7. Nailing Discs: Flat caps, minimum 25 -mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.

PART 3. EXECUTION

1.9. EXAMINATION

- 1.9.1. Verification of Conditions: Verify conditions of substrates previously installed are acceptable for product installation in accordance with manufacturer's instructions.
 - 1.9.1.1. Inform Consultant of unacceptable conditions immediately upon discovery.
 - 1.9.1.2. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

1.10. INSTALLATION

- 1.10.1. Requirements:
 - 1.10.1.1. Accurately frame and properly assemble rough carpentry work
 - 1.10.1.2. Securely attach rough carpentry work to substrate by anchoring and fastening
 - 1.10.1.3. Include required nails, fastenings and other connectors
 - 1.10.1.4. Set rough carpentry to required levels and lines with members plumb, true to line, cut, and fitted
 - 1.10.1.5. Fit rough carpentry to other construction
 - 1.10.1.6. Scribe and cope as needed for accurate fit
 - 1.10.1.7. Locate furring, nailers, blocking, grounds, and similar supports as required when attaching to other construction.
 - 1.10.1.8. Do not use materials with defects that impair the quality of the rough carpentry or use pieces that are too small to use with a minimum number of joints or optimum joint arrangement.
- 1.10.2. Sill Plate Construction: Install sill gasket material between pressure treated sill plate and concrete foundation wall in accordance with manufacturer's instructions.
- 1.10.3. Wood Frame Construction: Space framing members as noted on drawings on centre using continuous

pieces of the longest possible length and as follows:

- 1.10.3.1. Fabricate in accordance with Division B, Part 9 of the Ontario Building Code (OBC), except where more stringent requirements are indicated on the Drawings
- 1.10.3.2. Make allowance for erection stresses.
- 1.10.3.3. Securely brace members in place to maintain plumb and true until permanently fixed and held to structure.
- 1.10.3.4. Minimize cutting of framing members for pipes and other penetrations by coordinating with other parts of the Work before starting work of this Section; limit cutting and drilling per OBC 9.23.9.5 (or NBC 9.23.9.5) and CSA O86 Clause 11.5.” Refs: OBC/NBC 9.23.9.5; CSA O86-24 Cl. 11.5.
- 1.10.4. Sheathing Installation: Install sheathing in accordance with Part 9 of the NBC and as follows:
 - 1.10.4.1. Roof Sheathing: Install roof sheathing with length perpendicular to roof framing using 50–mm coated nails at 150 mm along edges and 305 mm along roof framing in the middle of the sheets and as follows:
 - 1.10.4.1.1. Nail size and pattern noted above is a minimum requirement; increase number and decrease spacing, or increase size as required to meet site conditions. Confirm nail type and spacing with the structural Drawings; in no case less than CSA O86 Table 9.3.2 requirements
 - 1.10.4.1.2. Butt joints tightly together, support all edges of non-tongue-and-grooved sheathing with 38-mm x 89-mm framing, H-Clips or other acceptable method for square edge sheathing.
- 1.10.5. Roof Framing, Parapets, Cant Strips and Plates:
 - 1.10.5.1. Construct wooden roof curbs around openings in the roof for vents, ducts, and other penetrations.
 - 1.10.5.2. Make curbs a minimum height of 200 mm above roof membrane; make base of curbs same thickness as insulation.
 - 1.10.5.3. Form sloped tops to wood parapet plates and wood up stands more than 38 mm wide to roofs that receive metal flashings; sloped not less than 2:12.
 - 1.10.5.4. Provide continuous wood backing for flashings.
 - 1.10.5.5. Provide solid wood or plywood sheathing and backing to receive membrane and metal flashings, conforming to [RCABC] [ARCA] [CRCA] Manual; fasten plywood sheathing securely to parapet walls using mechanical fasteners; use screws or anchors where the roofing manufacturer prohibits nailing.
 - 1.10.5.6. Construct framing and blocking for membrane control joints conforming to CRCA Manual.

- 1.10.5.7. Do not place pressure-treated wood in direct contact with adhered roof membranes. Separate with a membrane or barrier per roofing manufacturer's instructions.

1.11. CLEANING

- 1.11.1. Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
- 1.11.2. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

1.12. PROTECTION

- 1.12.1. Protect installed products and components from damage during construction.
- 1.12.2. Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for rough carpentry work in accordance with the Contract Documents.
- .2 Refer to Structural drawing and specifications for load bearing elements.

1.2 **REFERENCES**

- .1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .2 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.
- .3 ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .5 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .6 CAN/CSA O80 Series M, Wood Preservation.
- .7 CAN/CSA O86, Engineering Design in Wood (Limit States Design)
- .8 CSA O121-M, Douglas Fir Plywood.
- .9 CAN/CSA O141, Softwood Lumber.
- .10 CAN/CGSB-51.32-M, Sheathing, Membrane, Breather Type.
- .11 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .12 CWC, Canadian Wood Council, Wood Reference Book.
- .13 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority

1.3 **DESIGN REQUIREMENTS**

- .1 Design structural lumber in accordance with the OBC and CAN/CSA O86 to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

- .2 Design structural lumber in accordance with climatic design data for North York contained in Ontario Building Code.
- .3 Design stair(s) to carry a minimum uniform live load of 488 kg/m² of projected plan area.
- .4 Design stair(s) to carry a minimum concentrated load of 1465 kg/m² applied at the centre of any tread span.
- .5 Construction is required to include off-site Modular and/or panelization construction, as per the CMHC RHI Modular construction definition and as included in the drawings. As per CMHC RHI definition, Modular is defined as: housing units that are partially or fully built in off-site (e.g. a factory, warehouse, or similar facility) by a qualified manufacturer and delivered to the site in whole or in parts and installed on an appropriately zoned and serviced lot. This may range between single, scattered units up to larger multi-unit housing projects.

1.4 SUBMITTALS

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data for structural lumber in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Plans, elevations, sections, details, materials, grades, dimensions, lumber nominal and actual sizes, gauges, finishes connections, and relationship to adjacent construction.
 - .2 Complete engineering design data confirming that Products meet design criteria specified.
 - .3 Samples: Submit samples of the following in accordance with the requirements of Section 01 33 00:
 - .1 Two representative pieces of each type of exposed pressure treated lumber finished as specified.
 - .4 Reports and Certificates:
 - .1 Submit certification from an independent inspection company that manufacturer meet the requirements of CSA 0177.
 - .2 Submit written inspection and test report results five working days after each inspection.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in work of comparable complexity and scope, to perform following services as part of work of this Section:
 - .1 Design of structural lumber.
 - .2 Review, stamp, and sign fabrication and erection shop drawings, design calculations.
 - .3 Professional Engineer to include confirmation in a conspicuous location in the shop drawings and design calculations that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .4 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed shop drawings.
 - .5 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .2 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.
- .3 Plywood identification: Grade mark in accordance with applicable CSA standards.
- .4 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.
- .5 Moisture Content of wood at time of construction shall be 19% maximum.
- .6 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, In accordance with CAN/CSA 080-M.
- .7 Dimensions of lumber shall conform to dressed sizes specified in CAN/CSA-0141 unless actual dimensions are otherwise indicted or specified.
- .8 Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions shall be dry size.
- .9 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Consultant for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.

1.6 ENVIRONMENTAL REQUIREMENTS

1. When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Store materials in a dry area. Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.

2 Products

2.1 MATERIALS

.1 General:

- .1 Materials used for work of this Section are to be in accordance with the following criteria, but not limited to:
 - .1 Regionally sourced materials.
 - .2 Certified wood.
 - .3 VOC content limits.
- .2 Adhesives - Urea-formaldehyde-free glues.
- .3 All dimensional lumber and plywood to be FSC certified.
- .4 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.
- .5 Material to be sourced regionally from within 800 km of jobsite wherever possible.

.2 Lumber: Softwood, G4S, moisture content 19% or less at time of installation, in accordance with the following:

- .1 Lumber shall be of same species and grade, equally seasoned and shall be processed and stamped at same mill.
- .2 CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.
- .3 Board quality: Construction or better.
- .4 Dimension quality:
 - .1 Structural joists, planks, and framing: No. 1 Select Structural.
 - .2 Light framing: Construction.
- .5 Beams and stringers: Standard.

.3 Pressure treated wood: No.2 or Better Grade treatable species (Pine or Fir) free of checks, holes, loose knots, pitch, shakes, splits, wane and warp, or as allowed by sample acceptable to the Consultant, vacuum/pressure impregnated with copper based preservative in accordance with CAN/CSA-080 to a net retention of 650 kg./m3, unless otherwise specified by preservative manufacturer.

- .4 Plywood (interior grade **IP-1** and exterior grade **EP-1**): CSA O121-M, G1S unsanded, T & G, standard construction, laminated with waterproof adhesive, exterior grade where indicated in drawings, Thickness as indicated on drawings.
- .5 Oriented Strand Board (**OSB**): To CSA O325, Mat Formed Panels, structural rated, T & G edge profile, laminated with waterproof phenolic adhesive, exterior grade, thickness as indicated on drawings.
- .6 Sheathing: In accordance with Structural Drawings and Specifications.
- .6 Roof lumber: NLGA, Construction grade light framing, Jack Pine, S4S, pressure treated to CAN/CSA-O80 series using copper based waterborne preservative treatment, impregnated to a net retention of 4 kg/ m^d of preservative unless otherwise specified by preservative manufacturer.
- .7 Surface applied wood preservative: Green coloured copper naphthenate or 5% pentachlorophenol solution, water repellant preservative or same copperbased preservative as used for shop impregnation, in accordance with CAN/CSA 080.
- .8 Fire retardant treatment of lumber and plywood (interior and protected locations): 'Dricon FRT' fire retardant treatment by Biewer Lumber or approved alternative, conforming to ASTM E84, to provide a flame spread rating of 25 or less.
- .9 Rough hardware: Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:
 - .1 Nails, spikes and staples: Spiral type.
 - .2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
 - .3 Screws: Countersunk head, full thread type.
 - .4 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.
 - .5 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere in accordance with CAN/CSA G164-M.
- .10 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.
- .11 Sill plate isolation pads: 5 mm thick rubber isolation gasket in width to match wood stud depth, with rubber washer for mechanical fastening to floor or ceiling structure; Iso-Sill by AcoustiGuard or approved alternative.
- .12 Resilient pads: 8 mm thick square neoprene pads with waffle texture, in size and capacity as indicated on reviewed shop drawings; 'W Neoprene Waffle Pad' by Mason Industries Inc. or approved alternative.

- .13 Resilient grommets: Bolt isolator and seismic relief grommets formed from bridge-bearing neoprene, sizes as indicated on reviewed shop drawings; 'HG Washer Bushing' by Mason Industries Inc or approved alternative.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **GENERAL**

- .1 Lay out work carefully and to accommodate work of others. Cut and fit accurately: erect in position indicated by Drawings.
- .2 Install rough carpentry to allow for expansion and contraction of the materials.
- .3 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.
- .4 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.
- .5 Provide anchors, bolts, and inserts required for attachment of the work of this Section, to those performing the work of other Sections and who are responsible for their installation.
- .6 Do not attach work by wood plugs or blocking in concrete or masonry. Use lead shields, expansion shields, or similar methods only as approved by Consultant.
- .7 Install resilient isolation components where indicated on reviewed shop drawings.

3.3 **MISCELLANEOUS WOODWORK**

- .1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for work under other Sections. Do not assume that Drawings show required work exactly or completely. Anchor wood members securely in place.

- .2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other work.
- .3 Except where steel supports are specifically shown, provide wood blocking and supports in metal stud partitions for fastening of item such as casework and other wall mounted accessories. Have respective trades approve the location of such wood blocking.
- .4 Bolt wood blocking or nailing strips to steel framing.
- .5 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .6 Use fire retardant lumber for blocking/framing in ceiling spaces, partitions and bulkheads.
- .7 Lay sill plate gasket under bearing plates over foundation for outside walls as work progresses. Position gasket flush with exterior wall face.

3.4 STAIRS

- .1 Fabricate wood stringer of size, construction and attachment to structure as shown.
- .2 Furnish prefabricated treads and risers stapled and glued to stringer and indicated on detail drawings.
- .3 Support treads, risers and landings as detailed on reviewed shop drawings.

3.5 ROOF WOODWORK

- .1 Install continuous wood nailers around roof perimeters, curbs and roof openings larger than 150 x 150 mm, and at edges of insulation as detailed. Install cut cant strips and continuous nailers on copings and curbs as detailed.
- .2 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation and roof hopper.
- .3 Fasten roof woodwork at maximum 400 mm o.c. in staggered pattern unless noted otherwise.

3.6 BACKBOARDS

- .1 Install plywood backboards, primed and painted white on both sides, with fire retardant paint.
- .2 Use minimum 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

3.7 NOTCHING AND DRILLING

- .1 Holes drilled in roof, floor or ceiling framing members shall be not larger than 1/4 the depth of the member, and located not less than 50 mm from the edges, unless the depth of the member is increased by the size of the hole.
- .2 Floor, roof and ceiling framing members may be notched provided the notch is located on the top of the member within $\frac{1}{4}$ the joist depth from the edge of bearing, and is not deeper than $\frac{1}{3}$ the joist depth, unless the depth of the member is increased by the size of the notch.
- .3 Do not notch, drill, or otherwise damage wall studs so that the undamaged portion of the stud is less than $\frac{2}{3}$ the depth of the stud, if the stud is load-bearing, or 40 mm if the stud is non-load-bearing, unless the weakened studs are suitably reinforced.
- .4 Do not notch, drill, or otherwise weaken the top plates in load-bearing walls and partitions to reduce the undamaged width to less than 50 mm, unless the weakened studs are suitably reinforced.
- .5 Do not notch, drill, or otherwise weaken roof truss members unless such notching or drilling is allowed for in the design of the truss.

3.8 FASTENERS

- .1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.
- .2 Use hot dipped galvanized fasteners for exterior work and work below grade.
- .3 Countersink bolts and bolt heads as required for clearance of other work.
- .4 Size fasteners to penetrate base member by half of fastener length minimum. Minimize splitting of wood members by staggering nails in direction of grain.
- .5 For plywood use spiral, annular or resin coated nails and staples.

3.9 SURFACE-APPLIED WOOD PRESERVATIVE

- .1 Treat raw surfaces, drilled holes and cut ends of pressure treated wood with 2 coats of wood preservative immediately after cutting.
- .2 Apply preservative by dipping, by brush or by pouring into plugged holes to completely saturate surface.

END OF SECTION

SPEC NOTE: DESCRIPTION: This Section does not include requirements for custom engineered, delegated design connections. If needed, the requirements are covered in RELATED REQUIREMENTS in this Section. Typically used as a deliverable responsibility of Glued-Laminated Timber or Heavy Timber/Timber Framing that picks up the structural supports required for shop-fabricated structural wood components.

SPEC NOTE: SUSTAINABILITY: This Section outlines the requirements to integrate sustainability aspects such as low carbon, water, materials, plastics and construction waste disposal into projects. Refer to the sustainability commitments laid out in the following documents: The Greening Government Strategy, the Ocean Plastics Charter – Government of Canada actions on plastic waste in federal operations, and PSPC's Departmental Sustainable Development Strategy: 2020-2023.

SPEC NOTE: When only one type of Shop-Fabricated Structural Wood is required for the Project, specifier can narrow-scope this Section's content into four different Sections with appropriate redaction to content, as follows:

SPEC NOTE: - Section 06 17 13 – Laminated Veneer Lumber - Section 06 17 16 – Laminated Strand Lumber - Section 06 17 23 – Parallel Strand Lumber - Section 06 17 33 – Wood I-Joists Note: These Sections are not currently part of the NMS library.

PART 1 - GENERAL

1.1. SUMMARY

SPEC NOTE: This specification does not include requirements for delegated design, engineered shop drawings and custom engineered connectors. Most installations will use standardized pre-engineered connectors or will be presented as a design solution by the Consultant.

1.1.1. This Section includes requirements for supply, fabrication, and erection of prefabricated, pre-engineered structural wood products. It also includes design, fabrication and installation of connections associated with the following components:

- 1.1.1.1. [Parallel Strand Lumber (PSL)] [,] [Laminated Strand Lumber (LSL)] [and] [Laminated Veneer Lumber (LVL)] [; and] [Composite Wood Joists (I-Joists)].
- 1.1.1.2. Pre-engineered, pre-fabricated connectors and fastenings.
- 1.1.1.3. Accessories, blocking, and other components required for complete installation.

1.2. RELATED REQUIREMENTS

SPEC NOTE: List other Sections referenced in this Section that contain specific information that the reader might expect to find in this Section, but is specified elsewhere. Typically, this list does not include Division 00 or Division 01 Sections.

1.2.1. Section [_____].

1.2.2. Section 06 03 05.73 – Long-Term Period Wood Treatment

1.2.3. Section 06 10 53 – Miscellaneous Rough Carpentry

1.3. DEFINITIONS

1.3.1. Structural Composite Lumber (SCL): Fabricated structural wood units that form the primary structural elements for the Project consisting of [framing,] [columns,] beams, joists, purlins, rim boards and accessory components described in this Section that are fabricated under factory-controlled conditions from exterior grade adhesives and strand/veneer wood manufactured in accordance with ASTM D5456.

1.3.2. Composite Wood Joists (I-Joists): Fabricated structural wood units that form the primary structural elements for the Project consisting of joists, headers, blocking panels and rim boards described in this Section that are fabricated under factory-controlled conditions in accordance with ASTM D5055[,] [and] [APA PRI-400] [and] [APA PRI-405].

1.4. REFERENCE STANDARDS

SPEC NOTE: List standards referenced within this Section.

1.4.1. American National Standards Institute (ANSI)/The Engineered Wood Association (APA):

SPEC NOTE: PRI-400 is primarily intended for residential projects; PRI-405 is primarily intended for commercial projects.

1.4.1.1. APA PRI-400-[2013], Performance Standard for APA EWS I Joists (Limit States Design), Canadian Edition

1.4.1.2. APA PRI-405-[2012], Performance Standard for APA EWS Commercial I-Joists

1.4.1.3. APA PRR-401-[2019], Performance Standard for APA Rim Boards

1.4.2. ASME International (ASME):

1.4.2.1. ASME B18.6.1-[1981], Wood Screws (Inch Series)

1.4.3. ASTM International (ASTM):

1.4.3.1. ASTM A36/A36M-[19], Standard Specification for Carbon Structural Steel

1.4.3.2. [ASTM A153/A153M [09], Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware]

1.4.3.3. ASTM A307-[21], Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

1.4.3.4. ASTM D5055 [19e1], Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists

1.4.3.5. ASTM D5456 [10a], Standard Specification for Evaluation of Structural Composite Lumber Products

- 1.4.3.6. ASTM D7612-[21], Standard Practice for Categorizing Wood and Wood-Based Products According to their Fiber Sources
- 1.4.3.7. ASTM F1667-[13], Standard Specification for Driven Fasteners: Nails, Spikes and Staples

1.4.4. CSA Group (CSA):

SPEC NOTE: CSA B111 is listed as withdrawn on the CSA Website, but is still referenced in CSA O86 as a referenced publication for nailed and spiked construction components.

- 1.4.4.1. CSA B111-[74], Wire Nails, Spikes and Staples
- 1.4.4.2. CSA O86 Consolidation-[14], Engineering Design in Wood

1.4.5. National Lumber Grades Authority (NLGA):

- 1.4.5.1. Standard Grading Rules for Canadian Lumber [2017].
- 1.4.5.2. NLGA SPS 1-[2013], Fingerjoined Structural Lumber
- 1.4.5.3. NLGA SPS 2-[2013], Machine Graded Lumber
- 1.4.5.4. NLGA SPS 4-[2020], Fingerjoined Machine Graded Lumber

1.5. ADMINISTRATIVE REQUIREMENTS

- 1.5.1. .1 Coordination: Coordinate installation of structural wood products with work specified in other Sections that may have items supported by or built into structural wood components described in this Section as follows:

SPEC NOTE: Include requirements for temporary protective measures when this Section is included with other Mass Timber structural wood Sections.

SPEC NOTE: The NMS library does not currently contain a Section that addresses temporary protective measures for mass timber - specifier is responsible for including 01 56 43 – Temporary Protective Measures for Mass Timber or adding content to 01 35 43 – Environmental Procedures, when required for the project.

- 1.5.1.1. [Coordinate temporary protective measures required by this Section to prevent exposure to weather and other deleterious environmental conditions in accordance with Section [01 35 43 – Environmental Procedures].]
- 1.5.1.2. [Coordinate with Section [06 03 05.73 – Long-Term Period Wood Treatment] for wood replacement associated with conservation treatment of period wood.]
- 1.5.1.3. Coordinate installation of structural connections to adjacent building components.
- 1.5.1.4. Coordinate fabrication of miscellaneous steel, anchorages and fasteners required by shop-fabricated wood components for complete installation dependent on work of any other Section listed under RELATED REQUIREMENTS.
- 1.5.1.5. Coordinate and interface with other Sections of Work including the following:

- 1.5.1.5.1. transitions to other assemblies
 - 1.5.1.5.2. anchorage to structural support components
 - 1.5.1.5.3. separation of differing or non compatible materials
 - 1.5.1.5.4. sequences of installation
 - 1.5.1.5.5. site tolerances
 - 1.5.1.5.6. other conditions affecting installation of materials specified in this Section
- 1.5.2. Pre-Construction Meeting: Conduct a pre-construction meeting on site in accordance with Section 01 31 19 – Project Meetings attended by [Contractor], [Subcontractor], [Departmental Representative] [DCC Representative] [Consultant] and other [Subcontractor]s affected by work of this Section to verify project requirements, and review methods and procedures related to structural wood products, including the following:
 - 1.5.2.1. Provide a minimum 72 hours notice to [Departmental Representative] [DCC Representative] [Consultant] before starting work of this Section; increase notice period when notification date occurs on weekends or statutory holidays.
 - 1.5.2.2. Review materials used on the project and any required changes to design for use of different materials than those specified.
 - 1.5.2.3. Review installation, substrate and structure conditions affecting work of this Section.
 - 1.5.2.4. Review requirements of this Section for connection to substrates and structures provided by other Sections.
 - 1.5.2.5. Review of metal fabrications, anchors and fasteners required by and provided by this Section to other components of the Work.
 - 1.5.2.6. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 1.5.2.7. Review location and alignment of vertical and horizontal elements as they relate to the aesthetic criteria and technical requirements indicated on the shop drawings.
 - 1.5.2.8. Review concealed connection and exposed connection details.
 - 1.5.2.9. Review written installation instruction requirements.
 - 1.5.2.10. Review other or additional installation requirements not otherwise covered by the suggested list of topics.
- 1.6. SUBMITTALS
 - 1.6.1. Submit required information in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.6.2. Action Submittals (to be submitted before starting any work of this Section):
 - 1.6.2.1. Product Data:

- 1.6.2.1.1. submit manufacturer's installation instructions and special handling criteria, installation sequence, printed product literature, catalogue pages and data sheets clearly identifying products used for the Project

1.6.2.2. Shop Drawings:

- 1.6.2.2.1. indicate applicable dimensions, fasteners, erection details and connection materials and finishes
- 1.6.2.2.2. indicate applicable grades, shop-applied finishes, camber, cuts, ledgers, holes and connection details
- 1.6.2.2.3. coordinate critical installation conditions and related work required by other [Subcontractor] [Trade Contractor]s
- 1.6.2.2.4. indicate temporary bracing required for installation.

1.6.3. Informational Submittals (to be submitted during the course of work):

SPEC NOTE: Expect historic Test and Evaluation reports, not project specific ones, unless configuration is not typical for manufacturer.

1.6.3.1. Test and Evaluation Reports:

- 1.6.3.1.1. submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties

SPEC NOTE: Include requirements for temporary protective measures when this Section is included with other Mass Timber structural wood Sections.

SPEC NOTE: The NMS library does not currently contain a Section that addresses temporary protective measures for mass timber - specifier is responsible for including 01 56 43 – Temporary Protective Measures for Mass Timber or adding content to 01 35 43 – Environmental Procedures, when required for the project.

- 1.6.3.2. [Mass Timber Protection Plan: Provide written plan describing temporary environmental protection procedures in accordance with Section [01 35 43 – Environmental Procedures].]
- 1.6.3.3. Source Quality Control Submittals: Submit proof that components and products supplied to the project are obtained from a single manufacturing source, and that accessory connectors are obtained from a manufacturer recommended source.

SPEC NOTE: Coordinate the following paragraph with Section 01 35 21- LEED Requirements.

- 1.6.4. [Sustainable Design Submittals: Coordinate project sustainable design requirements with Section [01 35 21 - LEED Requirements]; provide information supporting PART 2 – SUSTAINABILITY CHARACTERISTICS described in this Section.]

1.7. DELIVERY, STORAGE AND HANDLING

1.7.1. Delivery and Acceptance Requirements:

- 1.7.1.1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- 1.7.1.2. Carefully unload materials using forklifts or cranes, to avoid damage.
- 1.7.1.3. Keep lumber stored in wrapped and strapped bundles stacked not to exceed manufacturer's height restrictions.
- 1.7.1.4. Support bundles to prevent excessive bowing.
- 1.7.1.5. Support and separate bundles with 38 mm x 89 mm or larger dimension lumber spaced in accordance with manufacturer's written instructions.

SPEC NOTE: Consider keeping the wrapping in place until after the building is enclosed or after interior finishes are complete, if members will be left exposed.

- 1.7.1.6. Keep wrapping in place until right before installation of materials; slit wrapping on underside to prevent moisture build up.

1.7.2. Storage and Handling Requirements:

- 1.7.2.1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- 1.7.2.2. Keep materials dry.
- 1.7.2.3. Handle individual pieces to prevent physical damage during measuring, cutting and erection; use padded or non-marring slings when lifting.
- 1.7.2.4. Store components on a hard, dry, level surface.
- 1.7.2.5. Do not store components in contact with the ground.
- 1.7.2.6. Do not allow components to have prolonged exposure to weather.
- 1.7.2.7. Protect corners using wood blocking.

1.7.3. Develop [Waste Reduction Workplan] [Construction Waste Management Plan] related to Work of this Section and in accordance with Section [01 35 21 - LEED Requirements].

1.7.4. Packaging Waste Management: Remove for reuse [by manufacturer] [and return] [banding,] [pallets,] [crates,] [padding,] [packaging materials] as specified in [Waste Reduction Workplan] [Construction Waste Management Plan] in accordance with Section [01 74 19 - Waste Management and Disposal].

1.8. SITE CONDITIONS

1.8.1. Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where anchorages, connectors and other structural components are indicated to fit between or around other construction, or embedded into other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.

- 1.8.2. Established Dimensions: Establish dimensions and proceed with fabricating glued-laminated construction systems without site measurements where doing so would delay the Work; coordinate construction so that actual site dimensions correspond to established dimensions; allow for trimming and fitting.

PART 2 - PRODUCTS

2.1. DESCRIPTION

2.1.1. Regulatory Requirements

- 2.1.1.1. Manufacture shop-fabricated structural wood in accordance with [ASTM D5055] [and] [ASTM D5456], or proprietary Products in plant certified by certification agency accredited by the Standards Council of Canada; and bearing accredited stamp noting the name and plant number of manufacturers, grade, and Canadian Construction Materials Centre (CCMC) [report] [certificate] number (if applicable) and quality control agency.

2.1.2. Sustainability Characteristics

- 2.1.2.1. Environmental Product Declaration (EPD): Submit an Industry-wide EPD or Product-specific EPD for each lumber specified. Provide EPD with at least a cradle-to-gate scope, identifying the following impact categories:

- 2.1.2.1.1. Global Warming Potential (GWP): All GWP information submitted in the form of kgCO₂eq/kg.
- 2.1.2.1.2. Ozone Depletion Potential (ODP): All ODP information submitted in the form of kgCFC-11/kg.
- 2.1.2.1.3. Acidification Potential (AP): All AP information submitted in the form of kgSO₂/kg.
- 2.1.2.1.4. Eutrophication Potential (EP): All EP information submitted in the form of kg N/kg.
- 2.1.2.1.5. Photochemical Ozone Creation/Smog Formation Potential (SFP): All SFP information submitted in the form of kgO₃/kg.

- 2.1.2.2. Certified Wood Sourcing: Extract and source wood products (dimensional lumber, plywood, and similar materials) used for the Project from USGBC-recognized sustainable forestry certification agencies. Responsibly source wood products demonstrating compliance to legal extraction methods with proof of chain-of-custody from one of the following agencies:

- 2.1.2.2.1. American Tree Farm System (ATFS)
- 2.1.2.2.2. Canadian Standards Association (CSA)

- 2.1.2.2.3. Forest Stewardship Council (FSC)
- 2.1.2.2.4. Programme for the Endorsement of Forest Certification (PEFC)
- 2.1.2.2.5. Sustainable Forestry Initiative (SFI)

2.1.2.3. Alternative to Certified Sourcing Requirements: [Departmental Representative] [DCC Representative] [Consultant] will consider the use of an Alternate compliance path (ACP) based on certification requirements described in ASTM D7612, using defined third-party certified sourcing categories as follows:

- 2.1.2.3.1. Legally Compliant (Non-controversial) Sources
- 2.1.2.3.2. Responsible Sources
- 2.1.2.3.3. Certified Sources (Chain-of-Custody)

2.1.2.4. Material Toxicity:

SPEC NOTE: Confirm health product declarations (HPD) are available for the types of products specified before including this item.

- 2.1.2.4.1. [Materials must not contain any materials or chemicals that are harmful to the comfort and well-being of installers and building occupants; exceptions will be permitted when documented exceptions are available and replacement components are not yet commercially viable, materials must meet material ingredient reporting requirements for HPD.]
- 2.1.2.4.2. Low Emitting Materials: Materials must demonstrate volatile organic compound (VOC) emissions equal to or less than the maximum permitted for the materials described in this Section, meeting formaldehyde emissions for composite wood products for ultra-low emitting formaldehyde or no added formaldehyde in accordance with California Air Resources Board, Airborne Toxic Control Measures (ATCM).

SPEC NOTE: Include the following requirement for composite wood products (glulam, cross-laminated timber, plywood, particleboard and medium density fibreboard, oriented strandboard and similar products) when they are used for interior construction.

- 2.1.2.5. [Durable Construction: Provide products and installation practices that are rot and insect resistant and improve the performance of the building through the use of appropriately sourced and durable products for [fire resistant assemblies] [,] [mass timber construction] [foundations and piles] [exposed structures] [exterior finish carpentry] [and] [exterior pedestrian surfaces].]

2.2. DESIGN CRITERIA

- 2.2.1. Source Limitation: Obtain shop fabricated structural wood components and accessories from a single manufacturing source and manufacturer recommended connectors source.
- 2.2.2. Lumber Grades: Provide lumber products that are all sides finished (S4S) in nominal dimensions required for the project; grade marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and conform to National Grading Rules published by the National Lumber Grades Authority (NLGA), and as follows:
 - 2.2.2.1. Grading: Machine grading, visual grading, or both based on material type.
 - 2.2.2.2. Moisture Content: Kiln dry, 19% or less.
 - 2.2.2.3. Structural Design Properties: Strength and related properties in accordance with CSA O86 and NLGA SPS 2.
 - 2.2.2.4. Acceptable Alternative Products: Lumber products meeting requirements of the American Lumber Standards Committee designated ALS Program Lumber and that are accepted by the Canadian Lumber Standards Accreditation Board may be acceptable for the Project when proof of compliance with strength and related properties meeting CSA O86 are submitted before purchasing any structural wood Products.
- 2.2.3. Finger-jointed Lumber:
 - 2.2.3.1. Provide machine-graded lumber (MSR) products meeting requirements of NLGA SPS 1 and SPS 4 acceptable to AHJ
 - 2.2.3.2. Provide MSR products meeting stress design requirements indicated in the NBC that are grade marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and conform to National Grading Rules published by the NLGA.
- 2.2.4. Structural Performance Requirements:
 - 2.2.4.1. Design shop-fabricated structural wood component connections to allow for building movements without damage or over-stressing; connection failures; and without imparting undue strain on fasteners and anchors.
 - 2.2.4.2. Account for the following structural performance requirements:
 - 2.2.4.2.1. Dead Loads: [As indicated on Drawings] [Insert applicable dead loads].
 - 2.2.4.2.2. Live Loads: [As indicated on Drawings] [Insert applicable live loads]
 - 2.2.4.2.3. Roof Loads: [As indicated on Drawings] [Insert applicable roof loads].
 - 2.2.4.2.4. Snow Loads: [As indicated on Drawings] [Insert applicable snow loads].
 - 2.2.4.2.5. Live Load Deflection Limit: [As indicated on Drawings] [L/600] [L/480] [L/360] [L/240] [L/180].
 - 2.2.4.2.6. Permanent Load Deflection Limit: [As indicated on Drawings] [L/360] [L/240] [L/180].
 - 2.2.4.2.7. Total Load Deflection Limit: [As indicated on Drawings] [L/240] [L/180].

2.3. MATERIALS

- 2.3.1. Laminated Veneer Lumber (LVL): Structural composite lumber comprised of laminated veneers glued together using manufacturer's proprietary waterproof adhesives and bonded under pressure and heat to provide design stresses based on 100% load duration and with the following properties:

2.3.1.1. Water Resistant Coating: [Not required] [Manufacturer's proprietary coating].

SPEC NOTE: Other design grades are available, confirm design grade with structural engineer.

2.3.1.2. Grade: [2.0E] [1.7E] [1.5E] [As scheduled on Drawings].

2.3.1.3. Dimensions: [As scheduled on Drawings] [Thickness x Depth] mm, comprised of [[1 ply] [2] [3] [4] plies].

2.3.1.4. [Basis-of-Design: Include product and manufacturer information when required to differentiate design values and construction solutions.]

- 2.3.2. Laminated Strand Lumber (LSL): Structural composite lumber comprised of laminated strands oriented along length of members glued together using manufacturer's proprietary waterproof adhesives and bonded under pressure and heat to provide design stresses based on 100% load duration, and with the following properties:

2.3.2.1. Water Resistant Coating: [Not required] [Manufacturer's proprietary edge and end seal coating].

SPEC NOTE: Other design grades are available, confirm design grade with structural engineer.

2.3.2.2. Grade: [1.7E] [1.5E] [1.3E] [As scheduled on Drawings].

2.3.2.3. Dimensions: [As scheduled on Drawings] [Thickness x Depth] mm, comprised of [[1 ply] [2] [3] [4] plies].

2.3.2.4. [Basis of Design: Include product and manufacturer information when required to differentiate design values and construction solutions.]

- 2.3.3. Parallel Strand Lumber (PSL): Large section structural composite lumber comprised of laminated strands oriented along length of members glued together using manufacturer's proprietary waterproof adhesives and bonded under pressure and heat to provide design stresses based on 100% load duration, and with the following properties:

2.3.3.1. Water Resistant Coating: [Not required] [Manufacturer's proprietary coating].

SPEC NOTE: Other design grades are available, confirm design grade with structural engineer.

2.3.3.2. Grade: [2.0E] [As scheduled on Drawings].

2.3.3.3. Dimensions: [As scheduled on Drawings] [Thickness x Depth] mm.

2.3.3.4. [Basis-of-Design: Include product and manufacturer information when required to differentiate design values and construction solutions.]

2.3.4. Prefabricated Wood I-Joists: Structural member fabricated in accordance with ASTM D5055, comprised of sawn or structural composite lumber flanges and structural composite panel webs bonded using manufacturer's proprietary waterproof adhesives to form an I-cross sectional shape with the following properties:

- 2.3.4.1. Type: [Residential, meeting requirements of APA PRI-400] [Commercial, meeting requirements of APA PRI-405]
- 2.3.4.2. Flange Stock: Sawn-lumber or structural composite lumber as standard with manufacturer.
- 2.3.4.3. Web Material: Structural composite lumber as standard with manufacturer.
- 2.3.4.4. Stiffness Capacity (EI): [As scheduled on Drawings] [Insert value].
- 2.3.4.5. Shear Capacity (V): [As scheduled on Drawings] [Insert value].
- 2.3.4.6. Moment Capacity (M): [As scheduled on Drawings] [Insert value].
- 2.3.4.7. Dimensions: [As scheduled on Drawings] [Thickness x Depth] mm.
- 2.3.4.8. [Basis-of-Design: Include product and manufacturer information when required to differentiate design values and construction solutions.]

2.4. FABRICATION

2.4.1. Fabricated Structural Wood:

- 2.4.1.1. Fabricate structural composite lumber [and composite wood joists] in accordance with the Drawings and Specifications, and the reviewed shop drawings.
- 2.4.1.2. Mark all members for identification; mark top surface of straight beams clearly.
- 2.4.1.3. Do not splice or join members in locations other than those shown on the Drawings.
- 2.4.1.4. Apply specified sealer to exposed areas of structural composite lumber after fabrication; double treat exposed ends of laminates.
- 2.4.1.5. Fasten plies of engineered lumber by nailing, screwing or through bolting as recommended by manufacturer; additional fasteners may be required to correct cupping and crowing of plies in built-up members.

2.5. ACCESSORIES

- 2.5.1. Sheathing: Provide [wall sheathing] [subfloor sheathing] [roof sheathing] as specified in Section [06 10 53 – Miscellaneous Rough Carpentry].
- 2.5.2. Wood Framing and Blocking: Provide sawn lumber materials as specified in Section [06 10 53 – Miscellaneous Rough Carpentry].
- 2.5.3. Rim Boards: Structural composite lumber with [fire-rated composition] and a moisture protection coating, meeting requirements of APA PRR-401 for performance rated rim boards, and manufactured in accordance with ASTM D5456.
- 2.5.4. Ancillary Wood Components: Provide permanent bridging and bracing; headers and support framing at openings, and sheathing supports; blocking panels and other framing accessories

- required for complete and functional installation in accordance with manufacturer's written installation requirements.
- 2.5.5. Prefabricated Metal Anchoring Systems, Framing Connectors and Hangers: Prefabricated, pre-engineered [hot-dipped zinc coated steel] [stainless steel] products tested or designed in accordance with CSA O86; types and configurations as indicated on Drawings.
- 2.5.6. Pre-Engineered Shear Plate Connections: Pre-manufactured, pre-engineered components designed in accordance with CSA O86; and as follows:
- 2.5.6.1. Pressed Steel Type: Fabricated from hot rolled carbon steel shapes, plates and bars, meeting requirements of ASTM A36/A36M.
- 2.5.7. Driven Fasteners: Steel nails, spikes, brads and staples meeting requirements of ASTM F1667 or CSA B111:
- 2.5.7.1. Ensure length is sufficient to penetrate connecting solid wood materials.
- 2.5.7.2. Exterior Work: Hot-dipped galvanized.
- 2.5.7.3. Interior High Humidity Work: Hot-dipped galvanized.
- 2.5.7.4. Interior Work: Electroplated zinc plated, or cadmium plated.
- 2.5.8. Rough Hardware – manufacturer recommended fastening devices and anchors, including bolts, nuts, drift pins, and washers meeting requirements of ASTM A307:
- 2.5.8.1. [Exterior Work: Hot-dipped galvanized in accordance with ASTM A153/A153M, Class C or D depending on diameter.]
- 2.5.8.2. [Interior High Humidity Work: Hot-dipped galvanized in accordance with ASTM A153/A153M, Class C or D depending on diameter.]
- 2.5.8.3. Interior Work: Electroplated zinc coating, or cadmium plated.
- 2.5.9. Wood Screws – use steel screws meeting requirements of ASME B18.6.1:
- 2.5.9.1. Exterior Work: Galvanized, ceramic coated or stainless steel.
- 2.5.9.2. Interior Work: Galvanized.

PART 3 - PRODUCTS

3.1. EXAMINATION

- 3.1.1. Verify that site conditions are acceptable for installation of structural composite lumber in accordance with manufacturer's written instructions and as follows:

- 3.1.1.1. Report any discrepancies to the [Departmental Representative] [DCC Representative] [Consultant] immediately upon discovery.
- 3.1.2. Proceed with installation of shop-fabricated structural wood laminated components after unacceptable conditions are corrected.
- 3.2. PREPARATION
 - 3.2.1. Protection Before Installation: Protect shop-applied protective sealers, finishes and wrapping materials from damage before installation; touch up damaged finishes in accordance with manufacturer's written instructions.
 - 3.2.2. Notification: Notify [Departmental Representative] [DCC Representative] [Consultant] a minimum of [24] hours before installing any structural composite lumber units to allow for site review.
- 3.3. INSTALLATION
 - 3.3.1. Install shop-fabricated structural lumber in accordance with reviewed shop drawings and manufacturer's written instructions.
 - 3.3.2. Erection Aids:
 - 3.3.2.1. Securely brace shop-fabricated structural lumber components during construction; anchored to the ground, foundation, a braced wall or other completed, stable section of the structure.
 - 3.3.2.2. Remove temporary bracing as sheathing is attached, use caution to ensure that installed components remain stable.
 - 3.3.2.3. Support members laterally at end bearings and cantilevers.

SPEC NOTE: Fasten plies of engineered lumber by nailing, screwing or through bolting as recommended by the manufacturer. Side loaded composite/built-up members will require additional fastening of the plies compared to loading of the members from above. Additional fasteners may be required to correct cupping and crowning of plies in a built-up member.

- 3.3.3. Site Modifications: Structural composite lumber that requires notching, cutting or drilling arising from site conditions and that does not meet manufacturer's standard details must be performed in accordance with manufacturer's written recommendations, as directed by the [Departmental Representative] [DCC Representative] [Consultant]. The following modifications will not be permitted:
 - 3.3.3.1. Holes spaced closer to supports than recommended by manufacturer.
 - 3.3.3.2. Cut holes that are larger than recommended by manufacturer.
 - 3.3.3.3. Hole locations spaced differently than recommended by manufacturer.
 - 3.3.3.4. Going through bolts, or using nails or screws not recommended by the manufacturer to fasten composite or built-up members.

3.3.4. Damaged Components: Do not use structural composite lumber components that exhibit visible damage; damaged components will require replacement with material of same quality and performance as specified Products.

3.4. CLEANING

3.4.1. Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

3.5. CLOSEOUT ACTIVITIES

3.5.1. Non Conforming Work: [Departmental Representative] [DCC Representative] [Consultant] will confirm correction and verification procedures with manufacturer, and instruct [Contractor] [Subcontractor] responsible for work of this Section for repair procedures or replacement of non-conforming work.

3.5.2. Adjusting: Repair damage to adjacent materials caused by installation of materials specified in this Section.

3.6. PROTECTION

3.6.1. Protect installed work from damage arising from subsequent construction activity on the site.

END OF SECTION

SPEC NOTE: DESCRIPTION: Designed by a Structural Engineer for proper application given project criteria. Includes design requirements, materials, fabrication and erection.

SPEC NOTE: In case trusses are fabricated on the basis of design by a Structural Engineer, drawings must indicate loading conditions, limitations and dimensions of members, and particulars relating to connectors, sections and details of truss configuration, bearing conditions, chord extensions, chord splices, cantilevers, joint details, anchors, bracing, bridging and special framing for concentrated loads. If fabricator designs trusses, loadings must be indicated, and drawings must indicate location, spacing, span and geometry of trusses as well as minimum required distance at heel between top of truss and bearing surface to ensure air circulation. Use reference documents from The Truss Plate Institute of Canada for commercial, residential and farm snow loading such as Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses.

SPEC NOTE: This Section outlines the requirements to integrate sustainability aspects such as low carbon, water, materials, plastics and construction waste disposal into projects. Refer to the sustainability commitments laid out in the following documents: The Greening Government Strategy, the Ocean Plastics Charter – Government of Canada actions on plastic waste in federal operations, and PSPC's Departmental Sustainable Development Strategy: 2020-2023.

PART 1. GENERAL

1.1. SUMMARY

1.1.1. This Section includes requirements for supply and installation of shop-fabricated wood trusses using light-gauge metal connection plates and truss accessories required for a complete structural system with the following components:

1.1.1.1. [Roof] [,] [Floor] [and] [Girder] Trusses

1.1.1.2. Pre-engineered, pre-fabricated connectors and fastenings

1.1.1.3. Accessories, blocking, and other components required for complete installation

SPEC NOTE: The NMS library does not currently contain a Section that addresses delegated design procedures - Specifier is responsible for including 01 35 73 – Delegated Design Procedures when required for project. Refer to the reference guide for more information about delegated design requirements.

1.1.2. This Section requires delegated design, engineering analysis and preparation of sealed and signed shop drawings performed by a qualified, supporting professional engineer registered or licensed in [Province] [Territory], Canada who is retained by the truss fabricator responsible for fabrication of wood trusses described in this Section in accordance with [Section [____]].

1.2. RELATED REQUIREMENTS

SPEC NOTE: List other Sections that are referenced in this Section that contain specific information that the reader might expect to find in this Section, but is specified elsewhere. Typically, this list does not include Division 00 or Division 01 Sections.

- 1.2.1. Section [_____].
- 1.2.2. Section 04 05 19 – Masonry Anchorage and Reinforcing
- 1.2.3. Section 05 50 00 – Metal Fabrications
- 1.2.4. Section 06 05 73 – Wood Treatment
- 1.2.5. Section 06 08 99 – Rough Carpentry for Minor Works
- 1.2.6. Section 06 10 53 – Miscellaneous Rough Carpentry

1.3. DEFINITIONS

- 1.3.1. Delegated Design Professional Engineer: The supporting professional engineer hired by, engaged by or contracted to truss fabricator for the design of light metal plate connected wood trusses described in this Section. They produce signed and sealed shop drawings, are registered in the province of the Work, they are not the Consultant, and they are responsible for the following:

SPEC NOTE: Naming of documents is specific to the province where the Work is taking place, and governed by the provincial engineering association. British Columbia uses the terms “Model Schedule S-B” and “Model Schedule S-C”, Alberta uses the terms “Letter of Commitment” and “Letter of Compliance”, Ontario uses the terms “Commitment to General Reviews by Architects and Engineers” and “Letter of General Conformance”. For other jurisdictions it is generally acceptable to use the terms “Letter of Commitment” and “Letter of General Conformance”.

SPEC NOTE: The NMS library does not currently contain a Section that addresses delegated design procedures - specifier is responsible for including 01 35 73 – Delegated Design Procedures, when required for project. Refer to the reference guide for more information about delegated design requirements.

- 1.3.1.1. [[Model Schedule S-B] [Letter of Commitment] [Commitment to General Reviews by Architects and Engineers]: Documents prepared by the supporting professional engineer indicating extent of their involvement with design solution as recommended by provincial engineering associations in accordance with Section [_____].
 - 1.3.1.2. [[Model Schedule S-C] [Letter of Compliance] [Letter of General Conformance]: Document prepared by the supporting professional engineer indicating their general review of the installed system on site during construction in accordance with Section [_____].
- 1.3.2. Equal Dimensions: Structural wood products and assemblies indicating equal dimensions on the Drawings shall be calculated to align with in-place structural elements followed by an even division of the space between structural elements. Space glued laminated construction

products evenly between adjacent structural members, but not necessarily evenly spaced across the entire assembly.

1.4. REFERENCE STANDARDS

SPEC NOTE: List standards referenced within this Section.

- 1.4.1. ASTM International (ASTM):
 - 1.4.1.1. ASTM A653/A653M-[13], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 1.4.1.2. ASTM A780/A780M-[20], Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings
 - 1.4.1.3. ASTM D7612-[21], Standard Practice for Categorizing Wood and Wood-Based Products According to their Fiber Sources
 - 1.4.1.4. ASTM F1667-[13] Standard Specification for Driven Fasteners: Nails, Spikes and Staples
- 1.4.2. CSA Group (CSA):
 - 1.4.2.1. CSA B111 [74] Wire Nails, Spikes and Staples
 - 1.4.2.2. CSA O86 Consolidation-[14], Engineering Design in Wood.
 - 1.4.2.3. CSA S347-[14], Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
 - 1.4.2.4. CSA W47.1-[19], Certification of Companies for Fusion Welding of Steel.
- 1.4.3. Forest Stewardship Council (FSC):
 - 1.4.3.1. FSC-STD-01-001-[2015], FSC Principle and Criteria for Forest Stewardship
- 1.4.4. National Lumber Grades Authority (NLGA):
 - 1.4.4.1. Standard Grading Rules for Canadian Lumber [2017]
 - 1.4.4.2. NLGA SPS-1-2013, Fingerjoined Structural Lumber
 - 1.4.4.3. NLGA SPS-2-2013, Machine Graded Lumber
 - 1.4.4.4. NLGA SPS-4-2020, Fingerjoined Machine Graded Lumber
- 1.4.5. National Research Council Canada (NRC):
 - 1.4.5.1. National Building Code of Canada (NBC) [2020]
 - 1.4.5.2. Canadian Construction Materials Centre (CCMC)-[on-line edition], Registry of Product Evaluations
- 1.4.6. Truss Plate Institute of Canada (TPIC):
 - 1.4.6.1. BCSI Canada [2014], Building Component Safety Information Book, Guide to Good Practice for Handling, Installing, Restraining and Bracing of Metal Plate Connected Wood Trusses
 - 1.4.6.2. TPIC - [2019], Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).
 - 1.4.6.3. [TPIC TB4-[2020], Design for Corrosive Environments]
- 1.4.7. Sustainable Forestry Initiative (SFI):

- 1.4.7.1. SFI-[2015-2019 (extended through December 2021)] SFI Forest Management Standard

1.5. ADMINISTRATIVE REQUIREMENTS

SPEC NOTE: Include requirements for temporary protective measures when this Section is included with other mass timber structural wood Sections.

SPEC NOTE: The NMS library does not currently contain a Section that addresses temporary protective measures for mass timber - specifier is responsible for including 01 56 43 – Temporary Protective Measures for Mass Timber or adding content to 01 35 43 – Environmental Procedures, when required for project.

- 1.5.1. [Coordination: Coordinate temporary protective measures required by this Section to prevent exposure to weather and other deleterious environmental conditions in accordance with Section [01 35 43 – Environmental Procedures].]
- 1.5.2. Pre-Construction Meeting: Conduct a pre-construction meeting a minimum of [two (2) weeks] before starting work of this Section in accordance with Section 01 31 19 – Project Meetings, attended by [Contractor], [Subcontractor], truss fabricator, other affected Subcontractors, and Consultant to discuss the following:
- 1.5.2.1. Verify project requirements
 - 1.5.2.2. Review installation conditions
 - 1.5.2.3. Coordinate with building Subcontractors affected by work of this Section
 - 1.5.2.4. Review truss fabricator's written product handling and installation instruction requirements

1.6. SUBMITTALS

- 1.6.1. Submit in accordance with Section 01 33 00 - Submittal Procedures.
- 1.6.2. Action Submittals (to be provided before starting any work of this Section):
- 1.6.2.1. Product Data:
 - 1.6.2.1.1. submit truss fabricator's installation instructions, special handling criteria, installation sequence, and printed product literature and data sheets describing product characteristics, performance criteria, physical size, finish and limitations of hardware components required for installation.
 - 1.6.2.2. Shop Drawings: Prepare and submit shop drawings in accordance with the Truss Plate Institute of Canada (TPIC) Truss Design Drawing requirements indicating connection details, erection sequence, framing details and the following:
 - 1.6.2.2.1. Special Requirements: Identify special structural modifiers (if any) that may be required by local AHJ.
 - 1.6.2.2.2. Wood Truss Drawings: Indicate applicable TPIC Truss Design Procedures and CSA O86 engineering requirements, including the following:
 - 1.6.2.2.2.1. name of truss fabricator and truss plate manufacturer

- 1.6.2.2.2.2. truss identification number and job name
- 1.6.2.2.2.3. wood species, sizes, and stress grades of lumber used as truss members
- 1.6.2.2.2.4. pitch, span, camber, configuration and spacing of trusses
- 1.6.2.2.2.5. required bearing widths and bearing details
- 1.6.2.2.2.6. specified loads applicable to:
 - 1.6.2.2.2.6.1. top chord live load
 - 1.6.2.2.2.6.2. top chord dead load
 - 1.6.2.2.2.6.3. bottom chord live load
 - 1.6.2.2.2.6.4. bottom chord dead load
 - 1.6.2.2.2.6.5. concentrated loads and their points of application
 - 1.6.2.2.2.6.6. methods for controlling unbalanced loads
 - 1.6.2.2.2.6.7. wind and earthquake loads used for design solution
- 1.6.2.2.2.7. connector types, thicknesses, sizes, locations and design values
- 1.6.2.2.2.8. location, size and fastening of required permanent truss member bracing
- 1.6.2.2.2.9. connection requirements for truss to truss, truss to girder, truss to bearing, and site fabricated splices
- 1.6.2.2.2.10. reaction forces and point load locations, when different than heel locations, indicating points of occurrence and direction
- 1.6.2.2.2.11. locations of the maximum deflection and movements under live load conditions indicated on Drawings
- 1.6.2.2.2.12. allowable lateral horizontal movement of trusses under live load conditions indicated on Drawings
- 1.6.2.2.2.13. design loads for members
- 1.6.2.2.2.14. bearing length for trusses accounting for maximum deflected shape and horizontal slip at bearing ends of each member
- 1.6.2.2.2.15. location of lateral bracing for compression members
- 1.6.2.2.2.16. additional information used for confirmation of truss design
- 1.6.2.2.3. Indicate stress diagram or print out of computer design indicating design load for truss members - include allowable load and stress increase.
- 1.6.2.2.4. Indicate arrangement of webs or other members to accommodate ducts and other specialties.
- 1.6.2.2.5. Indicate adjustments to lumber and connector plate design values based on conditions of use (if any).
- 1.6.2.2.6. Indicate connector plate types, thickness, size and location at each joint, except where symmetrical configurations allow for centreline illustration of joints.
- 1.6.2.2.7. Indicate connection requirements for truss to bearing, truss or girder ply to ply and site-assembled splices.

- 1.6.2.2.8. Indicate end connections of trusses to resist uplift and lateral reactions.
- 1.6.2.2.9. Supporting professional engineer registered or licensed in [Province] [Territory], Canada, is required to seal and sign design solutions presented in submitted shop drawings prepared under their supervision.
- 1.6.2.3. Placement Drawings: Submit placement and layout drawings for review by Consultant including the following:
 - 1.6.2.3.1. Indicate sequence of installation and erection, and temporary bracing requirements.
 - 1.6.2.3.2. Label truss and girder layouts using the same identification numbers indicated on shop drawings described in Subparagraph 1.6.2.2 above.
 - 1.6.2.3.3. Indicate partitions being used as bearing walls.
 - 1.6.2.3.4. Indicate hanger type used for connecting trusses to girder trusses and beams.
 - 1.6.2.3.5. Indicate connection requirements for truss to bearing, truss or girder ply to ply and site-assembled splices when not indicated on shop drawings described in Subparagraph 1.6.2.2 above.
- 1.6.3. Informational Submittals: Provide the following submittals concurrently with Action Submittals described above:
 - 1.6.3.1. Qualification Data: Submit concurrently with shop drawings proof of qualifications for truss fabricator and materials proposed for use as described in Article 1.7, Quality Assurance below.
 - 1.6.3.2. Certificates: Submit certificates signed by truss fabricator indicating that Products supplied to the Project meet requirements of TPIC Truss Design Procedures.

SPEC NOTE: Include requirements for temporary protective measures when this Section is included with other Mass Timber structural wood Sections.
 - 1.6.3.3. [Mass Timber Protection Plan: Provide written plan describing temporary environmental protection procedures in accordance with Section [____].]

SPEC NOTE: The NMS library does not currently contain a Section that addresses delegated design procedures - specifier is responsible for including 01 35 73 – Delegated Design Procedures and 05 05 00 – Common Work Results for Metals, when required for the project. Refer to the reference guide for more information about delegated design requirements.
 - 1.6.3.4. Delegated Design Submittals: Submit delegated design of shear connections in accordance with Section [____] and Section [____], for design criteria described in Article 2.2 below. Include the following:
 - 1.6.3.4.1. Design Notes and Data: Submit supporting professional engineer's design notes and calculations [only when requested by [Departmental Representative] [DCC Representative] [Consultant]] [concurrently with shop drawings] verifying capacity of members [, connectors for related components of the work,] and that assemblies meet design requirements described in this Section.

- 1.6.3.4.2. [Model Schedule S-B] [Letter of Commitment] [Commitment to General Reviews by Architects and Engineers]: Submit concurrently with preliminary shop drawings indicating supporting professional engineer's limitation of design responsibilities.
- 1.6.3.4.3. [Model Schedule S-C] [Letter of Compliance] [Letter of General Conformance]: Submit concurrently with site report indicating supporting professional engineer's assessment that installation is substantially compliant with system design indicated on shop drawings.
- 1.6.3.5. Source Quality Control Submittals: Submit test reports for shop-fabricated wood trusses signed by supporting professional engineer registered or licensed in [Province] [Territory], Canada, or other independent testing agency acceptable to Consultant indicating compliance with specifications for specified performance characteristics and physical properties.
- 1.6.3.6. [Site Quality Control Submissions: Submit truss fabricator's site services reports within three (3) days of review to Consultant.]
- 1.6.4. [Sustainable Design Submittals: Coordinate project sustainable design requirements with Section [01 35 21 - LEED Requirements]; provide information supporting PART 2 – Sustainability Characteristics described in this Section.]

1.7. QUALITY ASSURANCE

- 1.7.1. Qualifications: When requested by Consultant, provide proof of qualifications as described in Article 1.6, Submittals.
 - 1.7.1.1. Truss Fabricators: Obtain shop-fabricated structural wood trusses and accessories from a single fabrication source qualified in accordance with CWTA National Quality Standard that can provide evidence of In-Plant Qualification Program recognized by regional wood truss associations or other proof of manufacturing and design capability acceptable to the Consultant.
 - 1.7.1.2. Truss Plate Manufacturer: Provide evidence that plates used for truss manufacturing are manufactured to meet testing requirements of CSA S347, and are listed in the Registry of Product Evaluations published by Canadian Construction Materials Centre (CCMC), or other proof of manufacturing capability acceptable to the Consultant.
 - 1.7.1.3. Welded Connection Fabricator: Provide welded connections fabricated in a shop certified by CWB to CSA W47.1, Division 1 or 2.1.

1.8. DELIVERY, STORAGE AND HANDLING

- 1.8.1. Delivery and Acceptance Requirements: Deliver, handle, store and protect materials in accordance with truss fabricator's written instructions, and in accordance with BCSI Canada.

- 1.8.2. Storage and Handling Requirements:
 - 1.8.2.1. Provide bearing supports and bracings to prevent bending, warping and overturning of trusses, in accordance with truss fabricator's written instructions and in accordance with BCSI Canada
 - 1.8.2.2. Store and protect materials from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the truss fabricator
 - 1.8.2.3. Keep materials dry
 - 1.8.2.4. Store trusses on hard, dry and level surface
 - 1.8.2.5. Do not store truss lumber in direct contact with ground
 - 1.8.2.6. Do not expose trusses to prolonged weather exposure
- 1.8.3. Develop [Construction Waste Management Plan] [Waste Reduction Workplan] related to work of this Section and in accordance with Section [01 35 21 - LEED Requirements].
- 1.8.4. Packaging Waste Management: Remove for reuse [and return] [by manufacturer] of [pallets,] [crates,] [padding,] [packaging materials] as specified in [Construction Waste Management Plan] [Waste Reduction Workplan] in accordance with Section [01 74 19 - Waste Management and Disposal].

1.9. SITE CONDITIONS

- 1.9.1. Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where shop-fabricated wood trusses are indicated to fit between or around other construction. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- 1.9.2. Established Dimensions: Establish dimensions and proceed with fabricating shop-fabricated wood trusses without site measurements where site measurements cannot be made without delaying the Work. Coordinate construction to ensure that actual site dimensions correspond to established dimensions; allow for trimming and fitting.

PART 2. PRODUCTS

2.1. DESCRIPTION

SPEC NOTE: Structural Engineer to check National Building Code of Canada (NBC) to ensure climatic information is adequate for proper design, and for special criteria regarding drift snow loads, wind bracing and uplift.

- 2.1.1. Regulatory Requirements: Fabricate trusses, bracing and bridging in accordance with CSA O86 using truss joint components tested in accordance with CSA S347, and using products bearing accredited stamp with the manufacturer's name and certificate number, grade, CCMC [report] [certificate] number (if applicable) and quality control agency.

- 2.1.1.1. Qualification Markings: Apply CWTA Plant Qualification marking or tag or other plant certification agency accredited by the Standards Council of Canada to each truss assembly in a readily visible location.
 - 2.1.1.2. Loading: Design trusses to account for minimum uniform and minimum concentrated loadings stipulated in [NBC] commentary applicable to metal plate connected wood trusses.
 - 2.1.1.3. Loading Markings: Apply additional special markings at point load locations other than truss heels on each truss, and on bottom chord of bottom bearing, parallel chord trusses.
 - 2.1.2. Lumber Grades: Provide lumber products that are all sides finished (S4S) in nominal dimensions required for the project; grade marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and that conform to National Grading Rules published by NLGA.
 - 2.1.2.1. Grading: Machine Grading, Visual Grading, or Both
 - 2.1.2.2. Moisture Content: Kiln Dry, 19% or less
 - 2.1.2.3. Structural Design Properties: Strength and related properties in accordance with CSA O86 and NLGA SPS 2
 - 2.1.2.4. Acceptable Alternate Products: Lumber products meeting requirements of the American Lumber Standards Committee designated ALS Program Lumber and that are accepted by the Canadian Lumber Standards Accreditation Board, may be acceptable for the Project when proof of compliance with strength and related properties meeting CSA O86 are submitted before purchasing any structural wood products
 - 2.1.3. [Finger joined Lumber: Provide machine-graded lumber (MSR) products meeting requirements of NLGA SPS 1 and SPS 4 acceptable to AHJ, meeting stress design requirements indicated in [NBC] and that are grade marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and conform to National Grading Rules published by the NLGA.]
- SPEC NOTE:** Coordinate the following paragraph with Section 01 35 21- LEED Requirements.
- 2.1.4. Sustainability Characteristics:
 - 2.1.4.1. Environmental Product Declaration (EPD): Submit an Industry-wide EPD or Product-specific EPD for each lumber specified. Provide EPD with at least a cradle-to-gate scope identifying the following impact categories:
 - 2.1.4.1.1. Global Warming Potential (GWP): All GWP information submitted in the form of kgCO₂eq/kg.
 - 2.1.4.1.2. Ozone Depletion Potential (ODP): All ODP information submitted in the form of kgCFC-11/kg.
 - 2.1.4.1.3. Acidification Potential (AP): All AP information submitted in the form of kgSO₂/kg.
 - 2.1.4.1.4. Eutrophication Potential (EP): All EP information submitted in the form of kg N/kg.

- 2.1.4.1.5. Photochemical Ozone Creation/Smog Formation Potential (SFP): All SFP information submitted in the form of kgO₃/kg.
- 2.1.4.2. Certified Wood Sourcing: Wood products (dimensional lumber, plywood, and similar materials) used for the Project must be extracted and sourced from USGBC recognized sustainable forestry certification agencies. Wood products must be responsibly sourced demonstrating compliance to legal extraction methods with proof of chain of custody from one of the following agencies:
 - 2.1.4.2.1. American Tree Farm System (ATFS)
 - 2.1.4.2.2. Canadian Standards Association (CSA Group)
 - 2.1.4.2.3. Forest Stewardship Council (FSC)
 - 2.1.4.2.4. Programme for the Endorsement of Forest Certification (PEFC)
 - 2.1.4.2.5. Sustainable Forestry Initiative (SFI)
- 2.1.4.3. Alternative to Certified Sourcing Requirements: Consultant will consider the use of an alternate compliance path (ACP) based on certification requirements described in ASTM D7612, using defined third party certified sourcing categories as follows:
 - 2.1.4.3.1. Legally Compliant (Non controversial) Sources
 - 2.1.4.3.2. Responsible Sources
 - 2.1.4.3.3. Certified Sources (Chain of Custody)
- 2.1.4.4. Material Toxicity:

SPEC NOTE: Confirm health product declarations (HPD) are available for the types of products specified before including this item.

- 2.1.4.4.1. [Materials must not contain any materials or chemicals that are harmful to the comfort and well-being of installers and building occupants; exceptions will be permitted when documented exceptions are available and replacement components are not yet commercially viable. Materials must meet material ingredient reporting requirements for Health Product Declaration (HPD).]
- 2.1.4.4.2. Low Emitting Materials: Materials must demonstrate volatile organic compound (VOC) emissions equal to or less than the maximum permitted for the materials described in this Section, meeting formaldehyde emissions for composite wood products for ultra-low emitting formaldehyde or no added formaldehyde in accordance with California Air Resources Board ATCM.

SPEC NOTE: Include the following requirement for composite wood products (glulam, cross laminated timber, plywood, particleboard and medium density fibreboard, oriented strandboard and similar products) when they are used for interior construction.

- 2.1.4.5. [Durable Construction: Provide products and installation practices that are rot and insect resistant, and improve performance of the building through use of appropriately sourced and durable products for [fire-resistant assemblies] [,] [mass

timber construction] [foundations and piles] [exposed structures] [exterior finish carpentry] [and] [exterior pedestrian surfaces].]

2.2. DESIGN CRITERIA

2.2.1. Design Responsibility: Truss fabricator is required to retain a supporting professional engineer registered or licensed in [Province] [Territory], Canada, experienced in the design and detailing of light metal plate connected wood trusses in accordance with TPIC Truss Design Procedures using engineering properties listed in CSA O86 for components described in this Section, and as follows:

2.2.1.1. Loads and forces shown on Drawings are not factored, unless specifically indicated otherwise.

SPEC NOTE: The following paragraph is not intended to be used as an all-encompassing statement - loads and forces must be indicated on Drawings and be as complete as possible.

SPEC NOTE: The subparagraph recognizes that coordination between the Construction Documents and production requirements for Fabrication and Erection Drawings may identify requirements for additional information that was not anticipated during information deployment onto our Drawings.

2.2.1.2. Request any loads and forces not shown on Drawings from Consultant, and that are required by the supporting professional engineer registered or licensed in [Province] [Territory], Canada, to complete design and detailing of connections.

2.2.1.3. The supporting professional engineer will provide the following in accordance with governing standards described in this Section:

2.2.1.3.1. design of wood truss members for Serviceability Limit States described in TPIC Truss Design Procedures, and as indicated on Drawings

2.2.1.3.2. design and detailing of wood truss members, bracing and bridging based on design loading and spacing indicated on Drawings

2.2.1.3.3. design and detailing of connections not specifically detailed on the Drawings

2.2.1.3.4. details of dimensions to accommodate mechanical services passing through truss members indicated on Drawings

2.2.1.3.5. written confirmation that components are fabricated in accordance to shop drawings submitted for the Consultant's review

2.2.2. Structural Performance Requirements: Design shop-fabricated structural wood component connections to allow for building movements without damage or over stressing, connection failures, and imparting undue strain on fasteners and anchors. Also take into account the following structural performance requirements:

SPEC NOTE: Wet service conditions may apply for open air (exterior conditions) facilities, high humidity buildings (swimming pools), when PPTW is used as a wood protectant; and high chemical exposure conditions that include salt, ammonia, hydrogen sulphide, pesticide/herbicide, fertilizer and other corrosive materials that can lead to oxidation of galvanized connectors.

- 2.2.2.1. Wet Service Conditions Modifier: [Not Required] [Required, in accordance with TPIC TB4]
- 2.2.2.2. Dead Loads: [Dead loads as indicated on Drawings] [Insert applicable dead loads]
- 2.2.2.3. Live Loads: [Live loads as indicated on Drawings] [Insert applicable live loads]
- 2.2.2.4. Roof Loads: [Roof loads as indicated on Drawings] [Insert applicable roof loads]
- 2.2.2.5. Snow Loads: [Snow loads as indicated on Drawings] [Insert applicable snow loads]
- 2.2.2.6. [Exterior Wind Loads: Wind loads q_{50} for deflection and for strength, modified by importance factors, building exposure, gust effect factors, and pressure coefficients in accordance with structural commentaries and also accounting for the following:]
 - 2.2.2.6.1. Wind Design Data: Location specific data from the NBC
- 2.2.2.7. Load Deflection Limit: [As indicated on Drawings] [L/600] [L/480] [L/360] [L/240] [L/180]
- 2.2.3. Design Tolerances: Design trusses with positive camber to allow for calculated deflection under dead and live loads to planar profile along slope or level top chord appropriate to truss type; limit horizontal deflection at reaction points to a maximum of [32 mm].
- 2.2.4. Modifications to Design: Supporting professional engineer registered or licensed in [Province] [Territory], Canada is required to account for changes to dimension and bearing capacities inherent with their Products where they are used to establish the Bid Price, while keeping in mind the following:
 - 2.2.4.1. Changes to placement of girder trusses and other loadbearing elements indicated on Drawings will not be permitted without before the acceptance from the Consultant
 - 2.2.4.2. Changes that modify design criteria described by the Consultant will not be permitted without before the acceptance from the Consultant
 - 2.2.4.3. No adjustment to contract price will be considered where manufactured or fabricated component sizes must change to account for design loads indicated on Drawings

2.3. MATERIALS

- 2.3.1. Truss Framing: Provide wood materials meeting truss fabricator's design requirements and meeting Structural Performance Requirements listed above, and as follows:
 - 2.3.1.1. [Pressure Preservative Treated Wood (PPTW): Preservative treatment of dimensional lumber, refer to Section [06 05 73 – Wood Treatment]]
 - 2.3.1.2. [Fire Retardant Treated Wood (FRTW): Fire retardant treatment of dimensional lumber, refer to Section [06 05 73 – Wood Treatment]]
 - 2.3.1.3. Sizes: Lumber sizes as described in TPIC Truss Design Procedures.

- 2.3.1.4. Finger joined Materials: [Allowed, in accordance with CWTA Guidelines for use of FJ Lumber] [Not allowed]
- 2.3.1.5. Grade: Provide No. 2 Grade and better materials
- 2.3.1.6. Species Group: [Spruce Pine Fir (SPF)] [Douglas Fir Larch (D.FIR L)] [Hemlock Douglas Fir (HEM FIR)]
- 2.3.1.7. Selection for Appearance: Not Required

SPEC NOTE: Refer to TPIC Truss Design Procedures for limitations on the use of truss grade structural composite lumber.

- 2.3.1.8. Acceptable Alternate Products: [Departmental Representative] [DCC Representative] [Consultant] [will] [will not] permit use of truss grade structural composite lumber that meets requirements of TPIC Truss Design Procedures
- 2.3.2. Truss Plates: Provide truss plates meeting requirements of CSA S347, manufactured from galvanized steel sheet meeting requirements of ASTM A653/A653M, having zinc coating designation Z275, and as follows:
 - 2.3.2.1. Grade: Structural steel sheet or high strength, low alloy steel sheet as determined by truss fabricator's supporting professional engineer registered or licensed in [Province] [Territory], Canada, based on loads and use conditions identified by Consultant.

SPEC NOTE: Duplex coatings are required for wet service conditions when wet service modifier is required by Structural Performance Requirements above.

- 2.3.2.2. Duplex Coating: [Not Required] [Apply epoxy polyamide corrosive protective coating to galvanized truss plates before fabrication of truss assemblies in accordance with TPIC TB4].
- 2.3.2.3. Truss Anchors and Hangers: Provide truss anchors and hangers meeting requirements of CSA O86, manufactured from galvanized steel sheet meeting requirements of ASTM A653/A653M, having zinc coating designation Z275; types and configurations as indicated on drawings and as follows:
 - 2.3.2.3.1. [Roof Truss Tie-Downs: Brackets rated for wind uplift loads indicated above]
 - 2.3.2.3.2. [Floor Truss Hangers: Full depth floor truss hangers rated for design loads indicated above]

SPEC NOTE: The NMS library does not currently contain a Section that addresses seismic control components or assemblies - specifier is responsible for including 13 48 53 – Manufactured Seismic Control Components or 13 48 63 – Fabricated Seismic Control Assemblies, when required for project.

- 2.3.2.3.3. [Seismic Tie-Downs: As specified in Section [_____]]

2.4. ACCESSORIES

- 2.4.1. Wood Framing and Blocking: Provide sawn lumber materials as specified in [Section [06 08 99 – Rough Carpentry for Minor Works]] [Section [06 10 53 – Miscellaneous Rough Carpentry]].

SPEC NOTE: The NMS library does not currently contain a Section that addresses post-installed fastenings - specifier is responsible for adding content to 01 61 00 – Common Product Requirements or including 05 05 23 – Post-Installed Fastenings, when required for project.

- 2.4.2. Anchors: Post-installed anchors to substrate materials supplied and installed by this Section, refer to [Section [04 05 19 – Masonry Anchorage and Reinforcing]] and Section 01 61 00 – Common Product Requirements.

SPEC NOTE: The NMS library does not currently contain a Section that addresses embedded items - specifier is responsible for adding content to 05 50 00 – Metal Fabrications or including 05 05 31 – Common Work Results for Embedded Items, when required for project.

- 2.4.3. Setting Plates: For setting plates and embedded items supplied in accordance to this Section that are installed in accordance to other Sections, refer to Section [05 50 00 – Metal Fabrications].
- 2.4.4. Driven Fasteners: Steel nails, spikes, brads, and staples meeting requirements of ASTM F1667 or CSA B111. Ensure length is sufficient to penetrate connecting solid wood materials.
- 2.4.4.1. [Exterior Work: Hot-dipped galvanized]
 - 2.4.4.2. Interior High Humidity Work: Hot-dipped galvanized
 - 2.4.4.3. Interior Work: Electroplated zinc plated, or cadmium plated
 - 2.4.4.4. [Pressure Treated Materials: Refer to Section [06 05 73 – Wood Treatment]]

2.5. FABRICATION

SPEC NOTE: Include in the following paragraph, specific material and product requirements required by project or coordinate with appropriate NMS Section used in project.

- 2.5.1. Fabricate wood trusses based on the reviewed shop drawings that were created in accordance with TPIC Truss Design Procedures at an accredited truss plant participating in CWTA In-Plant Qualification Program and with the following:
- 2.5.1.1. Assemble truss members in design configuration required for Project
 - 2.5.1.2. Assemble truss members using jigs or other means to maintain uniformity and accuracy of assembly with joints closely fitted to meet tolerances listed by TPIC Truss Design Procedures
- 2.5.2. Account for design camber and roof slopes when positioning truss members

2.6. SOURCE QUALITY CONTROL

- 2.6.1. In-Plant Testing and Inspections:
- 2.6.1.1. Test a minimum of three (3) trusses of each type as described in CWTA In-Plant Qualification Program and submit a report indicating that tested trusses represent trusses used for the Project

- 2.6.1.2. Indicate any manufacturing and material variances described in Appendix G of TPIC Truss Design Procedures
- 2.6.1.3. Conduct in plant testing and inspections in accordance with CSA S347
- 2.6.1.4. Document any follow-up repairs, rework or replacement of trusses for non conforming materials or variances in workmanship
- 2.6.1.5. Supporting professional engineer registered or licensed in [Province] [Territory], Canada, will direct all follow up repairs and rework and validate that trusses delivered to the Project meet specified requirements

PART 3 EXECUTION

3.1. EXAMINATION

- 3.1.1. Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
 - 3.1.1.1. Visually inspect substrate in presence of [Departmental Representative] [DCC Representative] [Consultant]
 - 3.1.1.2. Inform [Departmental Representative] [DCC Representative] [Consultant] of unacceptable conditions immediately upon discovery
 - 3.1.1.3. Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from [Departmental Representative] [DCC Representative] [Consultant]]

3.2. PREPARATION

- 3.2.1. Concentrated Load Prevention: Prevent concentrated loads on trusses until required bracing and sheathing is installed; do not permit stacking of sheathing bundles, lumber and other materials on unsheathed trusses.

3.3. ERECTION

- 3.3.1. Installation Requirements:
 - 3.3.1.1. Erect wood trusses in accordance with reviewed shop drawings, fabricator's written instructions, and in accordance with BCSI Canada
 - 3.3.1.2. Make adequate provisions for handling and erection stresses
 - 3.3.1.3. Exercise care to prevent out-of-plane bending of trusses
 - 3.3.1.4. Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed
 - 3.3.1.5. Install permanent bracing, bridging and sheathing in accordance with reviewed shop drawings, before the application of loads to trusses

- 3.3.1.6. Do not cut or remove any truss component without written confirmation by [Departmental Representative] [DCC Representative] [Consultant], and supporting professional engineer registered or licensed in [Province] [Territory], Canada
- 3.3.2. Bracing Requirements:
 - 3.3.2.1. Install permanent lateral bracing as indicated on shop drawings, in size and grade described, and fastened at locations shown using number and size of nails described on truss shop drawings
 - 3.3.2.2. Restrain lateral movement of bracing using permanently installed cross bracing at ends of each truss run and evenly spaced at intervals of six (6) metres or less
 - 3.3.2.3. Restrain top chord of trusses to prevent lateral movement using sheathing or permanent bracing as indicated on shop drawings
 - 3.3.2.4. Install lateral ties evenly spaced at intervals of three (3) metres or less; with additional permanent lateral bracing as indicated on shop drawings
- 3.3.3. Site Modifications: Cutting, notching or drilling of shop-fabricated wood trusses arising from site conditions that do not meet fabricator's standard details will not be permitted without fabricator's written recommendations, as directed by the [Departmental Representative] [DCC Representative] [Consultant].
- 3.3.4. Damaged Components:
 - 3.3.4.1. Do not use shop-fabricated wood truss components that exhibit visible damage; damaged components will require replacement with material of same quality and performance as specified Products
 - 3.3.4.2. Notify [Departmental Representative] [DCC Representative] [Consultant] and supporting professional engineer immediately of any damage to wood truss components
 - 3.3.4.3. Supporting professional engineer registered or licensed in [Province] [Territory], Canada, will recommend repair or replacement procedures as directed by the Consultant
 - 3.3.4.4. No work for repair or replacement of damaged components will be permitted without [Departmental Representative] [DCC Representative] [Consultant]'s written instructions

SPEC NOTE: Retain following item where an additional corrosion-resistant coating of metal connector plates is required.

- 3.3.4.5. [Protective Coatings: Clean and prepare exposed surfaces of metal connector plates; brush apply primer and one coat of protective coating.]

3.4. SITE QUALITY CONTROL

SPEC NOTE: Include truss fabricator's site services when required to verify the quality of the installed components. Establish the number and duration of periodic site visits required by truss fabricator and specify below. Consult with truss fabricator for services required. Delete if site services are not required.

- 3.4.1. [Truss Fabricator's Site Services: Truss fabricator's supporting professional engineer registered or licensed in [Province] [Territory], Canada, will review completed construction to verify that installation of wood truss system is in accordance with shop drawings and placement drawings. Other site services include:]
- 3.4.1.1. Review products supplied under this Section and confirm that wood truss system handling, installation and erection, protection and cleaning of its products is in accordance with fabricator's written instructions
 - 3.4.1.2. Truss fabricator's site services and recommendations include product use recommendations and periodic site visits for inspection of product installation in accordance with truss fabricator's instructions
 - 3.4.1.3. Schedule site visits to review work at the following stages:
 - 3.4.1.3.1. after delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins
 - 3.4.1.3.2. twice during progress of work at [25%] and [60%] complete
 - 3.4.1.3.3. after completion of work of this Section, and after cleaning is completed
 - 3.4.1.4. Submit written reports in format acceptable to [Departmental Representative] [DCC Representative] [Consultant], to verify compliance of Work with Contract.

3.5. CLEANING

- 3.5.1. Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

3.6. CLOSEOUT ACTIVITIES

- 3.6.1. Non-Conforming Work: [Departmental Representative] [DCC Representative] [Consultant] will confirm correction and verification procedures with manufacturer, and instruct [Subcontractor] [Trade Contractor] responsible for work of this Section on repair procedures or replacement of non-conforming work.
- 3.6.2. Adjusting: Repair damage to adjacent materials caused by installation of materials specified in this Section.
- 3.6.3. Repairs:
- 3.6.3.1. Replace wood trusses that are damaged or do not meet requirements
 - 3.6.3.2. Apply touch-up coating materials to provide minimum dry film thickness recommended by coating system manufacturer
 - 3.6.3.3. Repair damaged galvanized coatings on exposed surfaces with galvanized repair coating in accordance with ASTM A780/A780M and truss plate manufacturer's written instructions

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products equipment and services necessary for the finish carpentry work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI A208.1, Particleboard.
- .2 ANSI A208.2, Medium Density Fibreboard for Interior Use.
- .3 ANSI/NEMA LD 3, High-Pressure Decorative Laminates.
- .4 APA - The Engineered Wood Association.
- .5 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.
- .6 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .7 Architectural Woodwork Standards (AWS) - Quality Standards for Architectural Woodwork.
- .8 CAN/CGSB-11.6-M, Installation of Exterior Hardboard Cladding.
- .9 CAN/CSA O141, Softwood Lumber.
- .10 CSA-A500, Building Guards.
- .11 CSA O151-M, Canadian Softwood Plywood.
- .12 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress.
- .13 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber.

1.3 **DESIGN REQUIREMENTS**

- .1 Design wood siding system to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .2 Design siding system in accordance with following Climatic Design Data for Toronto contained in Ontario Building Code.
 - .1 Design Temperature: January 1%, July 2 °7%.
 - .2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.
 - .3 Earthquake: Seismic Site Class "D".

- .3 Prevent rain penetration through siding system. Incorporate means of draining to the exterior.
- .4 Design wood siding system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design siding system to prevent vibration when subject to the effects of wind.
- .5 Design exterior wood balustrade and screen systems to CSA-A500. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

1.4 SUBMITTALS

- .1 Shop drawings: Submit shop drawings of finish carpentry work in accordance with Section 01 33 00 indicating materials, thicknesses, sizes, finishes, wood species, grades, profiles, connection attachments, shop jointing, field jointing, reinforcing, anchorage, fastener types and sizes, location of exposed fastenings, mechanical and electrical service routes, service outlets, cutout locations, and sizes. Include erection drawings, plans, elevations, sections, and details as applicable.
- .2 Samples: Submit samples of the following in accordance with the requirements of Section 01 33 00:
 - .1 Two representative pieces of each type of wood with stained and/or natural finish.
 - .2 Two representative pieces of each type of wood finished as specified.
 - .3 Two of each colour, pattern, gloss, and texture of plastic laminate, in manufacturer's standard tag size.
 - .4 Two samples of laminated plastic joints, edging, cutouts and postformed profiles.
 - .5 Two of each solid wood sills, in 100 x 100 x 13 mm samples.
 - .6 Two samples of melamine surfaced board, edging and postformed profiles.
 - .7 One of each item of finish carpentry hardware.
 - .8 Allow for minimum two submissions.
 - .9 Submit samples in tandem with those of sections 09 51 00, 09 65 00, 09 65 19, 09 67 23 and 09 91 00. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .3 Reports and certificates:
 - .1 Submit written document of Contractor's work experience.
- .4 Extended Warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 QUALITY ASSURANCE

- .1 Execute work of this Section by a member if AWMAC, with 5 years experience in finish carpentry work of comparable complexity and scope. Submit proof of experience to Consultant prior to shop drawings submission.

- .2 Fabricate finish carpentry work in accordance with NAAWS Quality Standards, Premium Quality materials and installation unless otherwise indicated. Perform work in accordance with the definition of Good Workmanship as defined in the NAAWS Quality Standards.
- .3 Remove and replace finish carpentry work which does not conform to the NAAWS Quality standards or as amended by these Specifications.
- .4 Mock-up:
 - .1 Shop fabricate one mock-up of **one standard kitchen and one BF kitchen** base cabinet, wall cabinet, and counter top for each type of surfacing specified, complete with hardware and shop applied finishes, installed in location acceptable to Consultant.
 - .2 Provide mock-up of the wall panel beside a typical suite door.
 - .3 Provide mock-up of the wall paneling in ~~elevator lobbies~~, corridors **FSW-2** and typical suite entrance door surround with **WDV-1** and/or stairs.
 - .4 **Provide one mock-up of a typical suite's closets.**
 - .5 Provide mock-up of the windowsills.
 - .6 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
 - .7 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may not remain as part of Work. Remove and dispose of mock-ups which do not form part of Work.
- .5 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80-M.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle finish carpentry in accordance with the AWS Quality Standards. Control the temperature and humidity in accordance with the AWS recommendations, before, during, and after finish carpentry delivery, and also during storage and installation.
- 2 Cover finished plastic laminated work with heavy kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove until immediately before final inspection.

1.7 EXTENDED WARRANTY

- .1 Submit an extended warranty for plastic laminate work of this Section in accordance with General Conditions, except that warranty period is extended to 2 years from date of Substantial Performance of the Work.
 - .1 Warrant against defects in material and workmanship including but not limited to opening of joints, cracking, shrinkage, warpage, and delamination of plastic laminate.
 - .2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 MATERIALS

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, adhesives and mastics, are to have low VOC content limits.
 - .2 Adhesives - Urea-formaldehyde-free glues.
 - .3 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.
- .2 Concealed framing lumber and plywood:
 - .1 Eastern Spruce, Balsam Fir, or Jack Pine, to CAN/CSA 0141, NLGA, and NAAWS Custom Grade, S4S, average moisture content 7% +/- 2% at installation.
 - .2 Softwood plywood: CSA O151-M; 19 mm unless indicated otherwise, (G2S).
- .3 Hardwood lumber: Quarter saw White Oak, unless otherwise indicated, Conforming to NHLA and NAAWS Premium Grade, S4S, average moisture content 7% +/- 2% at installation, and to match existing species used in building.
- .4 Veneer core plywood (substrate): APA plywood, Grade A-D, in sizes, thickness and shapes as indicated.
- .5 Wood veneer (**WDV1**):
 - .1 White Oak-surfaced plywood core, conforming to ANSI/HPVA HP-1 having finishes and meeting grades as follows:
 - .1 Opaque finish, Grade B
 - .2 Transparent finish, Grade AA
 - .2 Face veneer cut: Quarter sawn.
 - .3 Sizes, thickness, and shapes as indicated.
- .6 Plastic laminate-surfaced plywood core (**PLM**): Provide plastic laminates conforming to ANSI/NEMA LD 3 as follows:
 - .1 Flatwork face sheet: 1.2 mm thick, heavy wear resistance.
 - .2 Vertical interior face sheets: 0.8 mm thick.
 - .3 Postformed face sheet: 0.8 mm thick.
 - .4 Backing sheet: thickness to match face sheet, high pressure laminate, manufactured by same manufacturer as face sheet.
 - .5 **PLM-1**: Panolam, Nevamar, Armored protection, Textured Suede finish, or approved alternative by Wilsonart.
 - .1 **PLM-1a**: Flourish Green SV7600, for use at units' kitchens' bottom cabinets.
 - .2 **PLM-1b**: Feral Fern SV7700, for use at units' kitchens' upper cabinets.

- .6 **PLM-2:** Panolam, Stone Essence, Armored protection, Evolution finish, Smokey Skies AG8720, or approved alternative by Wilsonart, for use at units' kitchens countertops including 100mm upstand.
- .7 Edging to be done in 3 mm thick PVC to match plastic laminate colour.
- .8 Allow for a minimum of 5 colours samples **submitted** to be selected by Consultant from manufacturer's full colour range. **Allow for minimum two submissions.**
- .7 Melamine-surfaced plywood core (**MEL**): Thermofused Melamine (TFM) thermally fused to both faces of the plywood core under heat and pressure to form a completely homogeneous bond, or approved alternative, having the following minimum criteria:
 - .1 Surface Weight: Minimum 120 g/m² saturate density layer conforming to NEMA LD-3.
 - .2 Melamine facing (**MEL-1**): 'Panval Melamine' by Uniboard Canada Inc. or approved alternative. Colour as follows:
 - .1 Interior millwork surfaces: White.
 - .3 Edging to be done in 3 mm thick PVC to match melamine colour.
- .8 Plywood Core: Hardwood or softwood veneer core plywood, minimum 7-ply for 19 mm thickness, conforming to CSA O121, CSA O151, or CSA O153.
 - .1 Core Type: Balanced veneer core construction. Particleboard, MDF or composite cores are strictly prohibited.
 - .2 Bonding: Exterior-grade, Type I water-resistant phenolic or polyurethane urea-formaldehyde-free adhesive.
 - .3 Thickness: 19 mm (3/4") unless otherwise indicated on Drawings
- .9 Solid Surface (**SSM1**):
 - .1 12mm thick sheet stock, provide with 3mm radiused edge and all cutouts as required and integral basin in locations indicated. 'Corian' solid surfacing by DuPont or approved alternative in colour 'Bisque' or approved alternative.
 - .2 Installation and seam adhesives to be as recommended by solid surfacing manufacturer, colour matched to solid surfacing.
- .10 Rubber base (**RB**): according to Section 09 65 19.
- .11 Wood base **and door trim (WD)**: Wood base to be 8 mm x 105 mm; 'Finger Jointed Pine Bevel Baseboard 00131' by Alexandria Moulding or approved alternative.
- .12 Faux Wood Slat Panel (**FWS2**): G-Teck Fluted Panel in PVC 6 x 96-in – Stained, White Oak CD-31, or approved alternative by Swan Canada or Richelieu. Applied to fully finished and painted walls and ceilings. Bottom, top, termination and transition mouldings to match the panel finish. Allow for a minimum of 5 colours samples to be selected by Consultant from manufacturer's full colour range.

- .12 Laminating adhesive: CSA O112 Series, water resistant type, low VOC content, selected by laminate manufacturer for intended end use.
- .13 Draw bolts and splines: Type as recommended by fabricator.
- .14 Nails and staples: Conforming to ASTM F1667; Size and type to suit application, galvanized for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- .15 Rough hardware: Conforming to ASTM F1667; Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:
 - .1 Nails, spikes and staples: Spiral type.
 - .2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
 - .3 Screws: Countersunk head, full thread type.
 - .4 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.
 - .5 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere.
- .16 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.
- .17 Bolts, nuts, washers, blind fasteners, lags and screws: Size and type to suit application. Stapling is not acceptable.
- .18 Adhesive and bituminous mastic: Selected by the millwork fabricator with low VOC content.
- .19 Miscellaneous metals: In accordance with Section 05 5000.
- .20 Finishing: In accordance with Section 09 91 00.
- .21 Insect repellent powder: Diatomaceous earth insect powder.

2.2 **HARDWARE**

- .1 The following hardware is the minimum quality standard for the work of this Section. Alternatives may be considered provided they are approved by Consultant prior to ordering of products.
- .2 Drawer slides: Full extension, 8400 Series by Knappe & Vogt, soft and self-closing.
- .3 Pilasters: Clear anodized aluminum recessed shelf standards with 12 mm divisions, Model 233 by Knappe & Vogt.

- .4 Clips: Bright zinc plated, adjustable height shelf supports, Model 256 by Knappe & Vogt.
- .5 Cabinet hinges: Heavy duty, concealed, 100 degree, clip, soft and self closing, Model 91M2550 by Blum.
- .6 Drawer and cabinet pulls: 33205170 by Richelieu.
- .7 Magnetic catches: Model 918 by Knappe & Vogt.
- .8 Locks: Cam locks/deadbolt locks complete with lock core by Hafele, type to suit application and installation.
- .9 Closet rail: 27 mm diameter wardrobe rail stainless steel finish 'Model 660 Round Tubing' and tubing flange 'Model 734' by Knappe & Vogt.
- .10 Lazy Susan: Lazy Susan for use at interior corner of lower cabinets as indicated, bottom mounted kidney polymer tray set, 711 mm diameter; 647230281 by Richelieu.
- .11 Upper Cabinet Pull-down Mechanism: Rev-A-Shelf pull-Down Shelf, by Richelieu

2.3 PLASTIC LAMINATE WORK

- .1 Perform plastic laminate work in accordance with AWS Quality Standards and ANSI/NEMA LD 3.
- .2 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .3 Laminate plastic laminates to core materials in accordance with manufacturer's instructions.
- .4 Fabricate core surfaces and profiles with continuous support and bond over entire surface to receive plastic laminate.
- .5 Apply plastic laminate backing sheets to balance shrinkage stresses induced by plastic laminate face sheets.
- .6 Minimize joints in plastic laminate work; do not install joints in plastic laminate work in less than 2400 mm o.c. Locate joints minimum 610 mm from cut-outs. Offset core and plastic laminate facing joints.
- .7 Form shaped profiles and bends as indicated, using postformed grade laminate to laminate manufacturer's instructions.

- .8 Edging to be done using 3 mm thick PVC to match plastic laminate colour to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .9 Apply laminated plastic liner sheet to interior of cabinetry and where indicated.
- .10 Fabricate units by solid surfacing manufacturer's certified or approved fabricator/installer. Fabricate built-up profiles as indicated.

2.4 FABRICATION

- .1 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other sections.
- .2 Coordinate locations of concealed supports and blocking with other parts of work. Provide cutouts for outlet boxes and other fixtures.
- .3 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections in wherever possible.
- .4 Set nails and countersink screws, apply wood filler to indentations, sand smooth and leave ready to receive finish.
- .5 Mitre exposed corners, no end grain shall be visible in completed installation.
- .6 Finish millwork in accordance with Section 09 91 00. Finished millwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity of colour, grain and texture.
- .7 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .8 Recess shelf standards, unless noted otherwise. Stagger recessed shelf standards on opposite sides of divider.
- .9 Do not exceed maximum 760 mm unsupported span for 19 mm thick shelving. House fixed shelving into gables and divisions.
- .10 Shop assemble finish carpentry to accommodate delivery and handling and to ensure passage through building openings.
 - .11 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .12 Wood base (BWD): Fabricate base from paint grade primed solid wood to profiles and heights as indicated, finished in accordance with Section 09 91 00.
- .13 Fabricate sills, frames and handrails to profiles shown.

- .14 Fabricate exterior wood guards and screens in accordance with reviewed shop drawings.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Before commencing installation, examine the work of other Sections to which work of this Section will be attached.
- .3 Ensure that openings and recesses to receive the work of this Section are within acceptable tolerances.

3.2 **INSTALLATION**

- .1 Install work in accordance with AWS Quality Standards and tolerances for Architectural Woodwork. Set and secure finish carpentry in place, rigid, plumb, square, and level.
- .2 Provide insect repellent powder under all millwork prior to installation.
- .3 Install anti-slip nosing tape on stair treads in accordance with manufacturer's written instructions and Ontario Building Code requirements.
- .4 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate columns, fixtures, outlets, or other projecting, intersecting or penetrating objects leaving a 0.8 mm gap maximum.
- .5 Coordinate cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures, in finish carpentry. Round internal corners of cut-outs and seal exposed cores.
- .6 Form joints to conceal shrinkage.
- .7 Install draw bolts and splines in laminated plastic counter top joints at maximum spacing 450 mm o.c., and 75 mm from edge. Make joints flush, hairline butt joints.
- .8 Install finishing hardware accurately and securely in accordance with manufacturer's directions, adjust and clean.
- .9 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

- .10 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .11 Melamine panels: Assemble melamine millwork using dowelled/wafered-and-glue construction. Installed melamine panels shall not show any exposed fasteners on finished/exposed surfaces.
- .12 Wood guards and screens:
 - .1 Use anchoring devices having sufficient adjustment to permit correct accurate alignment. After alignment, positively secure anchorage devices to prevent movement other than that designed for expansion and contraction. Take into consideration climatic conditions prevailing at time of installation.
 - .2 Site located fixings shall be approved corrosion-resistant materials.
 - .3 Make the completed installation free from objectionable noise, rattles, wind whistles, and creak or noise due to thermal movement.
- .13 Wood handrail:
 - .1 Construct wood handrail of sizes and details as noted.
 - .2 Round all corners, edges and ends.
 - .3 Install handrail brackets supplied under work of Section 05 50 00.
- .14 Solid surfacing:
 - .1 Install solid surfacing in accordance with manufacturer's written instructions.
 - .2 Align work plumb and level.
 - .3 Seal perimeter of fabrications to adjacent construction in accordance with Section 07 92 00.
- .15 Door frames:
 - .1 Butt and cope internal joints of door frames to make snug, tight, joint. Cut right angle joints with mitred joints.
 - .2 Fit backs of frames snugly to wall surfaces to eliminate cracks at junction of frame with walls.
- .16 Sills: Install window sills level, plumb and even in locations as indicated and ensure that sills are securely fastened.
- .17 Install cedar siding in accordance with CGSB 11-GP-6-M, reviewed shop drawings and manufacturer's written instructions.
- .18 Fastening:
 - .1 Coordinate wall securement, anchorage, and blocking for finish carpentry items.
 - .2 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .3 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .4 Provide heavy duty fixture attachments for wall mounted cabinets.

- .5 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.
- .19 Remove and replace damaged, marked, or stained finish carpentry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products equipment and services necessary for the PVC wall materials work in accordance with the Contract Documents.

1.2 **REFERENCE STANDARDS**

- .1 ASTM D 3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- .2 ASTM D 3274, Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation.
- .3 ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .4 ISO 9001:2008, Quality Management Systems – Requirements.

1.3 **SUBMITTALS**

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data in accordance with the Conditions of the Contract indicating:
 - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with the Conditions of the Contract indicating:
 - .1 Elevations, sections, details of partitions and operating components, hardware, track support and arrangement layout, stacking details, seals, gaskets, guides, materials, lining materials, table indicating dimensions and location of each partition, dimensions, gauges, and finishes.
- .3 Samples: Submit two 300 x 300 mm samples of partition finish in accordance with the Conditions of the Contract.
- .4 Certificates: Submit certification from an independent inspection company that acoustic operable panels meet specified design requirements.
- .5 Closeout submittals: Submit cleaning and maintenance instructions for incorporation into Operations and Maintenance Manuals in accordance with the Conditions of the Contract.

1.4 QUALITY ASSURANCE

- .1 Manufacturer's Qualifications:
 - .1 Perform work of this Section by a company that has a minimum of 20 years proven experience in work of similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.
 - .2 ISO 9001:2008 QMS certified company.
- .2 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in work of 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.
- .3 Mock-up:
 - .1 Fabricate, deliver, and erect a mock-up of PVC wall materials system in location acceptable to Consultant.
 - .2 Demonstrate full panel fabrication and installation techniques, confirm stiffness/absence of deformation, finish, clip system and anchoring devices, joint detailing and sealing, and quality of workmanship.
 - .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- .2 Storage and Handling Requirements:
 - .1 Store and handle materials in accordance with manufacturer's instructions.
 - .2 Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - .3 Store materials in clean, dry area indoors.
 - .4 Do not store materials near sources of heat.
 - .5 Do not store materials directly on floor.
 - .6 Store materials on flat, level surface, raised above floor, with adequate support to prevent sagging.
 - .7 Protect materials and finish during storage, handling, and installation to prevent damage.

1.6 AMBIENT CONDITIONS

- .1 Cold Temperatures: Warm panels to a minimum of 60 degrees F (16 degrees C) overnight before field-cutting in ambient temperatures below 40 degrees F (4 degrees C).

- .2 Warm Temperatures: Cool panels to a minimum of 70 degrees F (21 degrees C) overnight before installing panels in ambient temperatures above 70 degrees F (21 degrees C).

1.7 EXTENDED WARRANTY

- .1 Submit an extended warranty for aluminum panels work in accordance with General Conditions, except that warranty period is extended to 15 years from date of Substantial Performance.
 - .1 Warrant against leaking, warping, twisting, joint, and finish failure.
 - .2 Coverage: Complete replacement including affected adjacent parts.

2 Products

2.1 ACCEPTABLE MANUFACTURER(S)

- .1 Extrutech Plastics Inc.
- .2 Trusscore.
- .3 Canadian and/or US alternatives will be considered by the Consultant provided they match performance requirements, quality and matching manufactured offered colour, pattern and finish to the design basis.

2.2 PVC WALL PANELS

- .1 **PVC** Panels (P224):
 - .1 Material: 100 percent virgin, exterior-grade PVC. Recyclable Content: 100 percent.
 - .3 Flame spread rating: Complying to ASTM E84, CAN/ULC S102, CAN/ULC S105. PVC material to comply with the maximum 150 flame-spread rating permitted for interior surfaces.
 - .2 Panel Connection: Tongue and groove connection system with no exposed fasteners.
 - .3 Each Panel: to be selected by the Consultant.
 - .4 Each Camber: Runs length of panel.
 - .5 External Wall Thickness: to be selected by the Consultant.
 - .6 Internal Wall Thickness: to be selected by the Consultant.
 - .7 Panel Surfaces: Flat.
 - .8 Thickness: 34 mm.
 - .9 Panel Width: to be selected by the Consultant.
 - .10 Unit Weight: 2.0 psf.
 - .11 Fungus Resistance, ASTM D 3273 and D 3274: No mold or mildew growth.
 - .12 Nonporous.
 - .13 Waterproof.
 - .14 Corrosion proof.
 - .15 Termite resistant.

- .16 Does not conduct heat or electricity.
- .17 No exposed fasteners.
- .18 Colour and Finish (Both Sides): Colour to be selected by Consultant with Smooth, high gloss, reflective.
- .19 Acceptance: 'Norlock' by Trusscore or approved alternative.
 - .1 USDA.
 - .2 Canadian Food Inspection Agency (CFIA).
- .2 Wall Panels (P2400): Interior, Exterior, washable, multi-chamber, rigid, PVC partition wall panels:
 - .1 Material: 100 percent virgin, exterior-grade PVC. Recyclable Content: 100 percent.
 - .2 Panel Connection: Tongue and groove connection system with no exposed fasteners.
 - .3 Panel Surfaces: Flat and Smooth.
 - .4 Thickness: 12.7 mm
 - .5 Panel Width: 610 mm
 - .6 Unit Weight: 1.55 psf.
 - .7 Waterproof.
 - .8 Corrosion proof.
 - .9 No exposed fasteners.
 - .10 Fungus Resistance, ASTM D 3273 and D 3274: No mold or mildew growth.
 - .11 Colour and Finish (Both Sides): smooth, high gloss, reflection, Colour: Bright White.
 - .12 Acceptance: As manufactured by Extrutech Plastics Inc., or Trusscore or approved alternative.
 - .1 USDA.
 - .2 Canadian Food Inspection Agency (CFIA).

2.3 FABRICATION

- .1 Verify dimensions of work before commencing fabrications and report discrepancies to Consultant.
- .2 Fabricate work in accordance with Contract Drawings and reviewed shop drawings.
- .3 Fabricate work free from defects impairing function, appearance, strength and durability.

2.4 ACCESSORIES

- .1 Trim Accessories:
 - .1 Fitted Outside Corner Trim: "P0225".
 - .2 Material: Same as wall panels.
 - .3 Color: Bright White.
 - .4 Finish: Match wall panels.
 - .5 Lengths: 8' and 16'

- .2 Slip-on Outside Corner Trim: "P0226".
 - .1 Material: Same as wall panels.
 - .2 Color: Bright White.
 - .3 Finish: Match wall panels.
 - .4 Lengths: 9' and 18'
- .3 Rigid PVC U-Channel: "EPI0125".
 - .1 Material: Same as wall panels.
 - .2 Color: Bright White.
 - .3 Finish: Match wall panels.
 - .4 Lengths: 9' and 18'
- .4 Optional -Fastener Filler Insert: 1"x 2" PVC Brickmould "WM180".
 - .1 Material: Foamed PVC
 - .2 Color: White.
 - .3 Finish: Smooth, Flat.
 - .4 Lengths: 9' and 18'
- .5 Optional - Stiffener Insert: 1"x 2" - 14 ga. tube steel
 - .1 Material: 14 ga. tube steel
 - .2 Color: Black
 - .3 Finish: non-finished - optional (Primed)
 - .4 Lengths: - 1/4" of requested P224 panel length
- .6 Optional - Sealant:
 - .1 DAP clear, 100 percent silicone rubber sealant
 - .2 Use to seal panel and trim joints
- .7 Optional - Adhesives
 - .1 Heavy-duty construction adhesive
 - .2 Use as panel and trim adhesive
- 3 Execution
- 3.1 **EXAMINATION**
 - .1 Examine areas to receive wall system.
 - .2 Notify Architect of conditions that would adversely affect installation or subsequent use.
 - .3 Do not begin installation until unacceptable conditions are corrected.
- 3.2 **PREPARATION**
 - .1 Prepare surfaces in accordance with manufacturer's instructions.

3.3 INSTALLATION

- .1 Install wall system in accordance with manufacturer's instructions at locations indicated on the Drawings.
- .2 Install wall system plumb, level, square, flat, and in proper alignment.
- .3 Install wall system to be waterproof and washable.
- .4 Install wall panel and trim accessories in accordance with manufacturer's instructions.
- .5 Use fasteners in accordance with manufacturer's instructions to install wall system securely to supports.

3.4 ADJUSTING

- .1 Remove and replace with new material, damaged components that cannot be successfully repaired, as determined by Architect.

3.5 CLEANING

- .1 Clean wall system promptly after installation in accordance with manufacturer's instructions.
- .2 Do not use harsh cleaning materials or methods that could damage finish.
- .3 Do not use abrasive cleaners.

3.6 PROTECTION

- .1 Protect installed wall system from damage during construction.

END OF SECTION

This Section is to be read together with Section 01 40 00 and the individual trade sections where more specific requirements for inspection and testing will be identified.

The Air Tightness Testing Contractor (retained through the cash allowance by the Contractor) will provide the air tightness testing services outlined in 1.4.1 and 1.4.2 of this specification section. The remainder of this section outlines the Contractor requirements as they relate to the completion of the air barrier systems, assemblies separating apartments for each other and surrounding spaces, preparation of the building for air tightness tests, accommodating the tests in the project schedule and during daily activities, and addressing any areas of concern relating to air leakage.

1 - GENERAL

1.1 SUMMARY

- .1 Section includes
 - .1 Air tightness target for the whole building
 - .2 Overview of the air tightness tests that will be carried out during construction
 - .3 Sequencing requirements and scheduling milestones relating to the completion of the continuous air barrier system
 - .4 Procedural and coordination requirements to accommodate air tightness testing
 - .5 Remediation requirements

2.1 REFERENCES

- .1 Abbreviations and Acronyms
 - .1 ATT: Air tightness test
 - .2 ACH: Air changes per hour
 - .3 ATTC: Air tightness testing contractor
- .2 Air Tightness Testing Methods
 - .1 Whole building air tightness testing: multi-point infiltration procedures specified in Appendix F – ANSI/RESNET/ICC 380-2016, as well as additional guidance specific to multifamily building testing included in the RESNET Guidelines for Multifamily Energy Ratings document.

3.1 DEFINITIONS

- .1 Air Barrier System: The combination of air barrier assemblies and air barrier components, connected by air barrier accessories to form a continuous barrier to the movement of air through the building enclosure. This includes the top, bottom, and sides of, and all penetrations through, the enclosure.
- .2 Air Tightness Test: A type of test used to measure the air infiltration rate through the building enclosure under an induced pressure. This test is carried out using a blower door and typically involves both a positive and negative pressure test.
- .3 Negative Pressure Test: A test wherein air inside the enclosure is drawn to the outdoors. This places the enclosure at a lower (negative) pressure with respect to the outdoors.
- .4 Positive Pressure Test: A test wherein outdoor air is pushed into the enclosure. This air movement places the enclosure at a higher (positive) pressure with respect to the outdoors.

- .5 Blower Door: Commonly used term for an apparatus used to pressurize and depressurize the space within the building enclosure and quantify air leakage through the enclosure. The blower door typically includes a door fan and an air resistant fabric or a series of hard panels that extend to cover and seal the door opening between the fan shroud and door frame. The door fan is a calibrated fan capable of measuring air flow and is usually placed in the opening of an exterior door. With the air barrier otherwise sealed, air produced by the door fan pressurizes or depressurizes the enclosure depending on the orientation of the fan.
- .6 Building Enclosure: The surfaces that separate the inside air from the outside air. This consists of roofs and skylights; above grade walls, windows, curtain walls, and doors; and below grade walls and floors; and connecting flashings, air barrier, and moisture control transition membranes, sealants and expansion joints that separate the interior environment from the outdoors and any adjoining unconditioned spaces.
- .7 Interior Finishes: For the purposes of this specification section, interior finishes include, but are not limited to, the upper level ceiling service cavities (including studs, insulation, and drywall), drywall on exterior walls and ceilings, hollow-core concrete, window and door trim on exterior walls, baseboards and other trim on exterior walls and ceilings, flooring products and finishes for slab-on-grade and/or exposed floor assemblies.

4.1 TESTING, RESPONSIBILITIES, AND ADMINISTRATIVE REQUIREMENTS

- .1 Overview of the whole building air tightness test
 - .1 The final building shall achieve an air tightness of **<1.0 ACH @ 50 Pa** when tested under pressurized and depressurized conditions. This value must be measured after the building is complete, but prior to occupancy.
 - .2 The Air Tightness Testing Contractor (ATTC) retained through the cash allowance by the Contractor will complete three (3) air tightness tests throughout construction as follows:
 - .1 Whole Building Air Tightness Test #1: This test will be carried out upon completion of the air barrier system, but prior to interior finishes being installed. For the purposes of this test, it is not imperative that all mechanical and electrical penetrations be in place, nor final entry doors. Instead, these areas can be sealed off for this test as the goal will be to verify that the building shell meets the air tightness target identified for the project.
 - .1 **Note:** Following the test, areas of excessive air leakage will be identified and documented in a detailed site review report prepared by the ATTC. The Contractor(s) will be expected to remediate any areas of concern before proceeding with Test #2 and the installation of interior finishes.
 - .1 Whole Building Air Tightness Test #2: After all mechanical and electrical penetrations are in place, and after, the Contractor has remediated any areas of concern identified during Test #1, the ATTC will return to site to re-test the building and determine if the remediation efforts were successful. Any areas of concern will be shown to the Contractor.
 - .1 Whole Building Air Tightness Test #3: After the building is complete, but prior to occupancy, the ATTC will return to site to determine the final air tightness value of the building in its completed form. This final test will be used to demonstrate the building meets the air tightness criteria listed in 1.04.A.1.
- .2 Responsibilities

- .1 Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, the Contractor shall provide coordination of the sub-contractors, and the sequence of construction to ensure continuity of the air barrier system joints, junctures and transitions between materials and assemblies of materials and products, from substructure to walls to roof. Provide quality assurance procedures as specified herein. Facilitate inspections, tests, and other quality-control services specified herein and elsewhere in the Contract Documents and required by authorities having jurisdiction or by the Owner.
- .2 If the building fails to meet the air tightness target established herein, the Contractor will be required to address deficiencies at their own expense. Any testing required beyond the tests outlined herein shall be carried out at the Contractor's expense using the same ATTC.
- .3 Administrative Requirements
 - .1 Air Barrier Meeting: At the beginning of the project, the Contractor shall schedule a meeting with the Architect, Energy Consultant, ATTC, and all Subcontractors responsible for construction of any component of the air barrier system. The purpose of this meeting will be to review the following items:
 - .1 Air tightness target for whole building air tightness test
 - .1 Air tightness testing scope of work and milestones
 - .1 Exterior air barrier system design including the control layers and related details
 - .1 Dwelling unit air barrier system design including control layers and related details
 - .1 Sequence of construction
 - .2 Checklists: Before the ATTC arrives to site to carry out testing, the Contractor shall complete the air tightness test preparation checklists required by the ATTC. These will be provided to the Contractor prior to the Air Barrier Meeting. One preliminary checklist will be provided for whole building Tests #1 and Test #2. A second checklist will be provided for the final whole building air tightness test (Test #3).
 - .3 Sequencing – Whole building air tightness test
 - .1 Air tightness testing shall be carried out after the air barrier system is complete and prior to the installation of interior finishes:
 - .1 All components that make up the air barrier system must be installed prior to testing, including:
 - .1 Air Control layers in the walls, roof, and floor
 - .1 Windows and doors (including weather-stripping, sweeps)
 - .1 Attic doors and hatches
 - .1 Air barrier accessories (e.g., flashing tapes) required to connect air control layers together or to other air barrier components
 - .1 Prior to Test #2, all planned penetrations through the air barrier system must be in place before test #2 is carried out. This includes all penetrations relating to mechanical, electrical, and structural aspects of the project.
 - .4 No interior finishes that conceal or prevent access to the air barrier system shall be installed before air tightness tests #1 and #2 have been carried out and approval to proceed has been granted by the Architect.
 - .5 Construction Schedule: The following milestones shall be shown in the construction schedule:

- .1 Air Barrier System Meeting
- .1 Completion of the Exterior Air Barrier System
- .1 Whole Building Air Tightness Test #1 (to take place immediately following completion of the air barrier system, but prior to installation of interior finishes)
- .1 Whole Building Air Tightness Test #2 (to take place after mechanical and electrical penetrations through air control layers are complete)
- .1 Whole Building Air Tightness Test #3 (to take place after construction is complete and prior to occupancy)
- .6 Attendance at Whole Building Air Tightness Test #1 and #2: The Contractor and required sub-trades shall be present at the time that air tightness tests #1 and #2 are carried out by the ATTC. The purpose of this is to identify/review any areas with excess air infiltration and determine a suitable means of remediating the cause.
- .7 To avoid interruptions and possible errors during testing, subcontractors not required to be present for the air tightness tests shall not be present onsite.
- .8 Site Review Report Responses: The Energy Consultant and ATTC will conduct inspections intermittently throughout construction. Feedback will be provided to the Contractor(s) both onsite and in the form of a Site Review report. Similarly, a Site Review report will be issued after air tightness tests #1 and #2. The Contractor(s) shall respond to all high and medium priority issues identified in the report within 5 working days from the time it was issued. The response shall be provided in written format and correspond to the item numbers used in the original report. If required, the Contractor(s) shall provide photos and/or other supporting documentation that has been requested to demonstrate that the identified issues have been addressed.

3 – PRODUCTS

1.3 NOT USED

4 - EXECUTION

1.4 ONSITE QUALITY CONTROL

- .1 Site Inspections: The Contractor and subcontractors shall inspect air control layers and components to ensure that they are continuous and create an airtight system.
- .2 Conforming Work: Where one or more air control layers or components have been jeopardized, the Contractor shall remediate as required before interior finishes are installed so as not to compromise the effectiveness of the air barrier system and the overall air tightness of the building.
- .3 Consultant Inspections: The Air Tightness Contractor will complete inspections of the air barrier system intermittently throughout construction and provide feedback on any areas that need to be remediated so as not to compromise the air tightness of the building. Feedback will be provided verbally onsite and in site review reports.

2.4 WHOLE BUILDING AIR TIGHTNESS TESTING

- .1 Construction of the Air Barrier System:
 - .1 The Contractor shall construct the exterior air barrier system and partitions around dwelling units to reflect the details provided on the drawings and described in the specifications, and according to any further direction provided by the design team.
 - .2 Penetrations through the air barrier system must be kept to an absolute minimum. Where required, penetrations shall be air sealed and made continuous with the air barrier system using suitable, compatible, and durable gaskets and tapes that will last the anticipated service life of the building. Caulking should be avoided wherever possible, except for small fastener penetrations (e.g. screws into wood framing for the purposes of supporting interior components such as conduits).
 - .3 Penetrations through the roof assembly air control layer is strictly prohibited except as may be required for plumbing stacks, ducts, conduits, refrigerant lines, etc.
 - .1 All permitted penetrations through the roof assembly must be air sealed using a suitable gasket that is taped to the air control layer on all sides. For large opens where gaskets are not possible (e.g. ducts) air sealing can be accomplished using approved air sealing tapes and membranes.
 - .4 The air barrier system must be complete prior to any air tightness testing. This includes:
 - .1 Air control layers in the walls, roof and floor
 - .1 Windows and doors (including weather-stripping, sweeps)
 - .1 Air barrier accessories (e.g. flashing tapes) required to connect air control layers together or to other air barrier components
 - .1 All planned penetrations through the air barrier system must be in place before test #2 is carried out. This includes all penetrations relating to mechanical, electrical and structural aspects of the project.
 - .5 No interior finishes that conceal or prevent access to the air barrier system shall be installed before air tightness tests #1 and #2 are carried out and approval to proceed has been received from the Architect.
- .2 Preparation for Whole Building Air Tightness Test #1:
 - .1 Complete the air barrier system as per section 3.02

- .2 Schedule the air tightness test for a time period when:
 - .1 The building can be shut down to normal foot traffic for a 2-hour period (once the testing has started, sub contractors will be unable to enter and leave the building).
 - .1 The ventilation and exhaust ducts through the exterior walls can be temporarily sealed.
 - .1 No precipitation has occurred 24 hours prior to, or is anticipated to occur, during testing activities in order to prevent water ingress into the enclosure assemblies
 - .1 The wind speed is forecasted to be consistent and less than 10 kph during testing activities
- .3 Ensure that a 120 VAC power supply is available inside the building to power the blower door assembly.
- .4 Complete any air tightness preparation checklist required by the ATTC.
- .5 Clean the floor area prior to testing
 - .1 During pressurization tests, air will be blown into the building at high enough velocity that it may cause debris, dust and litter to become air borne,
 - .1 During depressurization tests, air will be blown into the building at high enough velocity that it may cause nearby debris, dust and litter to be drawn to the fan guards or become entangles in the fan blades.
- .6 Prime all plumbing traps located within the envelope (fill with water)
- .7 Turn off all ventilation, exhaust and recirculation fans. Temporarily seal (make airtight) all intake and exhaust ducts for ventilation systems that are intended to operate continuously (24/7). Any ventilation systems that are intended to be operated intermittently are to be left "as-is" with dampers in the closed position.
- .8 Proper all interior doors in the "open" position to permit airflow throughout the building.
- .9 Ensure that the ATTC has unhindered access to all mechanical rooms, air handlers, exhaust fans, and outdoor air and exhaust dampers.
- .10 Ensure that no sub-contractors are working in the area of the blower door equipment.
- .3 Preparation for Whole Building Air Tightness Test #2:
 - .1 Remediate any deficiencies identified by the ATTC during Test #1.
 - .2 Schedule the air tightness test for a period of time when all conditions under 3.02 B are met.
 - .3 Complete all steps listed under 3.02 B
- .4 Preparation for Whole Building Air Tightness Test #3:
 - .1 Schedule the air tightness test for a period of time:
 - .1 When all conditions under 3.02 B are met
 - .1 When construction is 100% complete
 - .1 That is prior to occupancy
 - .2 Complete all steps listed under 3.02 B.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for sheet waterproofing work in accordance with the Contract Documents.

1.2 SUBMITTALS

- .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating characteristics, performance criteria, and limitations. Indicate preparation, installation requirements and techniques, Product storage, and handling criteria.
- .2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating location and extent of system and system finish applications; system and joint sealant treatment materials, details of terminations at end of each days' work; large scale details, including relationships with adjacent construction; installation sequence and methods; connections; edge treatment at discontinuous edges; and accessories and other pertinent information required for proper and complete installations.
- .3 Samples: Submit following samples in accordance with Section 01 33 00:
 - .1 Two 300 x 300 mm samples of waterproofing membrane.
 - .2 Two samples, 300 mm long, of fastening bar.
 - .3 Two samples 300 x 300 mm of protection board.
- .4 Certification: Submit installer's certification verifying compliance with specification requirements.

1.3 QUALITY ASSURANCE

- .1 Provide all sheet waterproofing membranes, products and associated accessories from a single manufacturer to ensure material compatibility.
- .2 Qualifications: Execute work of this Section by manufacturer-approved, skilled, qualified, and experienced workers, trained in installation of work of this Section.

1.4 SITE CONDITIONS

- .1 Do not install the work of this Section outside of environmental ranges as recommended by manufacturers without Consultant's and Product manufacturer's written acceptance.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturers, and above specification, environmental requirements before, during, and after installation.

1.5 EXTENDED WARRANTY

- .1 Submit an extended written warranty for sheet waterproofing work in accordance with the Conditions of the Contract, except that warranty period is extended to five (5) years from date of Substantial Performance of the Work.
 - .1 Warrant work against defects including adhesive failure, cohesive failure, waterproofing failure, and water leakage.
 - .2 Coverage: Complete replacement including effected adjacent Work.

2 Products

2.1 MATERIALS

- .1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.
- .2 All components of the waterproofing system shall be compatible with EPS insulation and supplied by one manufacturer.
- .3 Primer:
 - .1 'Aquatec' by Henry Company Canada Inc.
 - .2 'CCW AWP' by Carlisle Coatings and Waterproofing.
 - .3 'Elastocol Stick H20' by Soprema.
 - .4 'Mel-Prime WB Primer' by W. R. Meadows
- .4 Mastic:
 - .1 'Termination Sealant' by Henry Company Canada Inc.
 - .2 'CCW 704 Mastic' by Carlisle Coatings and Waterproofing.
 - .3 'Sopramastic 200' by Soprema
 - .4 'Pointing Mastic' by W. R. Meadows
- .5 Sheet waterproofing (**FWP-1**): 1.5 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film.
 - .1 'Blueskin WP 200' by Henry Company Canada Inc.
 - .2 'CCW Miradri 860/861' by Carlisle Coatings and Waterproofing.
 - .3 'Colphene 3000' by Soprema
 - .4 'Mel-Rol' by W. R. Meadows
- .6 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.
- .7 Protection Board:
 - .1 '990-31' by Henry Company Canada Inc.
 - .2 'CCW Protection Board - V' by Carlisle Coatings and Waterproofing.
 - .3 'Sopraboard' by Soprema Inc.
 - .4 'Sealtight Vibraflex Waterproofing Protection Board' by W. R. Meadows.
- .8 Accessories: As recommended by waterproofing system manufacturer.
- ~~.9 Ensure compatibility with installed products under section 07 11 00. Sheet Waterproofing, Dampproofing and auxiliary products and materials under this and section 07 11 00 must be obtained as a single source from one manufacturer to ensure total system compatibility and integrity.~~

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that existing substrates to receive waterproofing are clean, dry, sound, smooth, and continuous.
- .3 Coordinate sealing of interruptions in, and protrusions through waterproofing membrane. Verify that other work items projecting through waterproofing membrane are in place and are securely installed.

3.2 MASTIC AND PRIMER

- .1 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for waterproofing is achieved.
- .2 Install mastic where required to ensure integrity of waterproofing installation at protrusions and other complex details.
- .3 Prime substrate surfaces to receive waterproofing in accordance with manufacturer's instructions, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.
- .4 Prime surfaces. Re-prime surfaces if not covered with waterproofing membrane within 4 hours.

3.3 WATERPROOFING

- .1 Install waterproofing membrane in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Horizontal application:
 - .1 Apply 2 plies of waterproofing membrane to prepared substrate.
 - .2 Lap waterproofing ends and edges 75 mm minimum. Roll waterproofing and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
 - .3 If more than one length is required on a vertical surface, apply in a shingle fashion.
 - .4 Terminate membrane using termination mastic or termination bar, reglet or counter flashing as indicated. Refer to manufacturers standard details.
 - .5 All laps within 300 mm inches of a 90 degrees change in plane are to be sealed with termination sealant.
- .3 Vertical application:
 - .1 Apply waterproofing membrane to prepared substrate.

- .2 Lap waterproofing ends and edges 75 mm minimum. Roll waterproofing and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
- .3 If more than one length is required on a vertical surface, apply in a shingle fashion.
- .4 Terminate membrane using termination mastic or termination bar, reglet or counter flashing as indicated. Refer to manufacturers standard details.
- .5 All laps within 300 mm inches of a 90 degrees change in plane are to be sealed with termination sealant.
- .4 At end of days' work, trowel mastic water cut-off along uppermost edge of incomplete waterproofing assembly, to prevent loss of adhesion and damage waterproofing.
- .5 Supply and install continuous mechanical fastening bar to clamp waterproofing both sides of unfilled gaps, cracks, and joints.
- .6 Supply and install protection board in accordance with detailed system, and manufacturer's instructions.

3.4 REPAIR

- .1 Repair misaligned or inadequately lapped seams, punctures, or other damage with additional ply of waterproofing sized to extend 150 mm minimum in all directions from repair edge.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for the thermal insulation work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

1.3 **SUBMITTALS**

- .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.
- .2 Certification: Submit installer's certification verifying compliance with specification requirements.

1.4 **QUALITY ASSURANCE**

- .1 Qualifications: Execute work of this Section by company specializing in thermal insulation work with minimum of three years, recent, documented experience, on work of comparable complexity and scope.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.
- .2 Semi-rigid stone wool insulation, exterior (**INS-1**): Semi-rigid stone wool conforming to ASTM C612 and CAN/ULC-S702, Type 1, minimum density 70 kg/m³, unfaced, thickness as indicated. 'CladStone 45' by Johns Manville, 'Thermafiber Rainbarrier 45' by Owens Corning, and 'CavityRock' by Rockwool.
- .3 Thermal batt stone wool insulation (**INS-2**): CAN/ULC-S702, Type 1, minimum density 45 kg/m³, unfaced, of thickness as indicated in drawings, friction fit. 'Unfaced Thermal and Sound Control Batts' by Johns Manville, 'ComfortBatt' by Rockwool, or approved alternative by Owens Corning Canada.

- .4 Acoustic batt stone wool insulation (**INS-3**): ASTM C665, Paperless, semi-rigid, spun stone wool fibre mats, minimum density 45 kg/m³, of thickness as indicated in drawings. 'MinWoolSAFB' by Johns Manville, 'SAFB Thermafiber' by Owens Corning Inc. or 'Rockwool AFB' by Rockwool
- .5 Concrete Faced Insulation Panel (**INS-4**): CAN/ULC S701, Type 2; Expanded polystyrene with ship-lapped edges, of thickness as indicated in drawings. Provide 8 mm thick fibre-reinforced cement face and manufacturer's standard fastening clips. 'Amgard Concrete Faced Perimeter Wall Panel' by Amvic Inc. , or approved alternative by T Clear Corporation or Tech-Crete.
- .6 Rigid insulation (**INS-5**): CAN/ULC-S701, Type 4; Minimum RSI of 0.87, Extruded polystyrene, ship-lapped edges, of thickness as indicated in drawings. 'Styrofoam SM' by Dupont de Nemours Inc., or 'Foamular NGX' by Owens Corning Canada Inc.
- .7 Thermal Cellulose loose fill Insulation (**INS-8**): blown or injected insulation to CAN/ULC-S703, containing a minimum of 80% recycled paper and cardboard, low VOC content, suitable for application by means of pneumatic blowing equipment to a minimum density of 25.6 kg/m³ (1.6 lb/ft³), of thickness as indicated in drawings. 'Sopra-Cell' by Soprema or approved alternative by ThermorShield or Procell.
- .8 Underslab insulation: in accordance with Structural documents
- .9 Insulation retainers: In accordance with Section 04 20 00

3 Execution

3.1 EXAMINATION

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- 2 Ensure substrate surfaces are dry, clean, suitable to receive adhesive and free from other deleterious substances.

3.2 INSTALLATION

- .1 Install thermal insulation in longest panel sizes possible in accordance with manufacturer's instructions.
- .2 Butt insulation with moderate contact and, cut and fit them tightly around other construction elements. Offset single layer vertical joints and both vertical and horizontal joints in multiple layer applications.,

- .3 Make thermal insulation continuous, maintain thermal protection continuity and secure to prevent displacement. Ensure that insulation is tight to substrate without air gaps.
- .4 Cut and fit thermal insulation tightly around electrical boxes, plumbing and heating pipes and ducts, exterior doors and windows, and other protrusions.
- .5 Leave 75 mm separation between thermal insulation and heat emitting devices such as recessed light fixtures.
- .6 Cut and trim thermal insulation neatly to fit spaces; do not compress insulation to fit. Install only thermal insulation boards which are free from chipped or broken edges.
- .7 Fill miscellaneous cavities with insulation to maintain continuity of thermal barrier. Do not compress insulation to fit.
- .8 Arrange for Consultant to review thermal insulation before it is enclosed.

3.3 SECUREMENT

- .1 Batt insulation (non-rated, fire-rated/acoustic):
 - .1 Install batt insulation in partitions, between studs, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions.
 - .2 Fill stud cavities to full height of partitions and carefully cut and fit required batt insulation type around services and protrusions.
- .2 Rigid insulation (Adhesive attachment):
 - .1 Apply adhesive to thermal insulation foam boards in accordance with manufacturer's recommendations.
 - .2 Omit adhesive bonding of foam board insulation over expansion and control joints.
- .3 Cavity wall insulation:
 - .1 Provide insulation tight to the inner wythe starting at the base of the wall in parallel courses with tight butt joints. Stagger end joints in adjacent course.
 - .2 Provide finish work level, plumb and true.
 - .3 Provide securement for cavity wall insulation with wedge type retainers in accordance with manufacturer's written instructions.
- .4 Perimeter foundation insulation:
 - .1 Exterior application: unless otherwise indicated, extend boards from top of foundation wall down to top of footing. Install on exterior face of perimeter foundation wall with clips and adhesive.
 - .2 Provide rigid insulation below grade and cement faced insulation with caulked joints extending down minimum 600 mm below finished grade. Caulking of cement faced insulation to be grey to match concrete face colour.

- .5 Loose Fibre Installation:
 - .1 Pneumatically place loose fibre insulation above ceiling between joists to provide minimum thermal resistance value RSI as indicated.
 - .2 Ensure roof areas exposed to outside air are insulated.
 - .3 Ensure unobstructed air circulation to eave vents.
 - .4 Install baffles as indicated to prevent insulation from spilling over top of exterior wall and causing blockage of soffit vents, and to prevent displacement of insulation by wind entering vents.
 - .5 Maintain building, electrical, gas and oil safety code clearances between the insulation and heat emitting devices, such as fuel burning appliances, chimney pipes, ducts and vents to these appliances and recessed light fixtures (at least 75 mm (3 in) from heat emitting devices and recessed light fixtures, and minimum 50 mm (2 in) from sidewalls of chimneys and vents) unless approved for insulation contact. Check with local building or fire officials for guidance on installation and barrier requirements.
 - .6 Use rulers to the ceiling joists in the attic, to indicate the insulation application thickness. The bottom of the ruler must be installed at the same level as the bottom of the Cellulose insulation. Use one ruler every 20 m² (200 ft²).

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for sprayed foam insulation work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM D1621, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
- .3 ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- .4 ASTM D1623, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- .5 ASTM D2842, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .6 ASTM D6226, Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
- .7 ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.
- .8 CAN/ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.
- .9 CAN/ULC S705.2, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.
- .10 CAN/ULC S770, Standard Test Method for Determination of Long-term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.3 **SUBMITTALS**

- .1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
- .1 Performance criteria, characteristics, and limitations.
- .2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating elevations, sections, materials, details of joint conditions, including door, window, entrance framing, flashings, and roof parapet connection.

- .3 Certificates: Submit the following certificates in accordance with Section 01 33 00:
 - .1 Applicator's current certificate of approval by CUFCA/NECA or BASF Canada's training program.
 - .2 Applicator's current certificate of approval from material manufacturer.

1.4 **QUALITY ASSURANCE**

- .1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of similar size and nature.
- .2 Contractor to be a certified member of the Canadian Urethane Foam Contractors Association/ National Energy Conservation Association (CUFCA/NECA) or be licensed under the BASF Canada Quality and Training Program "Raising Performance to New Heights" and in accordance with CAN/ULC S705.2 installation standard.
- .3 Provide quality assurance testing in accordance with CAN/ULC 5705.2. Record daily results in a log book for Consultant's review.
- .4 Provide adhesion tests on transition membranes, in accordance with manufacturer's written instructions, at the perimeters of all openings. If the project comprises more than 10 openings, adhesion tests should be conducted on 15% of them. For jobs comprising 10 or fewer openings, 30% of these should undergo adhesion tests. Adhesion tests should be performed on the transition membranes at every tenth column or beam.

1.5 **DELIVERY, STORAGE AND HANDLING**

- .1 Protect liquid from overheating 120°F/49°C and prolonged storage above 100°F/38°C.

1.6 **SITE CONDITIONS**

- .1 Do not install work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
 - .1 Ambient air and surface temperature: 5°C to 40°C.
 - .2 Relative Humidity: Above 85%.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 48 hours after installation.

2 **Products**

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

- .2 Sprayed foam insulation (**INS-6**): Sprayed/frothed polyurethane foam conforming to CAN/ULC S705.1. and containing no fluorocarbons and conforming to the following minimum requirements:
 - .1 Density (ASTM D1622): 28.9 kg/m³ (1.80 lb/ft³).
 - .2 Open cell content (ASTMD2856): 6%.
 - .3 Tensile strength (ASTM D1623): 325 kPa (47.1 psi).
 - .4 Compressive strength (ASTM D1621): 201 kPa (29.2 psi).
 - .5 Water absorption (ASTM D2842): 0.6% by volume.
 - .6 Water vapour permeance (ASTM E96): 50mm sample 41 ng/Pa s m² (0.68 perms).
 - .7 Flame spread: <500.
 - .8 Sprayed urethane foam: 'Walltite CM01' by BASF or approved alternative by Demilec Inc.
- .3 Primers: As recommended by sprayed foam insulation manufacturer.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

- .1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.
- .2 Provide ventilation in area to receive sprayed foam insulation, introducing and exhausting fresh air continuously during and for 24 hours after application.
- .3 Provide temporary enclosures to prevent spray from contaminating air beyond application area, and damage from overspray and dusting on adjacent surfaces.
- .4 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.
- .5 If required, apply primer to substrate surfaces in accordance with manufacturer's written instructions.

3.3 SPRAY INSULATION

- .1 Install insulation in accordance with manufacturer's written instructions and conforming to CAN/ULC S705.2.

- .2 Apply sprayed foam insulation to thickness indicated on drawings and to provide continuous air retarder in locations indicated on the Drawings. Apply insulation to within 3 mm of thickness indicated on drawings. Provide one measuring pin for every 50 m².
- .3 Apply insulation in maximum 50 mm pass thickness, with a minimum wait time between passes as recommended by manufacturer.
- .4 Insulation to be continuous, level, plumb and uniform thickness throughout. Insulation shall be free of voids and imbedded foreign materials.

3.4 INSPECTION AND TESTING

- .1 Arrange for third party site-inspection by approved company. Cost of inspections shall be included in bid price.
- .2 Site inspection shall be carried out at 5%, 50% and 95% completion to verify conformance with CAN/ULC S705.2, manufacturers written instructions and this Section.
- .3 Written inspection reports shall be forwarded to Consultant within three (3) working days of test being performed.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for vapour retarder work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM E1643, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .2 ASTM E1745, Standard Specification for Water Vapour Retarders used in contact with Soil or Granular Fill under Concrete Slabs
- .3 CAN/CGSB 19.21-M, Sealing and Bedding Compound, Acoustical.
- .4 CAN/CGSB-51.34-M, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.3 **SUBMITTALS**

- .1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
- .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
- .2 Product transportation, storage, handling and installation requirements.
- .2 Samples: Submit following samples in accordance with Section 01 33 00:
- .1 Two 300 x 300 mm samples of vapour retarders.
- .2 Two samples, 300 mm long, of fastening bar.
- .3 Duplicate samples of pipe and conduit boot.

1.4 **QUALITY ASSURANCE**

- .1 Mock-up:
- .1 Construct one 3 m² mock-up of vapour retarder in location acceptable to Consultant indicating as a minimum one lap joint, one inside corner, one window interface, and one electrical box.
- .2 Arrange for Consultant's review and acceptance.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .2 Pre-Installation meeting: Arrange meeting on Site to be attended by Consultant, Contractor, and vapour retarder manufacturer's representative to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect the surfaces to receive the vapour retarder, and installation procedures 48 hours in advance of installation.

1.5 **SITE CONDITIONS**

- .1 Do not install the work of this Section outside of environmental ranges as recommended by manufacturer without Consultant's and Product manufacturer's written acceptance.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Non vapour-permeable air barrier (**VRB1**):
 - .1 Membrane vapour retarder: 1.0 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film.
 - .1 'CCW 705' by Carlisle Coatings & Waterproofing.
 - .2 'Blueskin SA' by Henry Company Canada Inc.
 - .3 'Soprased Stick 1100 T' by Soprema.
 - .4 'Exo-Air 110' by Tremco.
 - .5 'Air-Shield' by W. R. Meadows.
 - .2 Primer:
 - .1 'Cav-Grip Primer' by Carlisle Coatings & Waterproofing.
 - .2 'Blueskin Adhesive' by Henry Company Canada Inc.
 - .3 'Elastocol Stick' by Soprema.
 - .4 'ExoAir Primer' by Tremco.
 - .5 'Mel-Prime' by W.R. Meadows.
 - .3 Mastic:
 - .1 'CCW 704 Mastic' by Carlisle Coatings & Waterproofing.
 - .2 'Polybitume 570-05' by Henry Company Canada Inc.
 - .3 'Sopramastic' by Soprema.
 - .4 'Acoustical Sealant' by Tremco
 - .5 'Sealtight Pointing Mastic' by W.R. Meadows.
 - .4 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.
 - .5 Fasteners: As specified herein or manufacturer's recommended fastener for attaching to Substrate.
- .3 Sheet vapour retarder (**VRB-2**) 'Super Six' Polyethylene film to CAN/CGSB-51.34, 0.15 mm (6 mil) thick.
 - .1 Joint sealing tape: Air resistant pressure sensitive adhesive tape, type recommended by sheet vapour retarder manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

- .2 Sealant: CAN/CGSB 19.21; One-part, non-sag, non-bleeding, non-drying, non-hardening, sealant shall remain tacky for permanent bonding to all surfaces; 'Tremco Acoustical Sealant' by Tremco Ltd. or approved alternative.
- .3 Ensure compatibility with installed products under section 07 27 00.
- .4 **Smart Vapour Retarder (VRB-4):** Polyimide film vapour retarder MemBrain by Certainteed, or approved alternative Majrex 200 by Siga, for use with unfaced, vapor permeable glass fiber and mineral wool insulation in ceiling assembly. Permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to greater than 10 perms using the wet cup method.
 - .1 **Water Vapor Permeance:**
 - a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).
 - b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).
 - .2 **Fire Hazard Classification: ASTM E 84**
 - a. Maximum Flame Spread Index; 25
 - b. Maximum Smoke Developed Index; 450

3 Execution

3.1 EXAMINATION AND COORDINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- 2 Verify that existing substrates to receive vapour retarder are clean, dry, sound, smooth, and continuous.
- 3 Coordinate installation of vapour retarders with work of other Sections to achieve a vapour tight building envelope.

3.2 SHEET VAPOUR RETARDER INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on the warm side of exterior wall assemblies, prior to installation of insulation or interior finishes to form a continuous vapour retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .5 At exterior surface openings, cut vapour retarder to form openings and ensure material is lapped and sealed to frame.
- .6 Ensure continuity of vapour retarder is maintained at junctures with other materials.

- .7 At perimeter seals, seal perimeter of sheet vapour retarder as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .8 Seal lap joints of sheet vapour retarder as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .9 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:
 - .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
 - .2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.3 FIELD QUALITY CONTROL

- .1 Inspect vapour retarder continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.
- .2 Where punctures and tears are extensive, replace entire damaged section.
- .3 Do not cover or permit to be covered any portion of vapour retarder until it has been inspected by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for under slab vapour retarders Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM E1643, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .2 ASTM E1745, Standard Specification for Water Vapour Retarders used in contact with Soil or Granular Fill under Concrete Slabs.

1.3 **SUBMITTALS**

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Samples: Submit following samples in accordance with Section 01 33 00:
 - .1 Two 300 x 300 mm samples of under slab vapour retarders.
 - .2 Duplicate samples of pipe and conduit boot.

1.4 **QUALITY ASSURANCE**

- .1 Mock-up:
 - .1 Construct one 3 m² mock-up of each type vapour retarder in location acceptable to Consultant indicating as a minimum one lap joint, one inside corner, one window interface, and one electrical box.
 - .2 Arrange for Consultant's review and acceptance.
 - .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 **SITE CONDITIONS**

- .1 Do not install the Work of this Section outside of environmental ranges as recommended by manufacturer without Consultant's and Product manufacturer's written acceptance.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.

2 Products

2.1 **MATERIALS**

- .1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Vapour retarder (**VRB-3**): ASTM E1745, Class A, 0.38 mm (15 mil) thick; 'Perminator' by W.R. Meadows or 'Stego Wrap Vapor Barrier' by Stego Industries.
 - .1 Joint sealing tape: High density polyethylene tape with pressure sensitive adhesive with minimum width 100 mm. Type recommended by sheet vapour retarder manufacturer.
 - .2 Pipe and conduit boots: Construct pipe and conduit boots from vapour retarder material and pressure sensitive tape as recommended by manufacturer.

3 Execution

3.1 **EXAMINATION AND COORDINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- .2 Verify that existing substrates to receive vapour retarder are clean, dry, sound, smooth, and continuous.
- .3 Coordinate installation of vapour retarders with work of other Sections to achieve a vapour tight building envelope.

3.2 **UNDER SLAB VAPOUR RETARDER INSTALLATION**

- .1 Install sheet vapour retarder under the floor slab prior to installation of floor slab, to form a continuous vapour retarder in accordance with ASTM E1643 and manufacturer's written instructions.
- .2 Lap vapour barrier over footings and seal to foundation walls.
- .3 Overlap joints 150 mm and seal with manufacturer approved sealing tape.
- .4 Seal all penetrations (including conduits and pipes) with manufacturer's pipe boot.
- .5 Use sheets of largest practical size to minimize joints.
- .6 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .7 Ensure continuity of vapour retarder is maintained at junctures with other materials.

3.3 FIELD QUALITY CONTROL

- .1 Inspect vapour retarder continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.
- .2 Where punctures and tears are extensive, replace entire damaged section.
- .3 Do not cover or permit to be covered any portion of vapour retarder until it has been inspected by Consultant.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products equipment and services necessary for air barrier Work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ASTM C920, Specification for Elastomeric Joint Sealants.
- .2 ASTM C1193, Standard Guide for Use of Joint Sealants.
- .3 ASTM E-779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- .4 ASTM E2178, Standard Test Method for Air Permeance of Building Materials.

1.3 DESIGN REQUIREMENTS

- .1 Design air barrier system to achieve a maximum air leakage rate of one air change per hour at a pressure of 50 Pa when tested in accordance with ASTM E-779.

1.4 SUBMITTALS

- .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating installation details, physical properties and detailed application and installation instructions.
- .2 Certificates and reports:
- .1 Submit manufacturer's certification that air barrier system materials and accessories supplied are compatible and meet Specification requirements, including termination with adjacent materials.

1.5 QUALITY ASSURANCE

- .1 Provide all air barrier membranes and associated accessories from a single manufacturer to ensure material compatibility.
- .2 Installer's qualifications: Perform Work of this Section by company, approved by Product manufacturer and having 5 years recent experience in Work of comparable complexity and scope.
- .3 Pre-installation meeting: Arrange meeting on Site to be attended by Consultant, Contractor, and air barrier manufacturer's representative to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect the surfaces to receive the air barrier, and installation procedures 48 hours in advance of installation.

.4 Mock-up:

- .1 Construct one 3 m² mock-up of air barrier in location acceptable to Consultant indicating as a minimum one lap joint, one inside corner, one window interface, and one penetration.
- .2 Arrange for Consultant's review and acceptance.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.6 **DELIVERY, STORAGE AND HANDLING**

- 1. Protect materials from direct exposure to sunlight and physical damage.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to be compatible and have low VOC content limits.
- .2 Vapour permeable air barrier (**AVP-1**): 23 mils thick, minimum water vapour permeance of 28 in accordance with ASTM E96, maximum air permeance 0.015 Lis m² in accordance with ASTM E2178, single-ply self adhering membrane consisting of engineered film and permeable adhesive with poly-release film; 'Blueskin VP160' by Henry Company Canada Inc. or approved alternative by Cosella-Dörken Products, Inc., or VaproShield.
- .3 Primer: Low VOC quick setting rubber based adhesive 'Blueskin LVC Adhesive' by Henry Company Canada Inc. or approved alternative by Cosella-Dörken Products, Inc. or VaproShield.
- .4 Sealant: ASTM C920, Type S, Grade NS, Class 25; Moisture sure, medium modulus polymer modified sealing compound 'HE925 BES' by Henry Company Canada Inc. or approved alternative by Cosella-Dörken Products, Inc. or VaproShield for their respective membranes.
- .5 Non-vapour-permeable air barrier transition membrane (**TRM-1**):
 - .1 Flashing membrane: 1.0 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film.
 - .1 'Blueskin SA' by Henry Company Canada Inc.
 - .2 'Air-Shield' by W. R. Meadows.
 - .2 Butyl flashing membrane: 100% solid, synthetic butyl, integrally laminated to polypropylene film; 'Blueskin Butyl Flash' by Henry Company Canada or approved alternative.
 - .3 Metal-clad flashing membrane: 1.0 mm thick, self adhering, self sealing, rubberised asphalt bonded to dual layers of polyolefin sheet with a metallic aluminum surface film; 'Blueskin Metal Clad' by Henry Company Canada or approved alternative.
- .6 Ensure compatibility with installed products under sections 07 26 00 and 07 11 00.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **APPLICATION**

- .1 Ensure surfaces to receive membrane are sound, dry, clean, and free from oil, grease, dirt, excess mortar or other contaminates.
- .2 Fill substrate voids, gaps, depressions, cracks, and joints with mastic or other approved fill material until continuous, smooth, substrate for air barrier is achieved.
- .3 Install mastic and sealant where required to ensure integrity of air barrier installation at protrusions and other complex details. Install sealant in accordance with ASTM C1193.
- .4 Install air barrier in accordance with reviewed shop drawings and manufacturer's instructions in locations indicated.
- .5 Lap air barrier ends and edges 50 mm minimum. Roll air barrier and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
- .6 Extend air barrier as required to connect to other components of work comprising air barrier system.
- .7 Provide end-dams and terminations fabricated from same material as air barrier or material recommended by membrane manufacturer at sills, lintels, openings, and where horizontal surfaces intersect with vertical surfaces to ensure moisture is shed to exterior.
- .8 Cut and fit air barrier as required for passage of protrusions, ensuring continuous adherence to substrate.
- .9 Seal around masonry reinforcing or ties and all penetrations.
- .10 At end of days' work, seal water cut-off along uppermost edge of incomplete air barrier assembly to prevent loss of adhesion and damage air barrier.
- .11 Do not expose air barrier to sunlight for more than 30 days prior to enclosure.

3.3 FIELD QUALITY CONTROL

- .1 Do not cover or permit to be covered any portion of the membranes until they have been inspected by the Consultant or by an inspection agency appointed by the Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for metal roof work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).
- .2 AAMA 2605, High Performance Organic Coatings on Architectural Extrusions and Panels
- .3 ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.
- .4 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .5 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .6 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board
- .7 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board
- .8 ASTM C920, Specification for Elastomeric Joint Sealants.
- .9 CAN/CGSB-1.40-M, Primer, Structural Steel, Oil Alkyd Type.
- .10 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- .11 CSA S136, Cold Formed Steel Structural Members.
- .12 CSA S136.1, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.
- .13 CAN3-S157-M, Strength Design in Aluminum.
- .14 CSA HA-Series-M, CSA Standards for Aluminum and Aluminum Alloys.

1.3 **DESIGN REQUIREMENTS**

- .1 Design metal roof system in accordance with CSA S136, S136.1 and Ontario Building Code, and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .2 Aluminum wall panel system to be standard building sheet alloy conforming to CSA HA Series -M.
- .3 General design to be based on CAN3-S157-M.

- .4 Design metal roof system in accordance with following Climatic Design
 - .1 Data for Cobourg contained in Ontario Building Code.
 - .1 Design Temperature: January 1%, July 2 ½%.
 - .2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.
 - .3 Movement caused by an ambient temperature range of 50 degrees C and a surface temperature range of 71 degrees C.
- .5 Design metal roof system to limit deflection under design loads, to L/240 tested to ASTM E1592.
- .6 Performance Requirements:
 - .1 Air leakage: Prefinished aluminum Maximum 0.048 CFM per square foot of roof area, measured at reference differential pressure across assembly of 40.0 PSF, tested to ASTM E1680.
 - .2 Water leakage: None, tested to ASTM E1646 at test pressure of 40.0 PSF.
- .7 Design metal roof system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design metal roof system to prevent vibration when subject to the effects of wind.
- .8 Design metal roof system to prevent water infiltration into the building through the cladding system under design wind loads specified by the Ontario Building Code. The assemblies shall provide:
 - .1 Such gaskets, baffles, overlaps, and seals as required to effectively prevent bulk water entry into the cavities of the system, and prevent entry of any water into building cavities.
 - .2 All openings must be effectively baffled or otherwise guarded to Minimize direct water entry, and entry of insects.
 - .3 Adequate drainage of water and condensate to exterior of cladding from rain screen cavity. Ensure weepers, vents and drain holes are located in such positions so as to permit free drainage of cavity.
- .9 Design clearance between components to allow for sufficient ventilation for wall rain screen assemblies to dry out.
- .10 Design miscellaneous, additional structural framing members and sag rods, required to complete metal roof system, where not indicated on Contract Drawings.
- .11 Design and fabricate brackets and anchorage devices so that when installed will compensate for unevenness and dimensional differences in structure to which they are secured.

1.4 SUBMITTALS

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.

- .2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
 - .1 Submit shop drawings, elaborated by the manufacturer, in accordance with Section 01 33 00 indicating:
 - .1 Illustrate products, installation, and relationship to adjacent construction.
 - .2 Roof plan indicating locations of panel colours and profiles, details, profiles, dimensions, thickness of materials, finishes, methods of joining, splice plate installation, arrangement of sheets, joints, and seams insect screens, pipe penetrations, special shapes, methods of anchoring, anchor and clip details, thermal and pressure clip details, types of sealants and gaskets, waterproof connections to adjoining work, details of other pertinent components of the work (i.e. siding and soffits, roof penetrations, membranes, etc), and compliance with design criteria and requirements of related work.
 - .3 Details indicating means of installation, including but not limited to direction of panel installation.
- .3 Samples:
 - .1 Submit samples in accordance with Section 01 33 00:
 - .1 600 x 600 mm samples of each colour roof system showing fully assembled components including face sheets, sub-girts, insulation, liner panel, thermal and pressure clips, and concealed sealant. Sample to be fabricated using exact colour and gauges specified. **Allow for minimum two submissions.**
 - .2 **Submit samples in tandem with those of sections 04 20 00, 07 46 19, 07 62 00, 07 71 23, 08 44 00, 08 53 13, 08 91 00 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.**
- .4 Reports:
 - .1 Submit written field inspection and test report results after each inspection.
 - .2 Substrate anchorage testing and inspection.
- .5 Extended warranty: Submit extended warranties signed and registered by the manufacturer providing the warranties in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 QUALITY ASSURANCE

- .1 Qualification: Perform work of this Section by a company specialized in this work that is a member in good standing of the CRCA and is a Certified Installer by the manufacturer with demonstrated factory and jobsite training. Company and foreman, with minimum 10 years demonstrated experience, and; any laborer, with minimum 5 years demonstrated experience, in standing seam metal roof work of comparable complexity and scope.
 - .1 Provide proof of current CRCA membership.

- .2 Provide proof of panel manufacturer factory and jobsite training certification.
- .3 Provide résumés of company, foreman and all and any laborers that will be performing the work. No foreman and or laborers for which résumé is not provided will be acceptable on site.
- .2 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for metal roof work:
 - .1 Design of metal roof work.
 - .2 **Design snow guards.**
 - .3 Sealed calculations for panel structural integrity by licensed engineer.
 - .4 Review, stamp, and sign shop drawings.
 - .5 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA standards and any other applicable standards and regulations related to the work".
 - .6 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of the Work is in accordance with Contract documents and reviewed shop drawings.
 - .7 Provide sign-off letter for Authorities Having Jurisdiction if requested by Consultant.
 - .8 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .3 Mock-up:
 - .1 Fabricate, deliver, and install one full scale, full length, mock-up of metal roof panel construction, minimum 4 panels wide, of each type of metal roof construction, in locations acceptable to Consultant.
 - .2 Demonstrate finishes, colours, panel transitions, 'knuckle' details and flashings at top, side and bottom at corners and with siding and soffit work, and overall quality of workmanship.
 - .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.
 - .4 **See section 07 46 19 for additional roof-to-wall/soffit mock-up requirements.**
- .4 Pre-installation meeting: Arrange with manufacturer's representative, Contractor, installer and Consultant to inspect substrates, and to review project conditions, manufacturer requirements, delivery and storage, staging and sequencing, installation procedures and protection of completed work 48 hours in advance of installation.
- .5 Roof system:
 - .1 Wind uplift resistance: Class 90, tested to UL 580.
 - .2 Solar Reflectance Index (SRI): Minimum 78 tested to ASTM C1549 and calculated in accordance with ASTM E1980.
 - .3 Energy Star certified for low slope.
 - .4 Fire hazard classification: Class A, tested to ASTM E108.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Stockpile 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. Cover components with opaque polyethylene sheet. Vent to allow air movement.
- .2 Protect metal and metal finishes to prevent damage during fabrication, storage, shipping, handling and installation. Do not remove materials from original packaging until ready for installation.

1.7 MAINTENANCE

- .1 Submit extra panels in maximum lengths used in installation, which are part of the same Production run as installed Products, in the following percentages of gross area covered:
 - .1 10% additional panels in all colours, finishes, shapes and profiles from manufacturer's standard range.
- .2 Provide one unopened can of touch-up paint for each colour provided.
- .3 Deliver to address as instructed by Owner for storage.

1.8 EXTENDED WARRANTY

- .1 Submit an extended warranty, co-signed by the Roof panels Subcontractor and the General Contractor, for metal roof work in accordance with General Conditions, except that warranty period is extended to 20 years from date of Substantial Performance of the Work.
 - .1 Warrant against defects in materials and workmanship: chipping, cracking, fading, delamination of panel finish, warping, twisting, joint, finish failure and water penetration.
 - .2 Coverage: Complete replacement including affected adjacent parts.
- .2 Manufacturer's finish Warranty: Provide manufacturer's written warranty naming Owner as beneficiary and covering finish degradation or failure of factory-applied exterior finish on metal roof work within the warranty period.
 - .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - .1 Failures include, but are not limited to, the following:
 - i. Structural failures including rupturing, cracking, or puncturing.
 - ii. Deterioration of metals and other materials beyond normal weathering.
 - .2 Warranty Period: 2 years from date of Substantial Completion.

- .2 Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - .1 Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - i. Color fading more than 5 Hunter units when tested in accordance with ASTM/D2244.
 - ii. Chalking in excess of a No. 8 rating when tested in accordance with ASTM/D4214.
 - iii. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - .2 Finish Warranty Period: 20 years from date of Substantial Completion.
- .3 Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - .1 Warranty Period: 20 years from date of Substantial Completion.

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 This specification is written on the basis of hidden fastener aluminum roof cladding systems by Morin Corporation. Specified products establish the minimum acceptable standards for the work of this Section. Approved roof panels consisting of similar configuration and components will be considered provided they meet the performance requirements systems listed in this Section and are deemed to be consistent with the roof panels indicated and components listed. Roof panels not meeting the performance requirements or not comprised of similar configuration and components will not be acceptable.

2.2 MATERIALS

- .1 All materials under work of this Section, including but not limited to, paints and sealants are to have low VOC content limits.
- .2 All Aluminum roof panels systems and components are to be provided by a single manufacturer to ensure a single source of responsibility for the Work of this Section and Section 07 46 19.
- .3 Prefinished aluminum roof – solid (**MTL-3**):
 - .1 Aluminum roof to ASTM B209, 3003-H14 alloy and temper; 51 mm seam height, 305 mm panel width, vertical orientation, one-piece, full height panels, as indicated on Drawings, 'Symmetry-12', with No Clip Relief, by Morin Corporation, or approved alternative.

- .2 Base metal thickness: Roll form panels from 0.050" / $\pm 1.29\text{mm}$ (16 ga.) minimum thick aluminum sheet. Panels to span full length of roof. Allow for site roll forming.
- .3 Finish and colour: 2 coat, coil coated fluoropolymer thermal setting enamel containing 70% PVDF resin, meeting requirements of AAMA 2605, minimum thickness 2.4 mil, colour to match "Dark Bronze". 'Fluoropon' by Sherwin-Williams, or approved alternative by PPG. **Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.**
- .4 Provide concealed Floating single piece anchor clip 'Symmetry Clip system', factory applied hot melt sealant and mechanically seamed.
- .5 Roof module: provide prefinished aluminum trim and custom break-formed closure panels to match MTL-1 profiles at all field-cut panel locations to minimize corner trim profile. Standard corner trim will not be acceptable.
- .4 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.
- .5 Hollow structural sections: CAN/CSA-G40.20/G40.21-M Grade 350W, Class H.
- .6 High Temperature Roof Underlayment (**HTRU-1**): Self-adhered rubberized waterproof roofing membrane underlayment, 'Blueskin PE200HT' by Henry Company.
- .7 Closure Strips: Closed cell rubber, minimum 1 inch thick, to match panel profile. Metal closure fabricated from same material, gage, and finish as panels.
- .8 Snow Guards: two-pipe, 25mm (1") diam., aluminum, snow bar system, 'DualGuard' by CMB Erectors, or approved alternative. Power-coated to match MTL-1 'Dark Bronze', or approved alternative of similar configuration and components by Terra Gen.
- .9 Insulation: In accordance with Section 07 21 00.
- .10 Fascia, trim, closures, and flashings: Material, base metal thickness, finish, colour, and fasteners to match roof material that the components are installed on or adjacent to unless otherwise indicated on Drawings. Minimum 0.76 mm base metal thickness. Provide custom profiles at noted locations as indicated on Drawings, segmenting is not permitted. Provide all colours and locations as indicated on Drawings.
- .11 Screw fasteners: ANSI B18.6.4, stainless steel Type 304. Exposed locations: With coloured nylon heads to match metal roof.
- .15 Primer paint: CAN/CGSB-1.40-M.
- .16 Isolation coating: Black bituminous coating, acid and alkali resistant material.
- .16 Joint backing: Product as recommended by roof sealant manufacturer.
- .17 Roof sealant: ASTM C920, Type S, Grade NS; One-part, ultra-low modulus, moisture curing silicone sealant, 790 Silicone by Dow Corning or Spectrem 1 by Tremco Ltd. Colour: As selected by Consultant.

Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Contractor shall arrange for testing of the capacity of the anchorage system into the plywood substrate assembly, to the approval of the Consultant. Submit an outline of the test method to be used for review and approval by the Consultant, prior to completing test on site.

3.2 STRUCTURAL FRAMING

- .1 Supply and install miscellaneous, additional structural framing members, required to complete metal roof system, where not indicated on Contract Drawings.
- .2 Additional structural framing to include, but no limited to, framing and blocking to support access hatches, bird netting, electrical equipment, roof penetrations, and security cameras.

3.3 HIGH TEMPERATURE ROOF UNDERLAYMENT LAYER

- .1 Install high temperature roof underlayment layer in accordance with manufacturer's written instructions.
- .2 Apply one ply underlayment horizontally over substrate.
- .3 Fasten each strip under overlapping strip to hold strip in position until roofing panels are installed.
- .4 Install layer so that it forms a continuous fabric layer over entire intended substrate area, allowing any water to drain down to away from openings.
- .5 Avoid blockages that would otherwise obstruct the water flow.
- .6 Starting at base of roof, unroll fabric layer horizontally across roof. Extend 150 mm over starting corner.
- .7 Fasten at top and bottom of roll within 50 mm of edge 300 mm on centre and at a maximum of 600 mm on centre in field.
- .8 Shingle next layers of fabric layer ensuring minimum 150 mm horizontal and minimum 300 mm vertical laps.
- .9 Ensure layer is slipped under bottom edge of penetration "skirt" and shingled over taped top edge.

.10 No penetrations are to be left in installed layer.

3.4 CLIP SYSTEM

- .1 Symmetry Series Clip:
 - .1 Install clip in accordance with reviewed shop drawings and manufacturer's written instructions.
 - .2 Install Z girts, fastened into structural framing beneath. Orient Z girts to drain water from cavity.
 - .3 Install sealant between clips and high temperature roof underlayment layer to seal screw penetrations.

3.5 ALUMINUM ROOF

- .1 Install aluminum roof in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Fasten panels using concealed panel clips.
- .3 Install panels in continuous lengths from eave to ridge without end joints.
- .4 Form seams using portable seaming machine.
- .5 Install closure strips per manufacturer's instructions at exposed panel edges.
- .6 Install snow guards at locations indicated in drawings.
- .7 Maintain sufficient distance/tolerances to dissimilar metal panels, such that they will not be in contact upon thermal movement of the building. Apply isolation coating where required, and/or contact may be expected.
- .8 Install insect screen in accordance with reviewed shop drawings and roof manufacturer's written instructions, at top and bottom of wall assembly unless otherwise indicated.
- .9 Maintain joints in exterior roof and soffit, plumb, true to line, tight fitting, hairline joints.
- .10 Attach metal roof system components to prevent warping, buckling, and deformation induced by restriction of thermal induced movement.
- .11 Damaged aluminum roof panels system, waviness, warp or distortion of finished work will not be accepted.
- .12 Install corner pieces, closures, flashings, etc, where shown and where required. Provide formed steel closures around penetrations.
- .13 Install aluminum roof panels with alignment of reveals and transitions between siding and soffit systems as indicated on Drawings.

- .14 Bed flashings, closures, and corner pieces in sealant to provide a weathertight installation.
- .15 Completed installation shall be free from rattles, wind whistles, noise due to thermal movement and other noises.
- .16 Installation Tolerances:
 - .1 maximum variation from plane: 3 mm over 3600 mm non-cumulative.

3.6 TOUCH UP

- .1 Touch up marred surfaces with air dry formulation to match pre-finished roof ~~only~~ if approved in writing by Consultant, otherwise remove and replace damaged metal roof.
- .2 Clean and touch up marred galvanized surfaces after installation, with zinc rich primer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for metal siding and soffit work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).
- .2 AAMA 2605, High Performance Organic Coatings on Architectural Extrusions and Panels
- .3 ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.
- .4 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .5 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .6 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board
- .7 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board
- .8 ASTM C920, Specification for Elastomeric Joint Sealants.
- .9 CAN/CGSB-1.40-M, Primer, Structural Steel, Oil Alkyd Type.
- .10 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- .11 CSA S136, Cold Formed Steel Structural Members.
- .12 CSA S136.1, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.
- .13 CAN3-S157-M, Strength Design in Aluminum.
- .14 CSA HA-Series-M, CSA Standards for Aluminum and Aluminum Alloys.

1.3 **DESIGN REQUIREMENTS**

- .1 Design metal siding and soffit system in accordance with CSA S136, S136.1 and Ontario Building Code, and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .2 Aluminum wall panel system to be standard building sheet alloy conforming to CSA HA Series -M.
- .3 General design to be based on CAN3-S157-M.

- .4 Design metal siding and soffit system in accordance with following Climatic Design
 - .1 Data for Cobourg contained in Ontario Building Code.
 - .1 Design Temperature: January 1%, July 2 ½%.
 - .2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.
 - .3 Movement caused by an ambient temperature range of 50 degrees C and a surface temperature range of 71 degrees C.
- .5 Design metal siding and soffit system to limit deflection under design loads, to L/240 tested to ASTM E1592.
- .6 Performance Requirements:
 - .1 Air leakage:
 - .1 Prefinished aluminum siding: Maximum 0.048 CFM per square foot of roof area, measured at reference differential pressure across assembly of 40.0 PSF, tested to ASTM E1680.
 - .2 Aluminum soffit: Maximum 0.008 CFM per square foot of roof area, measured at reference differential pressure across assembly of 40.0 PSF, tested to ASTM E283.
 - .2 Water leakage:
 - .1 Prefinished aluminum siding: None, tested to ASTM E1646 at test pressure of 40.0 PSF.
 - .2 Aluminum soffit: None, tested to ASTM E331 at test pressure of 40.0 PSF.
- .7 Design metal siding and soffit system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design metal siding system to prevent vibration when subject to the effects of wind.
- .8 Design metal siding system to prevent water infiltration into the building through the cladding system under design wind loads specified by the Ontario Building Code. The assemblies shall provide:
 - .1 Such gaskets, baffles, overlaps, and seals as required to effectively prevent bulk water entry into the cavities of the system, and prevent entry of any water into building cavities.
 - .2 All openings must be effectively baffled or otherwise guarded to Minimize direct water entry, and entry of insects.
 - .3 Adequate drainage of water and condensate to exterior of cladding from rain screen cavity. Ensure weepers, vents and drain holes are located in such positions so as to permit free drainage of cavity.
- .9 Soffit assemblies:
 - .1 Design soffit suspension system in accordance with manufacturer's printed directions and ASTM C754.
 - .2 Design soffit system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.
 - .3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

- .4 Design suspension system to support weight of electrical items such as lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.
- .5 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.
- .10 Design clearance between components to allow for sufficient ventilation for wall rain screen assemblies to dry out.
- .11 Design miscellaneous, additional structural framing members and sag rods, required to complete metal siding and soffit system, where not indicated on Contract Drawings.
- .12 Design and fabricate brackets and anchorage devices so that when installed will compensate for unevenness and dimensional differences in structure to which they are secured.

1.4 SUBMITTALS

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
 - .1 Submit shop drawings, elaborated by the manufacturer, in accordance with Section 01 33 00 indicating:
 - .1 Illustrate products, installation, and relationship to adjacent construction.
 - .2 Elevations indicating locations of panel colours and profiles, details, profiles, dimensions, thickness of materials, finishes, methods of joining, splice plate installation, arrangement of sheets, joints, and seams insect screens, access doors and cladding, special shapes, methods of anchoring, anchor and clip details, thermal and pressure clip details, types of sealants and gaskets, waterproof connections to adjoining work, details of other pertinent components of the work (i.e. roof, openings, wall penetrations, membranes, etc), and compliance with design criteria and requirements of related work.
 - .3 Details indicating means of installation, including but not limited to direction of panel installation.
- .3 Samples:
 - .1 Submit samples in accordance with Section 01 33 00:
 - .1 600 x 600 mm samples of each colour siding and soffit system showing fully assembled components including face sheets, sub-girts, insulation, liner panel, thermal and pressure clips, and concealed sealant. Sample to be fabricated using exact colour and gauges specified. **Allow for minimum two submissions.**

- .2 Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 62 00, 07 71 23, 08 44 00, 08 53 13, 08 91 00 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .4 Reports:
 - .1 Submit written field inspection and test report results after each inspection.
 - .2 Substrate anchorage testing and inspection.
- .5 Extended warranty: Submit extended warranties signed and registered by the manufacturer providing the warranties in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 QUALITY ASSURANCE

- .1 Qualification: Perform work of this Section by a company specialized in this work that is a member in good standing of the OMCA and is a Certified Installer by the manufacturer with demonstrated factory and jobsite training. Company and foreman, with minimum 10 years demonstrated experience, and; any laborer, with minimum 5 years demonstrated experience, in metal siding and soffit work of comparable complexity and scope.
 - .1 Provide proof of current OMCA membership.
 - .2 Provide proof of panel manufacturer factory and jobsite training certification.
 - .3 Provide résumés of company, foreman and all and any laborers that will be performing the work. No foreman and or laborers for which résumé is not provided will be acceptable on site.
- .2 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for metal siding work:
 - .1 Design of metal siding work.
 - .2 Sealed calculations for panel structural integrity by licensed engineer.
 - .3 Review, stamp, and sign shop drawings.
 - .4 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA standards and any other applicable standards and regulations related to the work".
 - .5 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of the Work is in accordance with Contract documents and reviewed shop drawings.
 - .6 Provide sign-off letter for Authorities Having Jurisdiction if requested by Consultant.
 - .7 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .3 Mock-up:
 - .1 Fabricate, deliver, and install one full scale, full length, mock-up of metal siding and metal soffit panel construction, including at vented attic areas (on South soffit and North tilted wall), edge detail between roof MTL-3 and wall cladding

MTL-1 siding on east elevation, edge detail at top of roof **MTL-3**, and edge detail at bottom of **MTL-3** with gutter and snowguard, minimum 8 panels wide, of each type of metal siding and soffit construction, in locations acceptable to Consultant.

- .2 Demonstrate finishes, colours, panel transitions, vertical and horizontal corner flashings at corners and with masonry work, corners with metal roofing, and overall quality of workmanship.
- .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .4 Pre-installation meeting: Arrange with manufacturer's representative, Contractor, installer and Consultant to inspect substrates, and to review project conditions, manufacturer requirements, delivery and storage, staging and sequencing, installation procedures and protection of completed work 48 hours in advance of installation.
- .5 Siding and Soffit system:
 - .1 Wind uplift resistance: Class 90, tested to UL 580.
 - .2 Solar Reflectance Index (SRI): Minimum 78 tested to ASTM C1549 and calculated in accordance with ASTM E1980.
 - .3 Energy Star certified for low slope.
 - .4 Fire hazard classification: Class A, tested to ASTM E108.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Stockpile 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. Cover components with opaque polyethylene sheet. Vent to allow air movement.
- .2 Protect metal and metal finishes to prevent damage during fabrication, storage, shipping, handling and installation. Do not remove materials from original packaging until ready for installation.

1.7 MAINTENANCE

- .1 Submit extra panels in maximum lengths used in installation, which are part of the same Production run as installed Products, in the following percentages of gross area covered:
 - .1 10% additional panels in all colours, finishes, shapes and profiles from manufacturer's standard range.
- .2 Provide one unopened can of touch-up paint for each colour provided.
- .3 Deliver to address as instructed by Owner for storage.

1.8 EXTENDED WARRANTY

- .1 Submit an extended warranty, co-signed by the siding and soffits Subcontractor and the General Contractor, for metal siding and soffit work in accordance with General Conditions, except that warranty period is extended to 20 years from date of Substantial Performance of the Work.

- .1 Warrant against defects in materials and workmanship: chipping, cracking, fading, delamination of panel finish, warping, twisting, joint, finish failure and water penetration.
- .2 Coverage: Complete replacement including affected adjacent parts.
- .2 Manufacturer's finish Warranty: Provide manufacturer's written warranty naming Owner as beneficiary and covering finish degradation or failure of factory-applied exterior finish on metal roof work within the warranty period.
 - .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - .1 Failures include, but are not limited to, the following:
 - i. Structural failures including rupturing, cracking, or puncturing.
 - ii. Deterioration of metals and other materials beyond normal weathering.
 - .2 Warranty Period: 2 years from date of Substantial Completion.
 - .2 Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - .1 Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - i. Color fading more than 5 Hunter units when tested in accordance with ASTM/D2244.
 - ii. Chalking in excess of a No. 8 rating when tested in accordance with ASTM/D4214.
 - iii. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - .2 Finish Warranty Period: 20 years from date of Substantial Completion.
 - .3 Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - .1 Warranty Period: 20 years from date of Substantial Completion.

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 This specification is written on the basis of aluminum siding and soffits systems by Morin Corporation. Specified products establish the minimum acceptable standards for the work of this Section. Approved siding and soffits systems consisting of similar configuration and components will be considered provided they meet the performance requirements systems listed in this Section and are deemed to be consistent with the siding and soffits indicated and components listed. Siding and soffits not meeting the performance requirements or not comprised of similar configuration and components will not be acceptable.

2.2 MATERIALS

- .1 All materials under work of this Section, including but not limited to, paints and sealants are to have low VOC content limits.
- .2 Prefinished aluminum siding – solid (**MTL-1**):
 - .1 Aluminum siding to ASTM B209, 3003-H14 alloy and temper; 51 mm seam height, 305 mm panel width, vertical orientation, one-piece, full height panels , as indicated on Drawings, 'Symmetry-12', with No Clip Relief, by Morin Corporation, or approved alternative.
 - .2 Base metal thickness: Roll form panels from 0.050" / ±1.29mm (16 ga.) minimum thick aluminum sheet. Panels to span full height of wall. Allow for site roll forming.
 - .3 Finish and colour: 2 coat, coil coated fluoropolymer thermal setting enamel containing 70% PVDF resin, meeting requirements of AAMA 2605, minimum thickness 2.4 mil, colour to match "Dark Bronze". 'Fluropon' by Sherwin-Williams, or approved alternative by PPG. **Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.**
 - .4 Provide concealed Floating single piece anchor clip 'Symmetry Clip system', factory applied hot melt sealant and mechanically seamed.
 - .5 Siding module: provide prefinished aluminum trim and custom break-formed closure panels to match MTL-1 profiles at all field-cut panel locations to minimize corner trim profile. Standard corner trim will not be acceptable.
- .3 Prefinished aluminum siding – perforated (**MTL-1a**):
 - .1 Same as MTL-1 with perforations, as follows:
 - .1 Gauge minimum as required by pattern and material.
 - .2 Standard perforation pattern as selected by the Consultant, providing 40% open area with 10 mm holes & 14 mm spacing,
- .4 Aluminum soffit – solid (**MTL-2**):
 - .1 Aluminum siding to ASTM B209, 3003-H14 alloy and temper; 38 mm panel depth, 305 mm panel width, one-piece, full height panels , as indicated in drawings, tongue and groove interlock, concealed floating [MIP] clip and fastener system, Matrix MX-6' by Morin Corporation, or approved alternative.
 - .2 Base metal thickness: Roll form panels from 0.050" / ±1.29mm (16 ga.) minimum thick aluminum sheet. Panels to span full length of soffit. Allow for site roll forming.
 - .3 Align seam pattern perpendicular to edge of soffit so that seams align with aluminum cladding seam.
 - .4 Finish and colour: 2 coat, coil coated fluoropolymer thermal setting enamel containing 70% PVDF resin, meeting requirements of AAMA 2605, minimum thickness 2.4 mil, colour to match "Dark Bronze". 'Fluropon' by Sherwin-Williams, or approved alternative by PPG. **Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.**

- .5 Aluminum soffit – perforated (**MTL-2a**):
 - .1 Same as MTL-2 with perforations, as follows:
 - .1 Gauge minimum as required by pattern and material.
 - .2 Standard perforation pattern as selected by the Consultant, providing 40% open area with 10 mm holes & 14 mm spacing,
- .6 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.
- .7 Hollow structural sections: CAN/CSA-G40.20/G40.21-M Grade 350W, Class H.
- .8 Z-girts and C channels: To CAN/CSA S136-M and CAN/CSA-G40.20/G40.21-M; Minimum 1.2 mm thick, Z275 galvanized. Depth as indicated on Contract Drawings. Z-girts to be thermally broken at mid-point of insulation thickness.
- .9 Thermal spacer clip system:
 - .1 Thermal spacer: Galvanized steel clip to ASTM A653/A653M with integral glass fibre reinforced polyamide thermal isolator pad, complete with fasteners and in depth as indicated on Contract Drawings; 'ISO Clip' by Northern Facades Ltd. or approved alternative.
 - .2 Fasteners for spacers and attachment to back-up construction: Corrosion resistant, types as recommended by thermal spacer manufacturer.
 - .3 Sealant: Type as recommended by thermal spacer manufacturer
- .10 Soffit suspension system material:
 - .1 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, 38 x 19 mm cold rolled, channels.
 - .2 Furring channels: ASTM C645; Formed from galvanized steel sheet, 22 mm winged flange type, cold rolled.
 - .3 Hanger wires: 4.1 mm minimum diameter galvanized pencil rod.
 - .4 Tie wire: 1.6 mm thick minimum diameter, soft annealed, galvanized steel wire.
- .11 Closure Strips: Closed cell rubber, minimum 1 inch thick, to match panel profile. Metal closure fabricated from same material, gage, and finish as panels.
- .12 Insulation: In accordance with Section 07 21 00.
- .13 Breathable fabriclayer:
 - .1 Double layer, coated polyester, water and UV resistant, breathable fabric layer with a nominal weight of 270g/m², in black colour; 'SRP Air Outshield UV' by SRP Canada Inc. or approved alternative.
 - .2 Fabric layer to be complete with tape and fasteners.
 - .3 For use behind perforated siding.
- .14 Fascia, trim, closures, and flashings: Material, base metal thickness, finish, colour, and fasteners to match siding material that the components are installed on or

adjacent to unless otherwise indicated on Drawings. Minimum 0.76 mm base metal thickness. Provide custom profiles at noted locations as indicated on Drawings, segmenting is not permitted. Provide all colours and locations as indicated on Drawings.

- .15 Screw fasteners: ANSI B18.6.4, stainless steel Type 304. Exposed locations: With coloured nylon heads to match metal siding.
- .15 Primer paint: CAN/CGSB-1.40-M.
- .16 Isolation coating: Black bituminous coating, acid and alkali resistant material.
- .16 Joint backing: Product as recommended by siding sealant manufacturer.
- .17 Siding sealant: ASTM C920, Type S, Grade NS; One-part, ultra-low modulus, moisture curing silicone sealant, 790 Silicone by Dow Corning or Spectrem 1 by Tremco Ltd. Colour: As selected by Consultant.
- .18 Insect screen: Corrugated strip of extruded polypropylene, 11 mm thick x 76 mm high; 'SV-3' by Cor-A-Vent Inc. or approved alternative.
- .19 Thermal Separation: Continuous 3 mm thick x 38 mm wide self adhering cork.

Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Contractor shall arrange for testing of the capacity of the anchorage system into the wood stud assembly, to the approval of the Consultant. Submit an outline of the test method to be used for review and approval by the Consultant, prior to completing test on site.

3.2 STRUCTURAL FRAMING

- .1 Supply and install miscellaneous, additional structural framing members, required to complete metal siding system, where not indicated on Contract Drawings.
- .2 Additional structural framing to include, but no limited to, framing and blocking to support access hatches, bird netting, electrical equipment, exhaust duct, and security cameras.

3.3 THERMAL CLIP SYSTEM

- .1 Thermal spacers and girts:
 - .1 Install thermal spacer in accordance with reviewed shop drawings and manufacturer's written instructions.
 - .2 Confirm thermal clip accommodates orientation of vertical and horizontal sub-framing.
 - .3 Clip thermal spacer to L-girt and fasten clip and girt to back-up structure, fastening through thermal spacer clip and into structure. Install sealant between clips and air/vapour retarder to seal screw penetrations.
 - .4 Position L-girts directly over thermal spacer before installation of fasteners.
 - .5 Completely install spacers, screws and sub-framing, prior to installing insulation

3.4 GIRTS AND CHANNELS

- .1 Notch Z girts and C channels as required to allow drainage of cavity.
- .2 Install Z girts, fastened into structural framing beneath. Orient Z girts to drain water from cavity.
- .3 Install C channels to frame openings such as doors, windows, and louvre openings, and orient channel webs to form heads, jambs and sills of openings.

3.5 SIDING INSULATION

- .1 Insulation: Install siding insulation in accordance with Section 07 21 00.

3.6 BREATHABLE FABRIC LAYER

- .1 Install breathable fabric layer in accordance with manufacturer's written instructions.
- .2 Install fabric layer so that it forms a continuous fabric layer over entire intended substrate area, allowing any water to drain down to away from openings.
- .3 Avoid blockages that would otherwise obstruct the water flow.
- .4 Starting at base of wall, unroll fabric layer horizontally across wall. Extend 150 mm over starting corner.
- .5 Fasten at top and bottom of roll within 50 mm of edge 300 mm on centre and at a maximum of 600 mm on centre in field.
- .6 Shingle next layers of fabric layer ensuring minimum 150 mm horizontal and minimum 300 mm vertical laps.
- .7 Ensure fabric layer is slipped under bottom edge of penetration "skirt" and shingled over taped top edge.

- .8 Seal top and sides with seam tape. Do not place vertical laps above windows.
- .9 No penetrations are to be left in installed fabric layer.

3.7 FASCIA, TRIM, CLOSURES, AND FLASHINGS

- .1 Install fascia and trim including inside and outside corners, flashing, edgings, cap strips, drips, under-sill trim, fillers, closure strips, starter strips, and window or door trim, carefully formed and profiled.

3.8 ALUMINUM SIDING AND SOFFIT

- .1 Install aluminum siding and soffit in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Maintain sufficient distance/tolerances to dissimilar metal panels, such that they will not be in contact upon thermal movement of the building. Apply isolation coating where required, and/or contact may be expected.
- .3 Install insect screen in accordance with reviewed shop drawings and siding manufacturer's written instructions, at top and bottom of wall assembly unless otherwise indicated.
- .4 Install panels in continuous lengths from eave to ridge without end joints.
- .5 Maintain joints in exterior siding and soffit, plumb, true to line, tight fitting, hairline joints.
- .6 Attach metal siding and soffit system components to prevent warping, buckling, and deformation induced by restriction of thermal induced movement .
- .7 Damaged aluminum siding and soffit panels system, waviness, warp or distortion of finished work will not be accepted.
- .8 Install corner pieces, closures, flashings, etc, where shown and where required. Provide formed steel closures around openings.
- .9 Install aluminum siding and soffit panels with alignment of reveals and transitions between roof system as indicated on Drawings.
- .10 Bed flashings, closures, and corner pieces in sealant to provide a weathertight installation.
- .11 Completed installation shall be free from rattles, wind whistles, noise due to thermal movement and other noises.
- .12 Installation Tolerances:
 - .1 maximum variation from plane: 3 mm over 3600 mm non-cumulative.

3.9 SOFFIT SYSTEM

- .1 Use stud, runner or angle sections for furring system. Adequately brace furring system to withstand expected negative and positive wind loads without detrimental effects.
- .2 Connect furring system to perimeter walls.
- .3 Recessed light fixtures which exert a load in excess of 48 kg/m² shall be suspended independent of soffit furring.
- .4 Prior to installation of suspension system confirm that heights called for on drawings can be maintained and that all recessed lighting can be accommodated.
- .5 Space stud or angle sections at maximum 1200 mm o.c. along runner channels and not more than 150 mm from ends to support weight of soffits and superimposed loads.
- .6 Where stud or angle spacing exceeds 1200 mm due to obstructions, increase size of main runner channels and hangers accordingly to sustain increased loading and span.
- .7 Where splices are necessary, lap stud members at least 200 mm and mechanically fasten. Splices in angles are not allowed. Avoid clustering or lining up splices.
- .8 Curved soffits provide additional support framing in concealed soffit spaces as required to meet wind loading requirements.
- .9 Runner Channels:
 - .1 Space runner channels at maximum 1200 mm o.c. and not more than 150 mm from boundary walls, interruptions in soffit continuity, and changes in direction.
 - .2 Run channels at right angles to structural framing members where splices are necessary, lap members at least 200 mm and wire each end with minimum double strand of tie wire. Avoid clustering or lining up splices.
 - .3 Mechanically fasten channels to suspension system in accordance with suspension system manufacturer's written instructions.
- .10 Cross Furring:
 - .1 Erect furring channels at right angles to runner channels.
 - .2 Space furring channels at 400 mm o.c. and not more than 150 mm from boundary walls, interruptions in soffit continuity and change in direction.
 - .3 Secure furring channels to each support with a double strand of tie wire or with clip approved by manufacturer of furring components. Splice joints by nesting and tying channels together.
 - .4 Furring channels shall be level to a maximum tolerance of 3 mm over 3600 mm non-cumulative.

.11 Install closure strips per manufacturer's instructions at exposed panel edges.

.12 Install panels in accordance with reviewed shop drawings and manufacturer's written instructions. Comply with system manufacturer's requirements regarding terminations at end of each days work and resumption of work.

Install continuous soffit vents in soffits as indicated on drawings to provide ventilation of concealed soffit spaces in accordance with OBC requirements.

3.10 JOINT BACKING AND SIDING SEALANT

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at siding system joints and perimeter for weathertight installation. Tool sealant to concave profile.

3.11 TOUCH UP

.1 Touch up marred surfaces with air dry formulation to match pre-finished siding only if approved in writing by Consultant, otherwise remove and replace damaged metal siding.

.2 Clean and touch up marred galvanized surfaces after installation, with zinc rich primer.

END OF SECTION

.1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for flashing and sheet metal work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 ASTM C1193, Standard Guide for Use of Joint Sealants.
- .4 ASTM C920, Specification for Elastomeric Joint Sealants.
- .5 CRCA Roofing Manual, Canadian Roofing Contractors Association.

1.3 **SUBMITTALS**

- .1 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
- .1 Proposed method of shaping, forming, jointing.
- .2 Fastening, and application of flashing and sheet metal work.
- .2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00:
- .1 50 x 50 mm samples of sheet metal material, colour and finish.
- .2 Representative sample section of prepainted metal flashing illustrating S locking jointing method, minimum 600 mm long.
- .2 **Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 46 19, 07 71 23, 08 44 00, 08 53 13, 08 91 00 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.**

1.4 **QUALITY ASSURANCE**

- .1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of similar size and nature.
- .2 Mock-up
- .1 Fabricate, deliver, and erect one full scale mock-up of each type of steel or aluminum flashing construction, in a location acceptable to Consultant.
- .2 Demonstrate finish, colours, flashing at bottom and top of brick, curtain wall header, roof transitions and quality of workmanship.
- .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

- .3 Pre-installation meeting: Arrange meeting on Site to be attended by Consultant and Contractor to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect substrates, and to review installation procedures 48 hours in advance of installation.

.2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, sealants and paints are to have low VOC content limits.
- .2 Prepainted sheet steel (**SMF-1**): ASTM A653/A653M; Classification LFQ, Grade A, Z275 zinc coating designation, 1.2 mm minimum base steel thickness, commercial quality, prefinished with Perspectra Series coating system by ArcelorMittal Dofasco, or WeatherXL by Vicwest Steel. Colour: Colour as selected by Consultant, allow for non-standard colour. No touch-ups will be accepted.
- .3 Aluminum sheet:
 - .1 Aluminum sheet (**ASMF-1**): ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.3 mm thick.
 - .2 Aluminum finish: 'Duranar XL' by PPG in accordance with AAMA 2605; Colour: to be selected by Consultant, allow for non-standard **custom** colour **to match those of sections 07 41 13 and 07 46 19**. No touch-ups will be accepted.
- .4 High temperature transition membrane (**TRM-1**):
 - .1 1.0 mm thick, high temperature composite sheet waterproof membrane, comprised of SBS modified bitumen with woven polyethylene reinforcement.
 - .2 Primer recommended by membrane manufacturer.
 - .3 High temperature waterproof membrane, 'CCW 300 HT' by Carlisle Coatings and Waterproofing, 'Blueskin PE200HT' by Henry Company Canada Inc. or 'Lastobond Shield HT' by Soprema.
 - .4 For use at metal flashings, parapet caps and any additional areas as indicated on Contract Drawings.
- .5 Plastic cement: Trowel grade asphalt mastic.
- .6 Sealant: ASTM C920, Type S, Grade NS, Class 25; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. 'CWS' by Dow Corning or approved alternative.
- .7 Starter strips: Starter strips to be continuous, of same material as flashing used, 1.2 mm thick.
- .8 Fasteners: Flat head roofing nails of length, type and thickness suitable for metal flashing application.
- .9 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

2.2 FABRICATION

- .1 Fabricate copings, flashings, curb counter flashings, starter strips, scuppers, down spouts and miscellaneous flashings in accordance with CRCA and to details shown.
- 2 Form prepainted sheet material at shop to shapes shown. Make end joints where adjacent lengths of metal flashing meet, in accordance with jointing method specified.
- 3 Form pieces in 2400 mm maximum practical lengths. Make allowance for expansion at joints.
- 4 Hem exposed edges 13 mm minimum on underside for appearance and stiffness. Mitre and seal corners with sealant.
- 5 Reglets and Cap flashing: Form flashings of as detailed and in accordance with CRCA. Provide slotted fixing holes and steel/plastic washer fasteners.
- 6 Gutters and downspouts:
 - .1 Form gutters and downspouts from prefinished aluminum sheet metal as shown on Contract Drawings, to meet CRCA requirements, and as follows:
 - .2 New roof gutters and downspouts, Type-1 and Type-2, Sizes and profiles as indicated in drawings.
 - .3 Existing roof to match existing.
 - .4 Provide goosenecks, outlets, strainer baskets and necessary fastenings.
 - .5 Include internal slope to downspout

.3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Install coping flashings, curb counter flashings, starter strips, scuppers, downspouts and miscellaneous flashings to details shown on the Contract Drawings and in accordance with CRCA.
- 2 Use concealed fasteners. Exposed fasteners such as pop rivets are not allowed.
- 3 Install continuous starter strips to present a true, non-waving, leading edge. Anchor to back-up for a rigid, secure installation.
- 4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.

- .5 Make end joints using an S lock joint. Execute by inserting end coping length in 25 mm deep S lock formed in end of adjacent length. Extend concealed portion of S lock 25 mm outwards and nail to substrate. Face nailing of joints will not be permitted.
- .6 Seal where necessary to form weathertight seal between flashing and adjoining surfaces and between flashing and other work. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed. Install sealant in accordance with ASTM C1193.
- .7 Insert metal flashing under cap flashing to form weathertight junction.
- .8 Caulk flashing at cap flashing with sealant.
- .9 Scuppers and downspouts:
 - .1 Fabricate and install scuppers and downspouts in accordance with reviewed shop drawing and manufacturer's written instructions. Seal joints watertight.
 - .2 Install downspouts and provide goosenecks back to wall. Secure downspouts to wall with straps at 1800 mm oc; minimum two straps per downspout.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services to furnish and install RHEINZINK Snap-Lock roof gutters, downspouts and accessories as shown in the construction documents and drawings.

1.2 **RELATED WORK**

- .1 This section shall be used in conjunction with the contract documents to establish the total requirements for the Nordic Steel Gutter rain drainage system:
- .1 Division 7 section included in the project specifications.
 - .2 The contract.
 - .3 Architectural drawings.
 - .4 Section 04 20 00 Unit Masonry.
 - .5 Section 07 41 13 Aluminum Roof Panels.
 - .6 Section 07 46 19 Aluminum Siding and Soffits.
 - .7 Section 07 62 00 Flashing and Sheet Metal.
 - .8 RHEINZINK-Gutter Systems Brochures:
 - 1. Gutter Installation Instructions Brochure 104655-RZ-USA.000.03.06
 - 2. Snap-Lock Gutter Installation and Soldering Instructions Brochure.
- .2 Use of this section without referencing and including all the above listed items may result in failure to execute basic requirements.

1.3 **REFERENCES**

- .1 ASTM A924 / A924M - 13 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .2 ASTM A370 Test Methods and Definitions for Mechanical Testing of Steel Products.
- .3 ASTM A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.
- .4 ASTM A635/A635M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements.
- .5 ASTM A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys.
- .6 ASTM E18 Test Methods for Rockwell Hardness of Metallic Materials.
- .7 ES-1 Wind Test for Metal Products Qualification ANSI/SPRI.
- .8 Architectural Sheet Metal Manual; 7th Edition for sizing components for rainfall intensity determined by a storm occurrence of 1 in 100 years and as required by Ontario Building Code.

1.4 SUBMITTALS

- .1 Shop drawings: Submit shop drawings of roof gutters and downspouts in accordance with Section 01 33 00 indicating:
 - .1 Typical floor plan, roof plan, elevations, roof eave/fascia details. Soffit section and wall plan anchoring details;
 - .2 Perimeter drain upstand locations, plug-in outlet and downspout locations, configurations, jointing methods, fastening methods, special component locations;
 - .1 Installation details, thickness, finishes, sizes, quantities and; fastenings types.
- .2 Samples: Submit the following samples in accordance with Section 01 33 00:
 - .1 Two minimum 300 mm long gutters and downspouts samples, including end cap, for each type of finish showing component design, finish, color, size, and configuration. Allow for minimum two submissions.
 - .2 Two snap lock mounting rail and bracket.
 - .3 Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 46 19, 07 62 00, 08 44 00, 08 53 13 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .4 Close-out submittals: Submit Aluminum work data for incorporation into the Operations and Maintenance Manual as part of Section 01 10 10.

1.5 QUALITY ASSURANCE

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of 10 years proven experience in the installations of a similar size and nature and that is approved by manufacturer.
 - 1. Provide installer's current certificate of approval by the material manufacturer as proof of compliance.
 - 2. Provide proof of experience.
- .2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in manufactured gutters and downspouts work of comparable complexity and scope to perform the following services as part of the work of this Section:
 - .1 Design of gutters and downspouts work.
 - .2 Support brackets of downspouts.
 - .3 Review, stamp, and sign shop drawings.
 - .4 Conduct On-Site inspections and prepare and submit inspection reports. Number and frequency of inspection to be sufficient to satisfy Engineer that Window Wall Work is being fabricated and installed in accordance with reviewed shop drawings and design intent.
 - .5 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter

.3 Site mock-up:

- .1** Provide one full scale in-situ mock-up for testing of water collection to Architectural Sheet Metal Manual; 7th Edition to the satisfaction of an Consultant. If a test fails, additional testing may be required by Consultant to ensure performance of gutters and downspouts Work at no additional cost to Owner.
- .2** Deliver and erect one, full scale mock-up of Aluminum workassembly, in location acceptable to Consultant.
- .3** Demonstrate conformance to specified design requirements.
- .4** Demonstrate installation procedures, finished look and quality of workmanship including, but not limited to, framing members, glazing units, anchorage, opening units, doors and transitions to adjoining assemblies and materials.
- .5** Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

Pre-installation meetings:

- .1** Mock-ups: Prior to installation of mock-ups, arrange meeting at the shop and on Site to be attended by Consultant, Construction Manager, and window wall Engineer and site superintendent to inspect substrates, and to review installation procedures 48 hours in advance of installation.
- .2** Site: Prior to installation of window wall, arrange meeting at the Site to be attended by Consultant, Construction Manager, and window wall Engineer and site superintendent to inspect substrates, and to review installation procedures 2 weeks in advance of installation

1.6 DELIVERY, STORAGE, AND HANDLING

- .1** Deliver, store, and handle wood doors in accordance with the AWS Quality Standards amended as follows:
 - .1** All material shall be covered and protected during transit to protect all coated finishes.
 - .2** All material shall be delivered to the work site including shipping documents and packing list showing manufacturer.
 - .3** All material shall be stored on work site on elevated platform and protected from damage to coated finishes. Stack material restrained vertically. Prevent twisting, bending, or abrasion. Keep dry and provide ventilation.
 - .4** Prevent contact with materials during storage and installation which may cause discoloration, staining or Damage.

1.7 PROJECT CONDITIONS

- .1** Coordinate the work with perimeter drain tile upstand pipe location.

1.8 EXTENDED WARRANTY

- .1** Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

- .2 Material Only Warranty: provide 20 year limited warranty, commencing from date of Substantial Performance, for Titanium-Zinc alloy from original rolling mill manufacturer. Warranty to cover the material quality of the sheet/ coil material used to fabricate sheet metal flashing & trim profiles appropriate for zinc installation.
- .3 Installation Warranty: provide 10 year guarantee, commencing from date of Substantial Performance, covering the proper material or product application preventing failure due to hot-water corrosion, damage due to inappropriate slip sheet, absorptive separation material, or other installer induced failure.

2 Products

2.1 **ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)**

- .1 This specification is written on the basis of gutters and downspouts systems by Rheinzink. Specified manufacturer's products establish the minimum acceptable standards for the work of this Section. Approved gutters and downspouts systems consisting of similar configuration and components by Lindab, KROP gutter systems, or Zambelli will be considered provided they are deemed to be consistent with the gutters and downspouts systems indicated and components listed below. Gutters and downspouts systems not comprised of similar configuration and components will not be acceptable.
- .2 All gutters and downspouts work systems and components are to be provided by a single manufacturer to ensure a single source of responsibility for the Work of this Section.
- .3 Gutters and Downspouts:
 - .1 6" Pre-weathered Half-round Snap-Lock Gutter System with powder coated aluminum fascia mounting rail and snap-lock brackets.
 - .2 4" round downspouts. Standard downspout profile to be smooth (without corrugations) with expanded hub ends for clean, tight, friction fit connections.
 - .3 Titanium Zinc Alloy: Rheinzink 99.995% pure electrolytic high-grade zinc alloyed with titanium and copper in accordance with ASTM B69-13-Type 1 and Type 2.
 - .4 Surface: Standard Pre-weathered Rheinzink Granum Basalte 0.8mm "No Pro" coated material for gutters, downspouts and prefabricated accessories unless noted otherwise.
 - .5 Colours: Factory-Coated Route: RHEINZINK-artCOLOR & COLOR LIN. Allow for non-standard custom colour to match those of sections 07 41 13 and 07 46 19. Field painting will not be acceptable. Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.

2.2 **COMPONENTS**

- .1 Gutters: 6" Half-round Profile as indicated on drawings.
- .2 Downspouts: 4" smooth plain round profile to fit corresponding gutter size. All downspouts, elbows, offsets and downspout accessories must be high frequency welded.
- .3 Plug in Outlets: Funnel inlets at transition between half-round gutter and downspouts.
- .4 Smooth Round Elbows 60° or 72° without corrugations.

- .5 Prefabricated roof drainage accessories:
 - .1 Starter Flashing.
 - .2 Leaf Collector and Rainwater Diverter 4".
 - .3 Rainwater Collector w/ Garden Hose Connector 4" Gardena.
 - .4 Half-round Leaf Guard 6".
 - .5 Half-round gutter expansion joint 6".
 - .6 Leader Head w/ 4" round outlet.
 - .7 Gutter End Caps 6".
 - .8 Spherical End Caps 6".
 - .9 Plug in Outlet.
 - .10 Drain Tile Extension 4".
 - .11 Offset 4".
 - .12 Wire Strainer
- .6 Anchors and Supports: Sized to suit gutters and downspouts:
 - .1 Anchoring Devices: In accordance with Rheinzink and SMACNA requirements.
 - .2 Gutter Supports: Rheinzink Extruded Aluminum Snap-Lock Mounting Rail, Rheinzink Mounting Rail Straps, and Rheinzink Cast Aluminum Snap-Lock Brackets.
 - .3 Downspout Supports: Prefabricated two piece Rheinzink Downspout Brackets or Rheinzink Hidden Downspout Hangers.
- .7 Fasteners:
 - .1 Stainless steel lag bolts with flat washer for attaching Snap-Lock Mounting Rail.
 - .2 Rheinzink stainless steel lag bolt for Hidden Downspout Hangers.

2.3 **ACCESSORIES**

- .1 Solder: 50-50 (lead-tin) low antimony solder.
- .2 Soldering Flux: ZD-pro by Felder.

3 Execution

3.1 **INSPECTION**

- .1 Verify existing conditions before starting work. Notify General Contractor of any conditions unsuitable for gutter installation.
- .2 Examine fascia board to ensure that substrate alignment is straight, level, & plumb and adequate for fastening to transfer structural loads. Determine if sloped gutter installation is required. Otherwise, provide level or minimal pitch to drain (1/16" per foot) unless otherwise directed by General Contractor.

3.2 GUTTER and OUTLET INSTALLATION - SNAP-LOCK BRACKET SYSTEM

- .1 Adequately screw [mounting rail with its long leg up, through fascia board and into rafter tail framing or blocking. Provide 0.25" space (for thermal expansion) alignment clips between adjacent mounting rails. For non-fascia installations: Insert mounting rail straps into holes at mounting rail and twist and lock straps to mounting rail. Screw straps to sides of exposed rafter tails. Ensure that rail is level or slightly sloped downward toward drainage outlet.
- .2 Insert and Twist Rheinzink Snap-Lock gutter brackets into position at spacing not to exceed 32" O.C. or lesser spacing as determined by project gutter load requirements.
- .3 Place half-round gutter into bracket supports, nest water check into bracket heel, and snap gutter bead into place. Shingle lap adjacent gutter sections 3/8" (10mm) to drain and solder additional sections of half-round gutter up to a maximum of 49' of straight unrestrained runs. Provide expansion capability within 25' of any fixed end using expansion joints or sliding joint centered over plug-in outlet locations.
- .4 Solder prefabricated gutter corners as required by roof geometry and drawings. Conceal gutter joints at gutter brackets.
- .5 Mark plug-in outlet locations of downspouts. Cut elongated oval hole in gutter at gutter low point, slightly smaller than required funnel opening. Bend cut zinc outlet edges down with mallet to provide drip edge transition from gutter to plug-in outlet. Allow space for gutter to move relative to outlet top due to thermal changes.
- .6 Fit prefabricated gutter plug-in outlet onto gutter at round cut opening. Bend back flanges over watercheck to fit half-round gutter and support plug-in unit. Friction fit installation suggested.]

.3 DOWNSPOUT INSTALLATION

- .1 Attach elbows beginning at gutter plug-in outlet. Friction fit connections without use of rivets, screws, solder, sealant, or adhesive. Install hanger at offset elbow at wall if concealed hanger is used, otherwise shim clamp below expanded portion of topmost downspout run using half bead. Install all hangers at same height on building. Vary heights at grade location only. Use continuous long lengths. For partial downspout sections, utilize downspout expanding tool attachment with electric drill to form female hub connection.

- .2 Connect downspouts to perimeter drains and storm sewer system where applicable.
- .3 For surface drainage, install prefabricated elbow 6" above finish grade for splash block installation by landscape contractor.

3.4 ACCESSORIES INSTALLATION

- .1 Provide leaf guard accessories to gutter systems as loose fit installations.
- .2 Provide leaf collector to downspouts on main runs connected to perimeter drains with clean-out height at 4'0" above grade or to fit rain barrel height.
- .3 Provide Rainwater diverter to accommodate remote rain barrel location where specified.

3.5 RECYCLING

- .1 Collect, store and return Rheinzink scraps to local metal recycler.

END OF SECTION

COLD SMOKE SEAL DETAIL

THIS COLD SMOKE SEAL DETAIL REPRESENTS A DETAIL THAT
WOULD BE EXPECTED TO IMPEDE THE PASSAGE OF COLD SMOKE

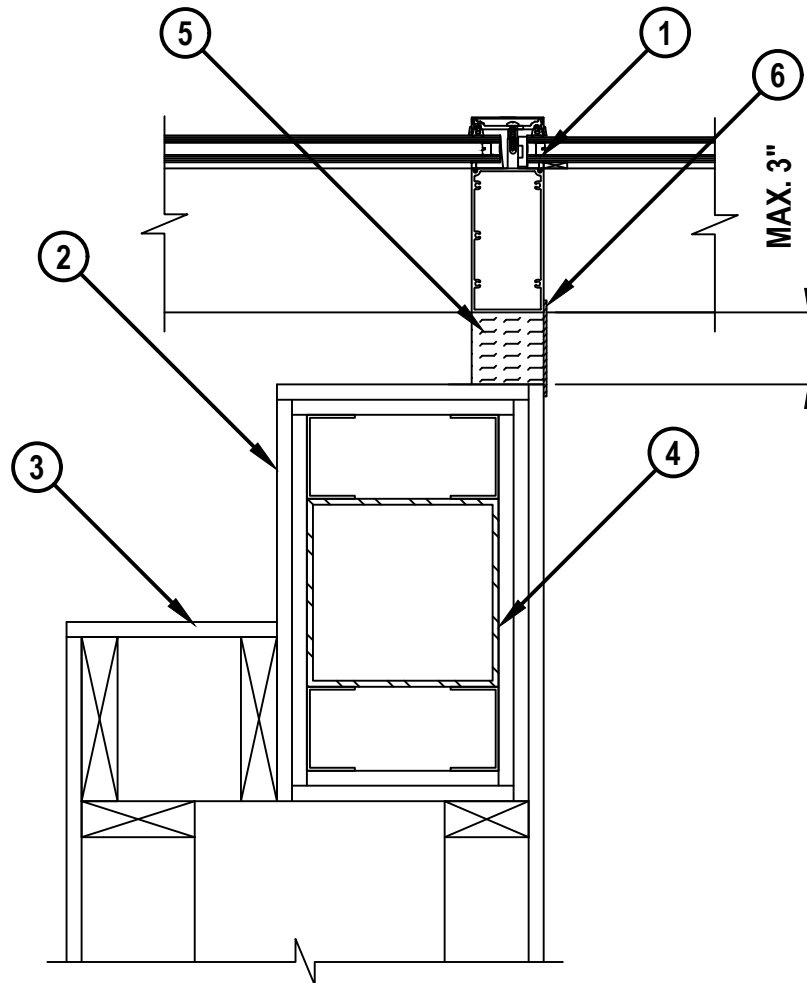
PROJECT : ONTARIO ABORIGINAL HOUSIJNG SERVICES
ADDRESS : 321 JOHN STREET, COBOURG, ON K9A 1G8

ISSUED TO : LGA ARCHITECTURAL PARTNERS LTD

Ratings

F-RATING = 0-HR.

TOP VIEW



HILTI, Inc.
Plano, Texas USA (800) 879-8000

Designed by Hilti FPE

Shazi Shahabi

Shazi Shahabi

Drafter

JG

Sheet

1 of 2

Scale

1/8" = 1"

Date

June 17, 2026

Drawing No.

728568a

Saving Lives through Innovation and Education

COLD SMOKE SEAL DETAIL

THIS COLD SMOKE SEAL DETAIL REPRESENTS A DETAIL THAT
WOULD BE EXPECTED TO IMPEDE THE PASSAGE OF COLD SMOKE

PROJECT : ONTARIO ABORIGINAL HOUSIJNG SERVICES
ADDRESS : 321 JOHN STREET, COBOURG, ON K9A 1G8

ISSUED TO : LGA ARCHITECTURAL PARTNERS LTD

Ratings

F-RATING = 0-HR.

1. SPANDREL OR VISION GLASS AND ALUMINUM MULLION CURTAIN WALL ASSEMBLY (NON FIRE-RATED).
2. GYPSUM BOX ENCLOSURE BUILT PER AUTHORITY HAVING JURISDICTION (1-HR. OR 2-HR. FIRE-RATING).
3. GYPSUM WALL ASSEMBLY (UL/cUL CLASSIFIED) (FIRE-RATED OR NON FIRE-RATED).
4. MAXIMUM 8" X 8" X 1/4" HSS TUBE (NON-RATED).
5. MINERAL WOOL SAFING (MIN. 4 PCF DENSITY) COMPRESSED 25% FLUSH WITH MULLION.
6. MINIMUM 1/8" (WET) THICKNESS HILTI CFS-SP WB FIRESTOP JOINT SPRAY OR MINIMUM 2mm (WET) THICKNESS HILTI CFS-SP SIL FIRESTOP SILICONE JOINT SPRAY TO COMPLETELY COVER MINERAL WOOL, OVERLAPPING MINIMUM 1/2" ONTO ADJACENT ASSEMBLIES.

NOTES :

1. MAXIMUM WIDTH OF JOINT = 3".
2. WHERE JOINTS OCCUR BETWEEN ADJACENT LAYERS OF GYPSUM BOARD, ADDRESS JOINTS PER THE REQUIREMENTS OF THE GYPSUM MANUFACTURER.

Referenced Tested Systems

(REFERENCE : UL/cUL SYSTEM NO. WW-D-0040 & WW-D-1084; cUL SYSTEM NO. HW-D-1002;
INTERTEK DESIGN NO. HI/BP 60-01)

Project Application Details

CSO0055171

Applicable Test Method

N/A



HILTI, Inc.
Plano, Texas USA (800) 879-8000

Designed by Hilti FPE

Shazi Shahabi

Shazi Shahabi

Drafter

JG

Sheet

2 of 2

Scale

-

Date

June 17, 2026

Drawing No.

728568a

Saving Lives through Innovation and Education

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for spray applied fireproofing work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ASTM E605, Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.
- .2 ASTM E814, Methods of Fire Tests of Through-Penetration Fire Stops.
- .3 CAN/ULC S101, Standard Methods of Fire Endurance Test of Building Construction and Materials.
- .4 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .5 Technical Manual 12-A, Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials by Association of the Wall and Ceiling Industry (AWCI).
- .6 ULC (Underwriters' Laboratories Canada) Fire Resistance Ratings.

1.3 DESIGN REQUIREMENTS

- .1 Design fireproofing for structural members, floor/ceiling assemblies, and floor/roof assemblies as unrestrained unless otherwise specifically noted as restrained on the structural drawings.
- .2 Design thickness of applications to suit required fire resistance ratings as indicated on the drawings.
- .3 Apply fireproofing in accordance with applicable UL/ULC listing.

1.4 SUBMITTALS

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 10 10 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.

- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Spray fireproofing materials, core thicknesses.
 - .2 Floor plans and sections indicating locations and types of all conditions.
 - .3 Products per system, identifying the assembly, system No. product and material.
 - .4 Individual systems ULC product design cut sheets and product data sheets.
- .3 Certification:
 - .1 Submit certified documentation for Company and each worker performing Work of this Section, to substantiate 5 years minimum of experience in sprayed fireproofing installation.
 - .2 Submit installer's and Product manufacturer's certification verifying compliance with Contract Documents.
 - .3 For assemblies not tested and rated in accordance with CAN/ULC S101 and CAN/ULC S102, submit proposals based on related designs using accepted fireproofing design criteria.
 - .4 Submit manufacturer's inspection reports and verification/certification that work has been correctly installed.
 - .5 Documentation for Approval by Authorities: Submit sufficient documentation to satisfy the authorities having jurisdiction that the insulation meets OBC requirements. Include ULC Approval Numbers where applicable.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
 - .1 Review and confirm all fireproofing listings are suitable to the designated applications.
 - .2 Review, stamp, date and sign shop Drawings.
 - .3 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .4 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .2 Qualifications: Execute work of this Section by manufacturer-approved, skilled, qualified, and experienced workers, trained in installation of work of this Section.
- .3 Mock-up:
 - .1 Construct one 3 m² mock -up of fireproofing in location acceptable to Consultant.
 - .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
 - .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

- .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.
- .4 Regulatory Requirements: Be responsible for securing approval of materials and installation of work from authority having jurisdiction:
 - .1 Perform work in compliance with ULC or cUL listed designs for the required fire resistance ratings.
 - .2 Submit signed engineering proposals to Authority having Jurisdiction for acceptance if there are no listed designs that match project conditions.
 - .3 Perform tests required by Authorities having Jurisdiction.
- .5 Manufacturer's Site Inspection: Manufacturer's technical representative shall inspect work at suitable intervals during application and at conclusion of work of this Section, to ensure work is correctly installed.
- .6 Inspection and Testing:
 - .1 Conduct on-site inspections by an inspection and testing company/laboratory acceptable to the Consultant. Test fireproofing as applied, to verify substrate preparation and thickness of fireproof coating in accordance with ASTM E605. Inspections shall be carried out prior to first and after topcoat applications.
 - .2 Prepare and submit written inspection reports of all inspections and final report verifying that this part of the Work is in accordance with Contract Documents, reviewed shop drawings and ASTM E605. Final report to be sealed by Professional Engineer, licensed in the Province of Ontario.
 - .3 The Consultant, on behalf of the Owner, may appoint an independent inspection and testing company/laboratory to carry out inspection and testing.
- .7 Correct deficiencies and have such corrected work retested and approved by testing laboratory/company, and independent inspection and testing company/laboratory (if applicable), before work is continued, at no additional cost to the Owner.

1.6 SITE CONDITIONS

- .1 Maintain a SOC air and substrate temperature for 24 hours before, during, and 24 hours after application in accordance with manufacturer's instructions.
- .2 Ventilate to dry fireproofing. In enclosed areas circulate interior air and exhaust to the exterior.
- .3 Protect adjacent surfaces and equipment around application areas from overspray, marring or damage. Clean, polish or replace materials damaged to acceptance of Consultant.
- .4 Provide temporary enclosures to prevent spray from contaminating air beyond the application area. Comply with the requirements of the Material Safety Data Sheets (MSDS).

2 Products

2.1 MATERIALS

- .1 All materials under work of this Section, including but not limited to, primers, adhesives, paints, and sealers are to have low VOC content limits.
- .2 Primer: Primed/unprimed as recommended by spray fireproofing manufacturer, as required.
- .3 ~~Spray fireproofing~~ **Applied Fire Resistive material (SFRM)** (wet/exterior areas, or exposure to weather conditions during construction): CAN/ULC S101, Spray applied, cementitious fireproofing with a minimum density of 256 kg/md:
 - .1 'Southwest Type SGP' by A/D Fire Protection Systems Inc.
 - .2 'Blaze-Shield II' by Cafco Industries Ltd.
 - .3 Or approved alternative by Hilti Inc.
- .4 ~~Spray fireproofing~~ **Applied Fire Resistive material (SFRM)** (dry/interior areas): CAN/ULC S101, Spray applied, gypsum- based fireproofing with a minimum density of 240 kg/m':
 - .1 'Cafco 300' by Cafco Industries Ltd.
 - .2 Or approved alternative by A/D Fire Protection Systems Inc. or Hilti Inc.
- .5 Sealer: Latex based emulsion:
 - .1 'A/D Sealer' by A/D Fire Protection Systems Inc
 - .2 'Bond-Seal' by Cafco Industries Ltd
 - .3 Or approved alternative by Hilti Inc.
- .6 Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire resistance designs acceptable to Authority having Jurisdiction and fire resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.
- .7 Water: Clean, free from organic and mineral impurities which would be harmful to application.
- .8 Ensure compatibility with installed products under sections 07 81 23 and 07 85 00.

2.2 MIXING

- .1 Mix Products in accordance with manufacturer's instructions.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that substrates are compatible and have suitable bonding characteristics to receive fireproofing.
- .3 Ensure written confirmation is received from steel fabricators of the specific surface preparation procedures and primers used to ascertain compatibility with work of this Section.
- .4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.
- .5 Ensure that ducts, piping, equipments, or other items which would interfere with application of fireproofing are not positioned until fireproofing is completed.
- .6 Verify that the fireproofing Products are compatible with the other fireproofing Products being used in the project, in contact or adjacently.
- .7 Ensure that primers, coatings and surface preparation of structural steel, steel joists and steel deck are compatible and have suitable bonding characteristics to receive fireproofing.
- .8 If compatibility tests indicate that the specified material is not compatible with other fireproofing Products being used in the project, substitute a material at no additional cost to the Contract. Do not use a Type I material compatible in exterior locations.

3.2 **PREPARATION**

- .1 Prime substrates where required by ULC or by sprayed fireproofing material manufacturer, unless compatible shop primer has been applied and is in satisfactory condition to receive work.
- .2 Clean surfaces of steel members free of dust, dirt, oil, grease, loose paint, mill scale, rust and other foreign matter in accordance with manufacturers written instructions which would interfere with bond of fireproofing. Steel to receive fireproofing should have no primers or coatings applied to the surface prior to application.
- .3 Install metal lath where required to comply with fire resistance ratings and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

- .4 Coat substrates with bonding adhesive where required to achieve fire resistance rating or as recommended in writing by spray fireproofing manufacturer for material and application indicated.
- .5 Use temporary enclosures to prevent spray from contaminating air beyond application area. Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing material. Protect walls, windows, floors and other surfaces around areas to be fireproofed, from marring or damage.

3.3 APPLICATION

- .1 Apply fireproofing in separate coats in accordance with the manufacturer's written instructions to total thickness required to achieve fire ratings shown on the Contract Drawings. Comply with accepted ULC or Intertek Testing Services design.
- .2 Apply fireproofing on steel over 2000 mm long as indicated or as required by authorities having jurisdiction.
- .3 Maintain continuity of fireproofing without gaps or voids.
- .4 Water tamping: Provide low pressure spray to finished surface of fireproofing to provide dense, medium smooth surface.
- .5 Apply sealer to surfaces of fireproofing in accordance with the manufacturer's instructions after tamping.
- .6 Repair fireproofing damaged by other trades, to acceptance of Consultant.

3.4 FIELD QUALITY CONTROL

- .1 Perform field tests as required by Authorities having Jurisdiction. Tests to be carried out as outlined in Technical Manual 12-A by AWCI and UL 1479.

3.5 CLEANING UP

- .1 Clean exposed wall, ceiling or other surfaces of fireproofing materials to the acceptance of Consultant.
- .2 Upon completion of the installation remove from the premises all surplus material, dirt and debris caused by the work of this Section and leave the installation clean; remove application equipment, masking, drop cloths, protective coverings, surplus materials, rubbish and debris and dispose of off-site.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for intumescent fireproofing work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- .3 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .4 ASTM E761, Standard test method for Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.
- .5 AWCI, Association of the Wall and Ceiling Industries - International.
- .6 Technical Manual 12-B, 'Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials by Association of the Wall and Ceiling Industry (AWCI)
- .7 ULC, Underwriter's Laboratories of Canada.

1.3 **SYSTEM DESCRIPTION**

- .1 Provide intumescent fireproofing to provide a fire resistance rating of 60 minutes for all columns and items indicated on drawings.

1.4 **SUBMITTALS**

- .1 Product data:
- .1.1 Submit duplicate copies of manufacturer's Product data for each material used in accordance with Section 01 10 10 indicating:
- .1.1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
- .1.2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
- .2.1 Submit shop drawings in accordance with Section 01 33 00 indicating:
- .2.1 Intumescent fireproofing materials, core thicknesses, colour and finish.
- .2.2 Floor plans and sections indicating locations and types of all conditions.

- .3 Products per system, identifying the assembly, system no., product and material.
 - .4 Individual systems ULC product design cut sheets and product data sheets.
- .3 Samples:
 - .1 Submit following samples in accordance with Section 01 10 10.
 - .1 Two 150 x 300 mm samples of intumescent fireproofing applied to 3 mm steel plate cut back to show primer, intumescent coating and topcoat demonstrating colour and finish for Consultant approval.
 - .2 Three 300 x 150 mm drawdowns of each colour minimum 4 weeks before paints are required.
 - .3 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.
- .4 Certificates and reports:
 - .1 Submit ULC certification for designs of fire resistive coating application to substrate materials required and test reports showing compliance with specified physical performance characteristics and physical properties.
 - .2 Submit manufacturer's certification that topcoat supplied by Section 09 97 13 is compatible and meets Specification requirements.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
 - .1 Review and confirm all intumescent coatings listings are suitable to the designated applications.
 - .2 Review, stamp, date and sign shop Drawings.
 - .3 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .4 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .2 Installers qualifications:
 - .1 Perform work of this Section by a company that has a minimum of five years proven experience in the installation of intumescent fireproof coatings on project 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.

- .3 Manufacturer's Site Inspection: Manufacturer's technical representative shall inspect work at suitable intervals during application and at conclusion of work of this Section, to ensure work is correctly installed.
- .4 Inspection and Testing:
 - .1 Conduct on-site inspections by an inspection and testing company/laboratory acceptable to the Consultant. Test intumescent coatings as applied, to verify substrate preparation and thickness of thin-film intumescent fire-resistive coating in accordance with AWCI Technical Manual 12-B. Inspections shall be carried out prior to first application, and prior and after topcoat application.
 - .2 Prepare and submit written inspection reports of all inspections and final report verifying that this part of the Work is in accordance with Contract Documents, reviewed shop drawings and AWCI Technical Manual 12-B. Final report to be sealed by Professional Engineer, licensed in the Province of Ontario.
 - .3 The Consultant, on behalf of the Owner, may appoint an independent inspection and testing company/laboratory to carry out inspection and testing.
- .5 Correct deficiencies and have such corrected work retested and approved by testing laboratory/company, and independent inspection and testing company/laboratory (if applicable), before work is continued, at no additional cost to the Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Ship, store and deliver at temperatures not less than 50°F (10°C); protect from freezing.
- .2 Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.7 SITE CONDITIONS

- .1 Do not install work of this Section outside of environmental ranges as recommended by the intumescent coating manufacturer without the Consultant's and Product manufacturer's written acceptance.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 24 hours before, during, and until the material has fully cured.

2 Products

2.1 MATERIALS

- .1 All materials under work of this Section, including but not limited to, coatings are to have low VOC content limits.

- 2 Primer: Primed/unprimed as recommended by intumescent fireproofing coating manufacturer, as required.
- 3 Intumescent ~~fireproofing system~~ **Fire Resistive Material (IFRM)** (interior): 'Sprayfilm WB 5' by Cafco, or approved alternative by A/D fire Protection Systems or Hilti Inc., consisting of the following components.
 - .1 Primer: Recommended by manufacturer for substrate being fireproofed, refer to manufacturer's list of approved primers.
 - .2 Intumescent coating conforming to:
 - .1 Hardness (Shore "D"): Durometer D65-70 in accordance with ASTM D2240.
 - .2 Surface Burning Characteristics: Class "A", in accordance with ASTM E84.
 - .3 Density: 1.31 kg/L.
 - .4 Bond strength: 2013 kPa in accordance with ASTM D4541.
 - .3 Top coat: In accordance with Section 09 97 13, colour to be selected by Consultant.
- 4 Intumescent ~~fireproofing system~~ **Fire Resistive Material (IFRM)** (exterior): 'Sprayfilm WB 4' by Cafco, or approved alternative by A/D fire Protection Systems or Hilti Inc., consisting of the following components.
 - .1 Primer: Recommended by manufacturer for substrate being fireproofed, refer to manufacturer's list of approved primers.
 - .2 Intumescent coating conforming to:
 - .1 Hardness (Shore "D"): Durometer D81 in accordance with ASTM D2240.
 - .2 Surface Burning Characteristics: Class "A", in accordance with ASTM E84.
 - .3 Density: 1.44 kg/L.
 - .4 Bond strength: 2220 kPa in accordance with ASTM D4541.
 - .3 Top coat: In accordance with Section 09 97 13, colour to be selected by Consultant.
- 5 Ensure compatibility with installed products under sections 07 81 16 and 07 85 00.

2.2 MIXES

- .1 Mix intumescent fireproof coating components in accordance with manufacturer's written instructions.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Verify that all clips, hangers, sleeves and similar devices have been attached. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

- .1 Protect work of other trades against overspray and make good at own expense any such damage. Provide adequate covering by drop cloths, masting or tarpaulins to surfaces, or on fitments in contact with, or adjacent to, surfaces to be fireproofed.
- .2 Clean surfaces, to be fireproofed, free of dust, grease, oils, etc. in accordance with manufacturer's recommendations. Ensure surfaces are free of any extraneous matter which could be detrimental to a satisfactory and acceptable finish.
- .3 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.
- .4 Certified installers should be responsible for accepting conditions of substrate, as they will be providing warranty of their own work.
- .5 Prime surfaces to be fireproofed with specified primer in accordance with manufacturer's recommendations.
- .6 Primer: Apply primer that has been tested and approved by product manufacturer.
- .7 Inspect primed surfaces to be fireproofed for gouges, marks, pinholes, nibs, etc. Properly prepare same by patching, filling, smoothing or any other surface preparation necessary to ensure a satisfactory surface finish.
- .8 Ensure written confirmation is received from steel fabricators of the specific surface preparation procedures and primers used for the application of fireproofing materials to ascertain compatibility with work of this Section:
 - .1 Verify that substrate surfaces are ready to receive work. Commercial blast cleaning (SSPC SP6) is required for minimum surface preparation. Weld flashes should be ground smooth prior to commencement of application. Select primer from manufacturer's list of approved primers.

3.3 APPLICATION

- .1 Install intumescent fireproofing in accordance with manufacturer's written instructions.
- .2 Install intumescent fireproofing at the proper consistency to ensure a satisfactory surface finish.
- .3 Use-up materials within shelf life period recommended by manufacturer.
- .4 Ensure finished work is uniform as to sheen, gloss, colour, and texture.
- .5 Patching: Patch and repair any fire resistive coating that has been damaged in accordance with patching recommendations of material manufacturer. If coating becomes damaged, rebuild thickness by spray or brush. Fill small areas with trowel. When dry, smooth and finish to match adjacent surfaces.

3.1 **FIELD QUALITY CONTROL**

- .1 Perform field tests as required by Authorities having Jurisdiction. Tests to be carried out as outlined in Technical Manual 12-B by AWCI.

3.2 **CLEANING**

- .1 Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed Products. Clean installed Products in accordance with manufacturer's instructions. Remove and legally dispose of construction debris.
- .2 Work will not be considered complete until all spatters, drippings, smears and overspray have been cleaned and removed to the satisfaction of Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for firestopping and smoke seals work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board—Type Thermal Insulation.
- .2 ASTM C920, Standard Specification for Elastomeric Joint Sealants.
- .3 ASTM C1104, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- .4 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops.
- .5 ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops.
- .6 ASTM G21, Standard Test for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .7 CAN/CGSB 19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .8 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .9 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
- .10 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.
- .11 CAN/ULC S129, Standard Method Of Test For Smoulder Resistance Of Insulation (Basket Method).
- .12 CAN/ULC S702, Thermal Insulation, Mineral Fibre for Buildings.

1.3 **DEFINITIONS**

- .1 Fire Separation: A construction assembly, plane or device, either vertical or horizontal, which is required to prevent the passage of fire and smoke for a prescribed period of time. Proof of compliance to required time rating shall be by ULC, Warnock Hersey (or similar approved) certification or shall be as listed in the Ontario Building Code Supplementary Standard SB-2.

- .2 Smoke Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time but is required to prevent the passage of smoke. A "Smoke Separation" is also known as a "Fire Separation with No Rating" or a "Zero Hour Rated Separation".
- .3 Non-Rated Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time and is not required to prevent the passage of smoke.

1.4 **SYSTEM DESCRIPTION**

- .1 Firestopping and smoke seals: ULC or Intertek Testing Services listed Products and systems in accordance with CAN/ULC S115 suitable to actual application and installation conditions.
- .2 Firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.
- .3 Firestop and smoke seal system shall achieve a fire resistance rating and smoke seal rating equal to that of assemblies into which they are installed.
- .4 Provide smoke sealants over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.
- .5 Firestopping and smoke seals located at movement joints shall be designed with movement capability.
- .6 Provide penetration firestopping with mould and mildew resistance rating of 0 in accordance with ASTM G21.
- .7 Firestopping and smoke seals within mechanical and electrical assemblies shall be provided as part of the work of Divisions 21, 22, 23, 26, 27, and 28 respectively.

1.5 **SUBMITTALS**

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate cUL or ULC reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .3 Submit firestop and smoke seal manufacturer's Product data for materials and prefabricated devices, including manufacturer's printed installation instructions.

- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Fire rated and smoke sealed systems for each typical application.
 - .2 Construction details, accurately reflecting actual job conditions, including floor plans and sections indicating locations and types of all conditions.
 - .3 ULC or Intertek Testing assembly listing, including products per discipline, identifying the assembly, system No. product and material.
 - .4 Each floor and wall assembly requiring firestop system with each corresponding ULC firestop system.
 - .5 Individual systems ULC product design cut sheets and product data sheets.
- .3 Certification:
 - .1 Submit certified documentation from manufacturer for each worker performing work of this Section.
 - .2 Submit installer's and Product manufacturer's certification verifying compliance with the Contract Documents and conformance with ASTM E814 and CAN/ULC S115.

1.6 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
 - .1 Review and confirm all firestopping and smoke seals listings are suitable to the designated applications.
 - .2 Provide third party engineering for all required firestopping engineering judgements.
 - .3 Review, stamp, date and sign shop Drawings.
 - .4 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .5 Conduct on-site inspections. Test firestopping as applied, to verify substrate preparation and firestopping application in accordance with ASTM E2174.
 - .6 Prepare and submit written inspection reports verifying that this part of the Work is in accordance with contract Documents, reviewed shop drawings and ASTM E2174.
 - .7 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .2 Installers qualifications: Perform work of this Section and any junctions with Firestopping and Smoke Seals work under sections 22, 23, 23 and 27, by a single company that has a minimum of five years proven experience in the installation of firestopping and smoke seal work of a similar size and nature and that is approved by manufacturer. Submit to Consultant applicator's current certificate of approval by the material manufacturer as proof of compliance.

- .3 Pre-construction meetings: Arrange with manufacturer's representative, Contractor, Consultant and Field Engineer to determine responsibility for handling such issues as FT rated partitions, firestop custom details, compatibility, mixed penetrations, and to review installation procedures 48 hours in advance of installation.
- .4 Manufacturer's direct representative and/or fire protection specialist shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures conforming to manufacturer's written recommendations published in their literature and drawing details.
- .5 ~~Third Party Engineering: Provide third party engineering by an Engineer licensed in the Province of Ontario for all firestopping engineered judgements.~~
- .6 Inspection and Testing:
 - .1 An independent testing laboratory/company may be selected by the Owner or Consultant to test random samples as applied, in accordance with ASTM E2174.
- .7 Correct deficiencies and have such corrected work retested and approved by Professional Engineer and Inspection/Testing Company (if applicable), before work is continued, at no additional cost to the Owner.

1.7 DELIVERY STORAGE AND HANDLING

- .1 Deliver materials to Place of Work in manufacturer's unopened containers, containing classification label with labels intact and legible at time of use.
- .2 Do not use damaged or adulterated materials exceeding their expiry date.

1.8 SITE CONDITIONS

- .1 Conform to manufacturer's requirements and maintain a minimum temperature of 5° C for a minimum period of 24 h before application, during, and until application is fully cured.
- .2 Maintain sealant at a minimum 18° C for best workability.

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 All Firestopping and Smoke Seals work systems and components are to be provided by a single manufacturer as a single source of responsibility for the Work of this Section and any junctions with work under sections 22, 23, 23 and 27, to ensure total system compatibility and integrity.
- .2 Acceptable manufacturers of rated systems include:
 - .1 AD Fire Protection Systems Inc.
 - .2 Hilti Canada Corporation.
 - .3 3M Canada Inc.
 - .4 Tremco Ltd.
- .3 Ensure compatibility with installed products under sections 07 81 16 and 07 81 23.

2.2 GENERAL SYSTEM REQUIREMENTS

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Do not use Products containing asbestos.
- .3 Firestopping components shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.
- .4 Provide smoke seal sealant in following colours:
 - .1 Grey or white in finished areas.
 - .2 Red in unfinished areas.
- .5 Smoke sealant for overhead and vertical joints for floor to be self-levelling and non-sagging sealant.
- .6 Smoke sealant at vertical through penetrations in areas with floor drains shall be waterproof type.

2.3 MATERIALS

- .1 Following materials have been provided for convenience. Contractor shall provide complete system with all components and accessories as required for fire-resistant and smoke seal installation.
- .2 Firestop sealant: single component, low modulus, silicone rubber, moisture curing sealant to ASTM C920, ULC labelled to CAN/ULC S115.
- .3 Pre-Installed firestop devices for use with non-combustible and combustible pipes, conduit and/or cable bundles penetrating concrete floors and walls.
 - .1 Cast-in place firestop device complete with aerator adaptor when used in conjunction with aerator system. Model CP 680-P by Hilti or approved alternative.
 - .2 Cast-in place firestop device for use with noncombustible penetrants. Model CP 680-M by Hilti or approved alternative.
 - .3 Speed sleeve for use with cable penetrations. Model CP 653 by Hilti or approved alternative.
 - .4 Firestop block. Model CFS-BL by Hilti or approved alternative.
- .4 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating walls:
 - .1 Speed sleeve with integrated smoke seal fabric membrane. Model CP 653 by Hilti or approved alternative.
 - .2 Firestop Sleeve. Model CFS-SL SK by Hilti or approved alternative.
 - .3 Retrofit sleeve for use with existing cable bundles. Model CFS-SL RK by Hilti or approved alternative.
 - .4 Gangplate for use with multiple cable management devices. Model CFS-SL GP by Hilti or approved alternative.
 - .5 Gangplate Cap for use at blank openings in gangplate for future penetrations. Model CFS-SL GP CAP by Hilti or approved alternative.

- .5 Firestop insulation: to CAN/ULC S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.
 - .1 Density: Minimum 64 kg/m³ when tested to ASTM C303.
 - .2 Combustibility: Noncombustible to CAN/ULC S114.
 - .3 Melt temperature: >1175 degrees C.
 - .4 Surface burning characteristics: to CAN/ULC S102, maximum flamespread of 0, smoke developed of 0.
 - .5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.
 - .6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC S129.
- .6 Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of authorities having jurisdiction.
- .7 Primer: As recommended by firestopping sealant manufacturer.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that substrates and surfaces to receive firestopping and smoke seals are clean, dry, and frost free.

3.2 PREPARATION

- .1 Prepare, modify, and adjust void sizes, proportions, and conditions to conform to fire rated and smoke sealed assembly requirements such as assembly opening size and dimensional restrictions.
- .2 Clean surfaces to remove material detrimental to bond including dust, paint, rust, oil, grease, moisture, frost and other foreign matter to manufacturers recommendations.
- .3 Mask adjacent surfaces to avoid spillage and over-coating of adjacent surfaces. Remove stains from adjacent surfaces.

3.3 INSTALLATION

- .1 Install firestopping and smoke seal systems in accordance with reviewed Shop Drawings, manufacturer's instructions and fire rated assembly to establish continuity and integrity of fire separations.
- .2 Install firestop insulation in compacted thicknesses required by ULC design. Compress insulation approximately 50 percent.
- .3 Install primers as recommended by firestop and smoke seal Product manufacturers.

- .4 Install temporary forming, damming, back-up as required, remove after materials have achieved initial cure and will resist displacement.
- .5 Install firestop and smoke seal filler in horizontal joints providing 25% compression
- .6 Use resilient, elastomeric firestopping and smoke seal systems in following locations:
 - .1 Openings and sleeves for future use.
 - .2 Penetration systems subject to vibration or thermal movement.
 - .3 Penetration systems in acoustical containment enclosures.
- .7 Trowel and tool exposed firestop and smoke seal. Product surfaces to uniform, smooth finish.
- .8 Seal joints to ensure an air and water resistant seal capable of withstanding compressions and extensions due to thermal wind or seismic joint movement.
- .9 Taped joints will not be acceptable.
- .10 Repair damaged firestopped and smoke sealed surfaces to acceptance of Consultant.
- .11 Identify each firestop and smoke seal penetration assembly with permanent label listing following:
 - .1 Assembly and rating in hours.
 - .2 Date of installation.
 - .3 Installing company's name and telephone number.
- .12 Do not cover materials until full cure has taken place.

3.4 **INSPECTION AND TESTING**

- .1 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E2174 to ensure that firestopping and smoke seals have been installed in accordance with Contract documents and to tested and listed firestop system.

3.5 **CLEAN-UP**

- .1 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.
- .2 Remove excess materials and debris immediately after application.

3.6 **SCHEDULE OF FIRESTOP AND SMOKE SEAL LOCATIONS**

- .1 Following firestop and smoke seal location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of work of this Section. Generally provide systems with required fire and smoke ratings at following locations:
- .1 Gaps at intersections of fire-resistance rated walls and partitions.
 - .2 Control and sway joints in fire-resistance rated walls and partitions.
 - .3 Gaps at top of fire-resistance rated partitions and walls.
 - .4 Penetrations through fire-resistance rated walls and partitions including mechanical and electrical services and openings and sleeves for future use.
 - .5 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.
 - .6 Gaps at edge of floor slabs at exterior walls.
 - .7 Perimeter of retaining angles on rigid ducts greater than 0.012 m², firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
 - .8 At locations where Engineering Judgements are required.
 - .9 Where indicated on drawings.
 - .10 At non-rated assemblies that require a smoke seal.
 - .11 Where required by Ontario Building Code.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for sealant work in accordance with the Contract Documents.
- .2 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.
- .3 Work of this Section does not include sealant work identified in individual specification sections.

1.2 **REFERENCES**

- .1 ASTM C834, Specification for Latex Sealants.
- .2 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
- .3 ASTM C920, Specification for Elastomeric Joint Sealants.
- .4 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 **SUBMITTALS**

- .1 Product data: Submit copies of Product data in accordance with Section 01 33 00 describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.
- .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00:
 - .1 Two samples of sealant/caulking, for colour selection by Consultant.
 - .2 Two samples of back-up material and primer for physical characteristics.

1.4 **QUALITY ASSURANCE**

- .1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

1.5 **SITE CONDITIONS**

- .1 Do not install materials when ambient air temperature is less than 5°C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 EXTENDED WARRANTY

- .1 Submit an extended warranty for Sealant work in accordance with General Conditions, except that warranty period is extended to 2 years from date of Substantial Performance of the Work.
 - .1 Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces.
 - .2 Coverage: Complete replacement including affected adjacent work.

2 Products

2.1 MATERIALS

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
 - .2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.
- .2 Sealant **Type A**: ASTM C920, Type S, Grade NS, Class 25; One-part, non-sag type, silicone sealant, in standard colours selected.
 - .1 'DC CWS' by Dow Corning Inc.
 - .2 'Sikasil 305CN' by Sika.
 - .3 'Tremsil 400' by Tremco.
- .3 Sealant **Type B**: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone, in standard colours selected.
 - .1 '786 Mildew Resistant Silicone Sealant' by Dow Corning Inc.
 - .2 'Sikasil GP Mildew Resistant' by Sika.
 - .3 'Tremsil 200 Silicone Sealant' by Tremco Ltd.
- .4 Sealant **Type C**: ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable).
 - .1 '950A Siliconized Acrylic Latex Caulk' by Sherwin Williams.
 - .2 'Tremflex 834 Siliconized Sealant' by Tremco Ltd.

2.2 ACCESSORIES

- .1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

- .2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.
- .3 Bond breaker: Type recommended by material manufacturers.
- .4 Void filler around the window frames to be one part expanding polyurethane foam.
- .5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 **MIXING**

- .1 Follow manufacturers instructions on mixing, shelf and pot life.

3 **Execution**

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

- .1 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.
- .2 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.
- .3 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.
 - .1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.
 - .2 Ensure recess is dry.
 - .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.
- .4 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.

- .5 Depth of recess: Maintain depth to $\approx$ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.
- .6 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.
- .7 Prime sides of recess, in accordance with sealant manufacturer's instructions.
- .8 Condition products for use in accordance with manufacturer's recommendations.

3.3 **INSTALLATION**

- .1 Apply sealant immediately after adjoining work is in condition to receive such work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.
- .2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth surface, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.
 - .1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.
 - .2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.
- .3 Make sealant bead uniform in colour.
- .4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.
- .5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.
- .6 Clean recesses and re-apply sealant.
- .7 Remove masking tape immediately after joints have been sealed and tooled.

3.4 **CLEANING**

- .1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.5 **SCHEDULE OF LOCATIONS**

- .1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of work of this Section. Generally seal following locations:
 - .1 Concrete, masonry, wood and stone to metal.
 - .2 Wood to masonry, concrete and stone.
 - .3 Metal to metal.
 - .4 All dissimilar materials.
 - .5 Where 'sealant' or 'caulking' is indicated on drawings.
- .2 Sealant **Type A:**
 - .1 Exterior joints between masonry and steel or aluminum.
 - .2 Exterior joints between masonry and shelf angle.
 - .3 Exterior joints between steel or aluminum and concrete or masonry.
 - .4 Interior and exterior control joints, except in floors.
 - .5 Door frames, louvre frames, blank-off panels, interior and exterior side.
 - .6 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
 - .7 Seal thresholds.
 - .8 Perimeter of basement floor slab at joint with foundation wall EPS.
 - .9 All penetrations through the basement floor slab are to be sealed from air leakage.
- .3 Sealant **Type B:**
 - .1 Control joints in tiled areas.
 - .2 Between vanity and tile.
 - .3 Between vanity and mechanical fixtures/fittings.
 - .4 Between access panels and tile.
 - .5 Between tiles and adjacent materials.
- .4 Sealant **Type C:**
 - .1 Perimeter of kitchen counters.
 - .2 Perimeter of interior windows.
 - .3 Perimeter of fire hose cabinets.
 - .4 Junction between drywall and masonry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for metal door and frame work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM A924/A924M, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .3 ASTM E90, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .4 CAN4/ULC-S104M, Standard Method for Fire Test of Door Assemblies.
- .5 CAN4/ULC-S105M, Standard Specification for Fire Door Frames, Meeting the Performance Required by CAN4/ULC-S104M.
- .6 CAN/CGSB-1.198, Cementitious Primer, (for Galvanized Surfaces).
- .7 CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors.
- .8 CAN/ULC-S702, Thermal Insulation, Mineral Fibre for Buildings.
- .9 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .10 CSA W59-M, Welded Steel Construction (Metal Arc Welding).
- .11 CSDMA, Canadian Steel Door Manufacturers Association.
- .12 NFPA 80, Standard for Fire Doors and Other Opening Protectives.
- .13 NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

1.3 **DESIGN REQUIREMENTS**

- .1 Design exterior frame assemblies to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.
- .2 Maximum deflection for exterior metal doors under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SUBMITTALS

- .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating door and frame construction.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 for each type of door and frame indicating:
 - .1 Thickness and type of steel.
 - .2 Thickness and type of core.
 - .3 Thickness and type of steel stiffeners and location of them within the door.
 - .4 Thickness and type of metal facing on edges of door and method of fastening.
 - .5 Location of mortises, reinforcement, anchorages, joining, welding, sleeving, exposed fasteners, openings and arrangement for hardware.
 - .2 Include schedule identifying each unit with door marks and numbers relating to numbering on Contract Drawings and in door schedule. Indicate doors and frames to be fire rated.
- .3 Reserved:

1.5 QUALITY ASSURANCE

- .1 Perform work in accordance with requirements of the Canadian Steel Door Manufacturer's Association (CSDMA).
- .2 Label and list fire rated doors and frames by an organization acceptable to authorities having jurisdiction and accredited by the Standards Council of Canada in conformance with CAN4/ULC-S104M and CAN4/ULC-S105M for ratings indicated, Labelling shall be in accordance with NFPA 80.
- .3 Reserved:

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2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 Daybar Industries Limited
- .2 Fleming Doors Products.
- .3 Steelcraft.
- .4 Vision Hollow Metal Limited.

2.2 **MATERIALS**

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.
- .2 Steel: ASTM A924/A924M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF120 galvanized coating.
- .3 Minimum base steel thickness:

.1	Frames	1.6 mm
.2	Typical doors	1.6 mm
.3	Interior stiffeners	0.9 mm
.4	Lock/strike reinforcements	1.6 mm
.5	Hinge reinforcements	2.7 mm
.6	All other reinforcement	1.6 mm
.7	Top and bottom channels	1.2 mm
.8	Glazing stops	0.9 mm
.9	Guard boxes	0.9 mm
.10	Jamb spreaders	0.9 mm
- .4 Top caps and thermal breaks: CGSB 41-GP-19Ma; Rigid PVC extrusions.
- .5 Primer: CAN/CGSB 1.198.
- .6 Core material:
 - .1 Interior doors: Mineral fibre insulation with a minimum face density of 24 kg/m³ (1.5 lbs/ft³).
 - .2 Exterior doors: Rigid poly/isocyanurate, closed cell insulation, 32 kg/m³ (2.0 lbs/ft³) , thermal value: U-Value 1.7 W/m²-K.
 - .3 Fire rated doors: Mineral fibre insulation to CAN/ULC S702, Type 1A; 24 kg/m³ (1.5 lbs/ft³).
- .7 Screws: Stainless steel screws with countersunk flat head.
- .8 Door silencers: Type 6-180, black neoprene.

- .9 Frame anchors:
 - .1 Frames in masonry: 1.2 mm minimum, adjustable T-strap jamb anchors.
 - .2 Frames in steel stud partitions: 0.9 mm minimum steel anchors of suitable design securely welded inside each jamb.
 - .3 Frames in existing masonry/concrete/precast walls: 0.9 mm minimum frame anchors to suit design.
 - .4 Labeled frames: In accordance with ULC requirements.
- .10 Floor anchors: 1.6 mm minimum adjustable floor clip angles with 2 holes for anchorage to floor.
- .11 Labels for fire doors and door frame: Brass plate, riveted to door and door frame, clearly visible and free of paint.
- .12 Grilles: Corrosion resistant steel with baked enamel finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley.
- .13 Glass and glazing: In accordance with Section 08 80 00.

2.3 **FABRICATION**

- .1 General:
 - .1 Fabricate doors and frames in accordance with reviewed shop drawings.
 - .2 Welding: CSA W59-M to produce a finished unit with no visible seams or joints, square, true and free of distortion.
 - .3 Welding: Continuous unless specified otherwise. Execute welding by a firm fully acceptable to the Canadian Welding Bureau to requirements of CSA W47.1.
 - .4 Form profiles accurately to details shown on Contract Drawings.
 - .5 Ream and remove burrs from drilled and punched holes.
 - .6 Grind welded corners and joints to a flat plane and fill with metallic filler and sand to a uniform smooth finish. Apply one coat of primer.
 - .7 Provide weather strip for exterior doors in accordance with Section 08 70 00 and door manufacturer.
- .2 Frames, windows, and screens:
 - .1 Fabricate frames of welded construction. Cut mitres and joints accurately and weld continuously on inside of frame profile. Exterior frames to be thermally broken.
 - .2 Construct large frame sections with provision for on Site assembly to suit Site conditions.
 - .3 Blank, reinforce, drill and tap frames for mortised, templated hardware. Protect mortised cut-outs with guard boxes.
 - .4 Reinforce frames where required for surface mounted hardware.
 - .5 Reinforce frames over 1200 mm wide with roll formed steel channels or hollow structural sections specified in Section 05 50 00 and as indicated on Drawings.
 - .6 Furnish exterior door frames with a continuously welded integral steel weather drip at head of frame.

- .7 Prepare each door opening for single stud rubber door silencers, 3 for single door openings located in strike jamb, and 2 for double door openings located in head.
- .8 Install 2 channel or angle spreaders per frame, to ensure correct frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting in place.
- .9 Form channel glazing stops minimum 16 mm height, accurately cut, mitred, fitted and fastened to frame sections with stainless steel counter-sunk, flat head screws spaced at maximum 450 mm throughout and 50 mm from each end.
- .10 Provide the following requirements for electrified frame applications:
 - .1 Low voltage wire conduit for required electrified hardware devices.
 - .2 Junction boxes for all frame mounted electrified hardware devices, complete with required connectors to in frame low voltage wire conduit.
- .3 Anchorage:
 - .1 Anchor units to floor and wall construction. Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb, minimum number of anchors for each jamb:
 - .1 Frames up to 2285 mm 3 anchors.
 - .2 Frames from 2285 mm to 2440 mm 4 anchors.
 - .2 Where frames are to be set in masonry or concrete, supply adjustable anchors to trade installing frame.
 - .3 Fabricate frames for installation in steel stud partitions with steel anchors of suitable design, minimum number of anchors for each jamb :
 - .1 Frames up to 2285 mm height 4 anchors.
 - .2 Frames 2285 mm to 2440 mm 5 anchors.
 - .4 Frames in previously placed concrete, masonry, precast or structural steel: Anchors located at 150 mm maximum from top and bottom of each jamb, and intermediate anchors at maximum 660 mm o.c.
- .4 General Door Requirements:
 - .1 Hollow steel construction, flush swing type, of sizes to conform to details, schedules and reviewed shop drawings with provisions for cut-outs for glass and grilles and reinforced to receive hardware fastenings.
 - .2 Blank, reinforce, drill and tap doors for mortised, templated hardware. Where required, reinforce doors for surface mounted hardware and door closers.
 - .3 Reinforce oversized doors with steel channels and plates specified in Section 05 50 00 and as indicated on Drawings.
 - .4 Where openings are required, form integral cut-outs with framing, glass stop moldings and division bars.
 - .5 Install grilles to fit tight and secure into openings.
 - .6 Bevel both stiles of single doors 1 in 16.
 - .7 Reinforce doors with galvanized metal stiffeners at 150 mm o.c.
 - .8 Provide the following requirements for electrified door applications:
 - .1 In door low voltage wire raceways.

- .2 Steel astragals for hollow metal doors.
 - .3 Reinforcement for all door mounted electrified hardware devices as required and as indicated on Contract Drawings.
- .5 Interior Doors:
 - .1 Supply and install inverted, recessed, fully welded channels at top and bottom of doors.
 - .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
 - .3 Fill hollow space within door and vertical stiffeners from top to bottom with mineral fibre batt insulation.
 - .4 Fabricate door from honeycomb core laminated under pressure to each face.
- .6 Exterior Doors:
 - .1 Supply and install inverted, recessed, fully welded channels at top and bottom of doors. Supply and install PVC top caps.
 - .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
 - .3 Fill hollow space within door from top to bottom with rigid polyisocyanurate insulation.
- .7 Fire Rated Doors:
 - .1 Supply and install inverted, recessed, spot welded channels at top and bottom of doors. Supply and install steel flush top caps on exterior doors.
 - .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
 - .3 Fabricate doors to achieve fire rating as indicated on Drawings and in accordance with ULC. Provide ULC label plate on door at hinged edge midway between top hinge and head of door.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **HOLLOW METAL DOOR, FRAME, AND SCREEN INSTALLATION**

- .1 Install hollow metal doors, frames, and screens in accordance with reviewed shop drawings, manufacturer's written instructions and to meet CSDMA requirements.
- .2 Install hollow metal doors, frames, and screens plumb, square, level, secure, and at correct elevation.
- .3 Install doors clear of floor finishes, and with the correct rebate opening for the door installation. Install door silencers.
- .4 Secure anchorages and connections to adjacent construction. Brace frames rigidly in position while building-in. Remove temporary steel shipping jamb spreaders prior to frame setting. Install wood spreaders at third points of frame rebate height to maintain frame width. Supply and install vertical supports as indicated on Drawings for openings over 1200 mm in width. Remove wood spreaders after frames have been built-in.
- .5 Allow for structural deflection and prevent structural loads from being transmitted to hollow metal frames.
- .6 Touch-up areas where galvanized coating has been removed or damaged with primer.
- .7 Fire rated doors: Install fire rated doors and frames in accordance with requirements of NFPA 80. Hollow metal frames to be filled with INS-3 unless otherwise indicated.

3.3 **ADJUSTING AND CLEANING**

- .1 Adjust doors for smooth and balanced door movement.
- .2 Clean doors, frames, windows and screens.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for the wood doors work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI A208.1, Particleboard.
- .2 ASTM D198, Standard Test Methods of Static Tests of Lumber in Structural Sizes.
- .3 ASTM D1037, Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
- .4 Architectural Woodwork Standards (AWS) - Quality Standards for Architectural Woodwork.
- .5 CSA O112 Series, Wood Adhesives.
- .6 CAN4 S104-M, Standard Method for Fire Tests of Door Assemblies.
- .7 CAN4 S105-M, Fire Door Frames.
- .8 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 **SUBMITTALS**

- .1 Shop drawings: Submit shop drawings of wood doors in accordance with Section 01 33 00 indicating detail thicknesses, core construction, veneers, finish, door sizes, quantities, fastenings and finishes.
- .2 Samples: Submit the following samples in accordance with Section 01 33 00:
 - .1 Two minimum 300 x 300 mm door samples for each type of finish and cut-away corners showing construction and materials.
- .3 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

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1.4 QUALITY ASSURANCE

- .1 Perform work in accordance with requirements of AWS, Quality Standards for Architectural Woodwork, Premium Grade, for materials and installation unless otherwise indicated. Perform work in accordance with the definition of Good Workmanship as defined in the AWS Quality Standards.
- .2 Label and list fire rated doors by an organization accredited by the Standards Council of Canada in conformance with CAN4 S104-M and CAN4 S105-M for ratings indicated.
- .3 Mock-up:
 - .1 Provide one full scale in-situ mock-up of a suite door and frame, including finish trim on corridor side in accordance with Section 06 20 00.
 - .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
 - .3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle wood doors in accordance with the AWS Quality Standards amended as follows:
 - .1 Wrap wood doors individually in protective wrapping for shipment and Site storage.
 - .2 Handle wood doors carefully to prevent damage; replace damaged doors.
 - .3 Store doors flat on a dry, level surface. Ventilate and maintain recommended relative humidity before, during and after installation.

1.6 EXTENDED WARRANTY

- .1 Provide a Warranty certificate from the door manufacturer which binds the manufacturer to replace all doors found to have defects in factory workmanship or materials, or which warp more than 6mm out of plane, under normal use, for a minimum of five (5) years from the Date of Substantial Performance. Replacement doors shall bear same warranty from date of replacement.
- .2 "Replace" as used herein, does not include hanging, installation or field finishing. This work shall be performed by the Contractor for the warranty period stipulated in the General Conditions of the Contract. If doors were originally supplied factory finished, manufacturer must supply replacement doors with same finish

2 Products**2.1 MATERIALS**

- .1 General: All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.

- .2 General:
 - .1 Materials used for work of this Section are to include, but not be limited to the following criteria:
 - .1 Regionally sourced materials.
 - .2 Certified wood.
 - .3 Low VOC content limits.
 - .2 Adhesives - Urea-formaldehyde-free glues.
 - .3 All dimensional lumber and plywood to be FSC certified.
 - .4 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.
 - .5 Material to be sourced regionally from within 800 km of jobsite wherever possible.
- .3 Wood doors (solid core):
 - .1 5 ply wood door: As manufactured by Baillargeon Doors Inc. or Lambton Doors.
 - .2 Core: To ANSI A208.1, minimum density 513 kg/m³ minimum, sanded faces, of thickness to fill void. Extruded particle board cores with voids are not permitted.
 - .3 Rails:
 - .1 Top: 35 mm structural composite lumber.
 - .2 Bottom: 35 mm structural composite lumber.
 - .4 Stiles
 - .1 16 mm hardwood laminated to 19 mm structural composite lumber.
 - .2 Edge detail: AWMAC No.2.
 - .5 Crossbanding: Minimum 2.2 mm thick minimum wood based composite.
 - .6 Door facing: Minimum 0.8 mm stain grade White Oak veneer, or other wood species from the manufacturer's standard colour guide as selected by the consultant, finished in accordance with Section 09 91 00.
- .4 Wood doors (**solid core** fire rated):
 - .1 'Fire Door Series' by Baillargeon Doors Inc. or 'Fire Door' by Lambton Doors.
 - .2 Core: Fire rated mineral core. Density of 28-32 lbs per cubic foot.
 - .3 Internal blocking: AWS Option #3; Manufacturers' standard fire resistant blocking.
 - .4 Top and Bottom Rails: 85 mm laminated strand lumber bonded with type 1 water-resistant adhesive as per ASTM-D1037 and ASTM-D198.
 - .5 Stiles: 107 mm including 85 mm laminated strand lumber bonded with type 1 water-resistant adhesive as per ASTM-D1037 and ASTM-D198.
 - .6 Crossbanding: Minimum 2.2 mm thick HDF composite.
 - .7 Door facing: Minimum 0.8 mm stain grade White Oak veneer, or other wood species from the manufacturer's standard colour guide as selected by the consultant, finished in accordance with Section 09 91 00.
- .5 Wood doors (hollow core):
 - .1 5 ply hollow core doors as manufactured by Baillargeon Doors Inc. or Lambton Doors.
 - .2 Rails:
 - .1 Top: 38 mm hardwood.
 - .2 Bottom: 38 mm hardwood.

- .3 Stiles:
 - .1 Hinge: 38 mm hardwood edge strip.
 - .2 Lock: 38 mm hardwood edge strip.
 - .3 Perimeter of glazing: 38 mm hardwood.
 - .4 Edge detail: AWMAC No.2.
- .4 Crossbanding: Minimum 2.2 mm thick HDF composite.
- .5 Door facing: Minimum 0.8 mm paint grade birch veneer finished in accordance with Section 09 91 00.
- .6 Edge finish: To match door facings.
- .7 Adhesive: CSA O112 Series, Type I; Waterproof.
- .8 Grilles: Corrosion resistant steel with baked enamel finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley.
- .9 Door frames:
 - .1 Wood door frames in accordance with Section 06 20 00.
 - .2 Metal door frames in accordance with Section 08 11 13.
- .10 Glass and glazing: In accordance with Section 08 80 00.

2.2 FABRICATION

- .1 Fabricate doors to sizes indicated on Drawings.
- .2 Fabricate doors square, true, and free from distortion waves, ridges or core ghost lines. Factory machine doors for finish hardware and flooring.
- .3 Fabricate doors using hot press construction technology. Bond stiles and rails to core using adhesive. Sand for uniform thickness. Laminate door facing and trim, to assembled core in hot press.
- .4 Cut and bevel stile edges as follows:
 - .1 Lock side: 3 mm in 50 mm.
 - .2 Hinge side: 1.5 mm in 50 mm.
- .5 Finish wood doors in factory and deliver to site ready for hanging.

2.3 FIRE RATED DOORS

- .1 Fabricate and label fire rated wood doors with plate label indicating fire protection rating as indicated on door schedule.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install doors plumb, rigid, square, clear of floor finishes, and with correct rebate opening for door installation.
- .2 Conform to requirements of AWS Quality Standard, for wood door installation.
- .3 Install door grilles plumb and level, where indicated.

3.3 **FIRE RATED DOORS**

- .1 Install fire rated doors in accordance with the requirements of ULC and NFPA 80.

3.4 **ADJUSTING AND CLEANING**

- .1 Replace the following wood doors:
 - .1 Warped more than 3 mm, measured at any point on door, relative to perfectly flat surface.
 - .2 Core telegraphing visible at 1500 mm distance, under final Site lighting conditions.
- .2 Adjust doors for smooth and balanced door movement.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for access panel Work in accordance with the Contract Documents.

1.2 **SUBMITTALS**

- .1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Shop Drawings: Submit Shop Drawings in accordance with Section 01 33 00 indicating elevations, details, profiles, dimensions, thickness of materials, finishes, and methods of joining.
 - .3 Closeout submittals: Provide maintenance data for hardware complete with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices for incorporation into Operation and Maintenance Manual in accordance with Section 01 78 00.

1.3 **QUALITY ASSURANCE**

- .1 Installer's qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of access panel work of a similar size and nature and that is approved by the manufacturer.

2 Products

2.1 **ACCESS PANELS**

- .1 Access door (gypsum board walls and ceilings): Prime coat steel flush mounted access door constructed of 0.91 mm thick (20 ga.) door with rounded corners and one piece 0.45 mm thick (26 ga.) frame. Door to have continuous concealed hinge and stainless steel screwdriver operated latch. 'DW-5040' by Acudor Access Doors or approved alternative, in the dimensions indicated in the Drawings.
- .2 Access door (fire rated gypsum board walls and ceilings): Fire rated, prime coat steel flush mounted access door constructed of 1.5 mm thick (16 ga.) door with rounded corners and one piece 1.5 mm thick (16 ga.) frame with 25 mm flange. Door to have continuous concealed hinge and universal self-latching bolt operated by a knurled knob. 'FB-5060-DW' by Acudor Access Doors or approved alternative, in the dimensions indicated in the Drawings.

2.2 **FABRICATION**

- .1 Fabricate components free of twists, bends, or visual distortion and insulated. Weld corners and joints.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install access panels and associated components in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Erect components plumb, level and in proper alignment.
- .3 Repair finishes damaged during installation.

3.3 **CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, tool, equipment and services necessary for Aluminum work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 AAMA 501, Methods of Test for Exterior Walls.
- .2 AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.
- .3 AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels - Series: Components, Coatings and Finishes.
- .4 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.
- .5 AAMA CW-DG-1, Aluminum Curtain Wall Design Guide Manual.
- .6 AAMA TIR A7, Sloped Glazing Guidelines.
- .7 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.
- .8 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).
- .9 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- .10 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .11 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.
- .12 ASTM C920, Specification for Elastomeric Joint Sealants.
- .13 ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .14 ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .15 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

- .16 ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .17 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- .18 CAN/CGSB 1.108-M, Bituminous Solvent Type Paint.
- .19 CAN/CGSB-82.1-M, Sliding Doors.
- .20 CAN/ULC S702, Thermal Insulation, Mineral Fibre, for Buildings.
- .21 CAN/ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Third Edition.
- .22 NFRC 100, Procedure for Determining Fenestration Product U-factors.
- .23 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 DEFINITION(S)

- .1 Aluminum work: Shall mean aluminum curtainwall, windows, entrances, vestibules, screens, doors, and framing mentioned in Part 2 of this Specification Section.

1.4 DESIGN REQUIREMENTS

- .1 Design Aluminum work to meet requirements of AAMA/WDMA/CSA 101/I.S.2/A440, AAMA CW-DG-1, ASTM E283, ASTM E330, ASTM E331, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.
- .2 Design Aluminum work in accordance with following Climatic Design Data for Coubourg contained in the Ontario Building Code:
 - .1 Design temperature: January 1%, July 2 1/2% .
 - .2 Hourly wind pressures: 1 in 50 year occurrence.
- .3 Design complete aluminum window systems, including glazing, to meet the following performance criteria:
 - .1 U-value, frame: Maximum 1.65 W/(m²·K) [0.29 Btu/(h·ft²·°F)].
 - .2 U-value, glass: Maximum 0.68 W/(m²·K) [0.12 Btu/(h·ft²·°F)].
 - .3 SHGC: 0.20.
- .4 Design complete aluminum entrance door systems, including glazing, to meet the following performance criteria:
 - .1 U-value, frame: Maximum 1.65 W/(m²·K) [0.29 Btu/(h·ft²·°F)].
 - .2 U-value, glass: Maximum 0.68 W/(m²·K) [0.12 Btu/(h·ft²·°F)].
 - .3 SHGC: 0.20.

- .5 Design Aluminum work to accommodate following without producing detrimental effect:
 - .1 Cyclic 40°C daily thermal swing of components.
 - .2 Cyclic, dynamic loading and release of loads such as wind loads.
 - .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.
- .6 Design to prevent accumulation of condensate on interior side of Aluminum work framing under the following service conditions:
 - .1 Interior summer temperature: 21°C.
 - .2 Interior winter temperature: 21°C.
 - .3 Exterior temperature: -20°C.
 - .4 Interior RH: 35%.
- .7 Design windows in accordance to AAMA/WDMA/CSA -101/I.5.2/ A440, to the following performance levels:
 - .1 Performance class: CW.
 - .2 Minimum performance grade (PG): 35.
 - .3 Minimum positive design pressure: 1680 Pa.
 - .4 Minimum negative design pressure: - 1680 Pa.
 - .5 Minimum water penetration test pressure: 290 Pa.
 - .6 Minimum air infiltration/exfiltration: A3.
 - .7 Condensation resistance: I57
- .8 Restrict air infiltration/exfiltration, through Aluminum work in accordance with ASTM E283 at pressure differential as indicated:
 - .1 Curtainwalls and entrance assemblies: 0.0003 m³ /s m² at differential of 300 Pa.
 - .2 Doors (per door): 2.78 m³/h m per linear metre of crack at differential of 75 Pa.
- .9 Design and detail controlled drainage path to actively discharge water, which enters into of forms within Aluminum work, to exterior; prevent accumulation or storage of water within Aluminum work. Prevent water from entering interior when tested in accordance with ATS E331 at a pressure differential of 700 Pa..
- .10 Design aluminum curtain wall to included and integrated silicone transition membrane sealed into the aluminum frame.
- .11 Design and detail integral transition membrane, air barrier, vapour retarder, and rainscreen Products and assemblies into continuous and integrated Aluminum work envelope. Optimize Aluminum work design to align envelope layers and to minimize thermal bridges.
- .12 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 and 19 mm maximum for heights under 4115 mm and L/240 and 25 mm maximum for heights over 4115mm.
- .13 When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span in accordance with ASTM E330.

- .14 Design anchorage inserts for installation as part of other Sections of work. Design anchorage assemblies to accommodate construction and installation tolerances.
- .15 Provide all reinforcing within aluminum members as required by design and OBC to provide structurally sound assembly. In any case, mullion size shall not be increased due to provision of reinforcing.
- .16 Design Aluminum work and connections to substrate where the bottom of the Aluminum work extends to a point below 1070 mm above finished floor level and separates a floor level from an adjacent interconnected space to withstand the required guard and handrail loads in accordance with the OBC and applicable local regulations. When requested by Consultant, provide a letter signed and sealed by a Professional Engineer certifying that the Aluminum work conforms to the OBC requirements.
- .17 Design operable windows within reach of occupants with limiting stops conforming to requirements of OBC.

1.5 SUBMITTALS

- .1 Shop drawings:
 - .1 Submit shop drawings for mock-ups and Aluminum Work in accordance with Section 01 10 10 indicating:
 - .1 Plans, sections, details, type of extrusions, profiles, finishes, panels, spandrels, operating components, doors, related flashings, closures, fillers, and end caps, and sealants.
 - .2 Products and glazing types.
 - .3 Calculations or modelling confirming Aluminum work conforms to specified performance and energy requirements.
 - .4 Design calculations for engineered curtain wall connections.
 - .5 Structural integrity of Aluminum work, anchorage inserts, and system installation tolerances.
 - .6 Section and hardware reinforcement, anchorage, assembly fixings. Detailing, locations, and allowances for movement, expansion, contraction
 - .7 Air barrier and vapour retarder continuity and path of cavity drainage and air pressure equalization.
 - .8 Design calculations for engineered mullion reinforcing.
 - .2 Samples:
 - .1 Submit two samples of following in accordance with Section 01 10 10.
 - .1 250 mm long samples of each colour, allow for **minimum** two submissions. 250 mm long samples of each type of extrusion and finish.
 - .2 250 x 200 mm samples of insulating glass unit.
 - .3 One complete corner detail of door frame, glazing, and finish for each door type.
 - .4 Each door hardware item for Consultant's approval
 - .5 **Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 46 19, 07 62 00, 07 71 23, 08 53 13, 08 91 00 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.**

- .3 Reports:
 - .1 Submit substantiating engineering data, and independent test results of pre-tested, Aluminum work to substantiate compliance with the design criteria including air leakage and water penetration conforming to ASTM E283 and ASTM E331.
 - .2 Engineering data demonstrating compliance with test procedures outlined in AAMA 501 including as a minimum air leakage resistance, static pressure water penetration resistance, dynamic pressure water penetration resistance, wind load resistance, vertical live load deflection movement and lateral (horizontal) movement, and condensation resistance.
 - .3 Submit documentation to substantiate ten years of experience in Aluminum work manufacture and installation of similar size and nature.
- .4 Close-out submittals: Submit Aluminum work data for incorporation into the Operations and Maintenance Manual as part of Section 01 10 10.
- .5 Extended warranties: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.6 QUALITY ASSURANCE

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of ten 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.
- .2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Aluminum work of comparable complexity and scope to perform the following services as part of the work of this Section:
 - .1 Design of Aluminum work.
 - .2 Reinforcing within aluminum members.
 - .3 Review, stamp, and sign shop drawings.
 - .4 Professional Engineer to include confirmation in a conspicuous location in the shop drawings and design calculations that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .5 Conduct on-Site inspections and prepare and submit inspection written reports. Number and frequency of inspection to be sufficient to satisfy Engineer that Window Aluminum Work is being fabricated and installed in accordance with reviewed shop drawings and design intent.
 - .6 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .3 Shop mock-up:
 - .1 Provide one, full scale mock-up in shop of Aluminum work for shop testing, including air leakage, water penetration, and deflection in accordance with AAMA 501, ASTM E283, ASTM E330, and ASTM E331. If a test fails,

additional testing may be required by Consultant to ensure performance of Aluminum Work at no additional cost to Owner.

- .2 Demonstrate conformance to specified design requirements. Mock-up shall show full range of Products, finishes, textures, quality of fabrication, and workmanship including, but not limited to, framing members, glazing units, glazed corner at main entry, anchorage, opening units, doors, and membrane tie-ins and transitions to adjoining assemblies and materials.

.4 Site mock-up:

- .1 Provide one full scale in-situ mock-up for testing of air and water infiltration to AAMA 501 to the satisfaction of an Consultant. If a test fails, additional testing may be required by Consultant to ensure performance of Aluminum Work at no additional cost to Owner.
- .2 Deliver and erect one, full scale mock-up of Aluminum work assembly, in location acceptable to Consultant.
- .3 Demonstrate conformance to specified design requirements.
- .4 Demonstrate installation procedures, finished look and quality of workmanship including, but not limited to, framing members, glazing units, anchorage, opening units, doors and transitions to adjoining assemblies and materials.
- .5 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.3 Pre-installation meetings:

- .1 Mock-ups: Prior to installation of mock-ups, arrange meeting at the shop and on Site to be attended by Consultant, Construction Manager, and window wall Engineer and site superintendent to inspect substrates, and to review installation procedures 48 hours in advance of installation.
- .2 Site: Prior to installation of window wall, arrange meeting at the Site to be attended by Consultant, Construction Manager, and window wall Engineer and site superintendent to inspect substrates, and to review installation procedures 2 weeks in advance of installation.

1.7 **DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle Aluminum Work in accordance with AAMA CW-10 and manufacturer's written recommendations.
- .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.

1.8 **EXTENDED WARRANTY**

- .1 Aluminum work: Submit an extended warranty for Aluminum work in accordance with General Conditions, except that warranty period is extended to 5 years.
 - .1 Warrant against failure to meet the design criteria and requirements such as interior leakage, finish degradation, frame condensation.
 - .2 Coverage: Labour and materials to repair or replace Aluminum Work as required to correct deficient work and meet specified requirements including affected adjacent work.

- .2 Glazing:
 - .1 Provide a 20 year warranty, commencing from date of Substantial Performance, against defects in the insulating glass units and warrant them to be free from material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause, under normal design conditions. Warrant the following:
 - .1 The insulating glass units shall be free from condensation, logging material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause under design conditions.
 - .2 The insulating glass units shall not change their mechanical design properties and shall not in any way deteriorate, degrade, delaminate or change their visual appearance.
 - .3 The glass units will not break due to thermal shock and temperature differential due to inherent glass faults, other than extrinsic glass breakage.
 - .4 Internal logging shall be deemed to occur when light transmission of the glass is reduced by 5% in any 50 mm x 50 mm area.
 - .5 Failure will be deemed to occur when the internal dew point exceeds -40oC in a 21oC ambient temperature (when tested in accordance with ASTM E576).
 - .2 Warrant that glazing work is water and weather tight and free from distortion; that glazing materials will not deteriorate from exposure to the atmosphere and weather, will not be displaced, and will be free from permanent deformation under load; and that glass and insulating glass units will not be broken, cracked or scratched by causes resulting from defects in material, workmanship or design of glazing installation.
 - .3 Cracked or scratched glass, shrinking, cracking, staining, hardening, sagging of glazing materials; loosening or rattling of glass; and leaking of glazed joints will be considered defective work.
 - .4 Warranty shall provide for the removal of defective Products, replacement with new Products conforming to the specifications, and restoration of work.
- .3 Manufacturer's finish Warranty: Provide manufacturer's written warranty naming Owner as beneficiary and covering finish degradation or failure of factory-applied exterior fluoropolymer finish on Aluminum work within the warranty period; warrant finish per AAMA 2605 for colour fade less than 5 units, maximum chalk rating of 8, and greater than 30% gloss retention. Warranty period for finish: 5 years from date Work is certified as substantially performed.

2 Products

2.1 **ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)**

- .1 This specification is written on the basis of aluminum framed glazing systems by Alumicor Limited. Specified products establish the minimum acceptable standards for the work of this Section. Approved glazing systems consisting of similar configuration and components by Windspec Inc., Commdoor Aluminum or Kawneer will be considered provided they meet the performance requirements listed in this Section and are deemed to be consistent with the glazing systems indicated and components listed. Glazing systems not meeting the performance requirements or not comprised of similar configuration and components will not be acceptable.

- .2 All Aluminum work systems and components are to be provided by a single manufacturer to ensure a single source of responsibility for the Work of this Section.
- .3 Curtain Wall: Two-sided Structural Silicone Glazed (SSG) framing: 'ThermaWall 2600 Series' Capped and SSG systems by Alumicor Limited, or approved alternative,
 - .1 '5500HTP curtainwall' by Windspec Inc., or
 - .2 'Series 800 Stick Capped and SSG' by Commdoor Aluminum, or
 - .3 '1600UT curtainwall' by Kawneer.
- .4 Aluminum windows: 'RainBlade 2970' by Alumicor Limited, or approved alternative,
 - .1 'Series 925RS' by Windspec Inc., or
 - .2 '525' by Commdoor Aluminum, or
 - .3 'AA 6500 Thermal Widows' by Kawneer.
- .5 Aluminum operable windows (**OP-2**): 'Univent 1350' by Alumicor Limited, or approved alternative,
 - .4 '535 Series' by Windspec Inc., or
 - .5 'Series 225' by Commdoor Aluminum, or
 - .6 '526 Series' by Kawneer.
- .6 ~~Vestibule~~ **Office screen** framing: 'Flushglaze 1800 Series' by Alumicor Limited, or approved alternative,
 - .1 '630 Interior Flush Glaze Series' by Windspec Inc., or
 - .2 'Series 1450' by Commdoor Aluminum, or
 - .3 '450 Storefront' by Kawneer.
- .7 Aluminum doors:
 - .1 Interior, non-thermally broken: 'Canadiana 400A' by Alumicor Limited, or approved alternative,
 - .1 350 Standard commercial Doors by Windspec Inc., or
 - .2 'Series 350 Door' by Commdoor Aluminum, or
 - .3 '350 Standard Entrances' by Kawneer.
 - .2 Exterior: 'ThermaPorte 7700 T400A' by Alumicor Limited, or approved alternative,
 - .1 '375HTP Standard commercial Doors' by Windspec Inc., or
 - .2 '4000 Thermal Door' by Commdoor Aluminum, or
 - .3 '350T Standard Entrances' by Kawneer
- .8 Contractor is responsible for ensuring that the listed alternative glazing systems meet the performance requirements listed in this Section and are deemed to be consistent with the glazing systems indicated and components listed as basis of design.

2.2 MATERIALS

- .1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.
- .2 Aluminum extrusions and channels: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.
 - .1 Profile and dimensions: Refer to Contract Drawings.
 - .2 Thermal breaks in frame members: Vertically aligned with glazing.
 - .3 Design glazing pocket spacer to accommodate airseal transition system at all curtainwall frame locations

- .3 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.
- .4 Reinforcements and anchors: ASTM A167, Type 304 to AISI No. 2B finish. Size as shown.
- .5 Glass and glazing materials: As specified in Section 08 80 00.
- .6 Structural glazing sealant: As specified in Section 08 80 00.
- .7 Spandrel panel airseal backpan: ASTM A653/A653M; 0.9 mm thick, Z275 galvanized steel sheet.
- .8 Shadow box airseal backpan: ASTM B209; 3 mm thick prefinished aluminum sheet in colour to be selected by Consultant.
- .9 Airseal and Aluminum work sealant: ASTM C920, Type S, Grade NS, Class 35; One part silicone, neutral cure sealant, medium modulus; 'Dowsil Contractors Weatherproofing Sealant (CWS)' by Dow Consumers Solution or 'Tremsil 400' by Tremco. Verify compatibility with insulating glass unit manufacturer's secondary sealant. Colour as later selected by Consultant. Primer as recommended by manufacturer.
- .10 Frame sealant: Type as recommended by the Aluminum work manufacturer.
- .11 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.
- .12 Airseal transition membrane: 'Sopraseal Stick 1100' by Soprema Inc., 'Exoair 110' by Tremco or 'Air-Shield' by W.R. Meadows. Membrane to come complete with applicable primer.
- .13 Airseal Transition System (ATS-1): Transition membrane mechanically attached to window assembly, 'Proglaze ETA System 3' by Tremco or approved alternative. Engineered transition assembly to include the following components:
 - .1 Silicone rubber extrusion: Extruded, 40 durometer, translucent silicone extrusion with lock-in dart.
 - .2 Silicone rubber corners: Premolded, 40 durometer, translucent silicone with lock-in dart.
 - .3 Silicone sealant: ASTM C920, single-component, neutral-curing silicone sealant in colour as selected by the Consultant. 'Spectrum 1' by Tremco or approved alternative.
- .14 Pocket fillers: Non-metallic, as recommended by Aluminum Work manufacturer.
- .15 Anchors, clips, and angles: Extruded aluminum or stainless steel.
- .16 Shims and blocking for frame: Rigid plastic, wood is not permitted.
- .17 Flashings, closures and trim: 1.0 mm minimum aluminum sheet, finish to match Aluminum Work extrusion finish.
- .18 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304

- .19 Isolation coating: CAN/CGSB-1.108-M; Bitumastic coating, acid and alkali resistant material.
- .20 Shadow box ~~and Spandrel panel~~ insulation (**SBX-1**): CAN/ULC S702; minimum 56 kg/m^d, unfaced, semi-rigid mineral wool.
 - .1 'Thermafiber FireSpan' by Owens-Corning.
 - .2 'CurtainRock' by Rockwool Inc.
 - .3 Thickness: As required to fill void.
 - .4 Insulation fasteners: Stik-Clip with retaining washer.
- .21 Spray Foam Insulation: CAN/ULC S705.1, CFC free, polyurethane foam in place, closed cell, low expansion, one component air sealant, minimum density 15 kg/m³.
- .22 Window hardware: Manufacturer's standard heavy duty corrosion resistant hardware
- .23 Door hardware: Supplied by finish hardware supplier under Section 08 70 00 for installation by door manufacturer.
- .24 Door thresholds: For installation at openings in curtainwall and vestibule framing, by Alumicor or approved alternative. Provide thermally broken thresholds at exterior curtainwall framing.
- .25 Weatherstripping: Manufacturer's standard weatherstripping, durable, non-absorbing material resistant to deterioration by aging and weathering.

2.3 FABRICATION

- .1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.
- .2 Fabricate Aluminum work in accordance with reviewed shop drawings and manufacturer's written instructions.
- .3 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints to provide continuity of water and air barrier.
- .4 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.
- .5 Do not expose manufacturer's identification labels on aluminum assemblies.
- .6 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing, form to profile shown. Fabricate filler and closure pieces as necessary for a complete and weather tight installation.
- .7 Certify aluminum windows as complying with the AAMA/WDMA/CSA 101/I.S.2/A440 design criteria and requirements using an easily removable label located on the inside face of glazing.
- .8 Fabricate doors and frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.

- .9 Fabricate Aluminum work closures and trim from aluminum sheet. Form to profile shown. Make weather tight.
- .10 Double weatherstrip windows and doors. Install weatherstripping in specially extruded ports and secure to prevent shrinkage or movement.
- .11 Fabricate glazing recess with drainage to exterior.
- .12 Curtainwall mullion glazing lips to be modified as required to accommodate airseal transition system installation prior to application of finishes. No on-site grinding of mullion lips to accommodate airseal transition system is permitted.
- .13 Airseal Transition System (ATS-1):
 - .1 Install engineered transition assembly in accordance with reviewed shop drawings and manufacturer's written instructions.
 - .2 Coordinate with Section 07 26 00 for application of air barrier/vapour retarder membrane and associated components as required for air and water tight installation of engineered transition assembly.
 - .3 Clean window frame with manufacturer approved materials where adaptor will make contact.
 - .4 Apply silicone sealant in the race and along leading edges at window frame to ensure a continuous seal.
 - .5 Bed the silicone rubber extrusion into the bonding bead.
 - .6 Ensure that transition membrane integrated into window frame laps the adjacent air barrier membrane under Section 07 26 00 by a minimum of 150 mm. Coordinate with noted Section as required for installation.

2.4 ALUMINUM DOORS

- .1 Fabricate doors of welded construction.
- .2 Glazing stop: Aluminum, square, snap-on type, designed for glazing system.

2.5 SHADOW BOXES

- .1 Fabricate shadow box inner facing **intermediate aluminum panel** of prefinished aluminum sheet to form an airseal backpan. Wrap edges with aluminum sheet, enabling installation and minor movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- .3 Provide integral reinforcing and stiffeners as required to reinforce panel against deflection caused by wind and suction loads.
- .4 Place continuous layer of insulation to airseal backpan **aluminum panel** with adhesive and impale clips and fasteners. Ensure there are not gaps between the insulation and airseal backpan **aluminum panel**. Provide prefinished aluminum sheet over exterior face of insulation in shadow box as indicated.
- .5 Provide spacers as necessary to separate dissimilar metals.
- .6 Ventilate and pressure equalize the air space outside the exterior surface of the insulation, to the exterior.
- .7 Arrange fasteners and attachments to ensure concealment from view.

- .8 Shadow boxes (**SBX-1**): Consists of insulated glass unit **IGU-2** to the exterior in accordance with Section 08 80 00, with insulated backpan **aluminum panel to match aluminum interior finish colour**, to the inside complete with prefinished **intermediate aluminum sheet panel** in colour ~~as selected by Consultant~~ **to match aluminum exterior cap** on exterior face of insulation. Seal all joints in shop with high grade butyl sealant, including perimeter seal at backpan **aluminum panel**.

2.6 SPANDREL PANELS

- ~~.1 Fabricate spandrel panel inner facing of galvanized sheet to form an airseal backpan. Wrap edges with galvanized sheet, enabling installation and minor movement of perimeter seal.~~
- ~~.2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.~~
- ~~.3 Provide integral reinforcing and stiffeners as required to reinforce panel against deflection caused by wind and suction loads.~~
- ~~.4 Place continuous layer of insulation to airseal backpan with adhesive and impale clips and fasteners. Ensure there are not gaps between the insulation and airseal backpan.~~
- ~~.5 Provide spacers as necessary to separate dissimilar metals.~~
- ~~.6 Ventilate and pressure equalize the air space outside the exterior surface of the insulation, to the exterior.~~
- ~~.7 Arrange fasteners and attachments to ensure concealment from view.~~
- ~~.8 Glass panels: Consists of sprandrel glass in accordance with Section 08 80 00 to the exterior with insulated backpan to the inside. Insulation shall be in thickness as indicated on Contract Drawings, retained with stick clips. Seal all joints in shop with specified sealant, including perimeter seal at backpan. Colour to later selection by Consultant.~~

2.7 FINISH

- .1 Extrusion finish and Doors: Anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finished Class I #14 AA-M-M12C22A41 (or A42) or, 'Duranar XLB' by PPG in accordance with AAMA 2605, in the following colours:
- .1 Exterior cap: ~~Extra-Dark Bronze— Class I EB or, to match RAL 7021, respectfully.~~ **Allow for non-standard custom colour to match that of section 08 53 13.**
- .2 Interior mullion: ~~To match exterior,~~ Clear Anodized or, RAL 9006.
- .3 Colours to be confirmed by Consultant upon submission of colour samples. **Allow for 5 colours submitted to be selected by Consultant.** Allow for **minimum** two submissions.
- .2 Panel and sheet finish: As indicated on drawings to match adjacent extrusion finish.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Install Aluminum work in accordance with reviewed shop drawings, manufacturer's instructions, AAMA/WDMA/CSA 101/I.S.2/A440 and to meet requirements of authorities having jurisdiction.
- .2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.
- .3 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.
- .4 Install flashings, closures, and trim pieces.
- .5 Fill voids between aluminum framing and adjacent construction with foam insulation.
- .6 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.
- .7 Refer to Contract Drawings for glazing type locations. Install glazing in accordance with Section 08 80 00.
- .8 Shadow boxes:
 - .1 Set back pans to framing in sealant and apply sealant to cover screw heads to maintain air tight seal between back pans and framing.
 - .2 Adhere stick clips to metal back pans at 300 mm o.c. both ways. Apply insulation adhesive over entire surface of barrier and around clips held with adhesive.
 - .3 Cut insulation slightly over-size and press insulation boards firmly to barrier impaling them on clips without bending clips. Butt insulation boards tightly. install retainers to clips.
 - .4 Wrap aluminum sheet over exterior face of insulation in shadow box.
- .9 Spandrel panels:
 - .1 Set back pans to framing in sealant and apply sealant to cover screw heads to maintain air tight seal between back pans and framing.
 - .2 Adhere stick clips to metal back pans at 300 mm o.c. both ways. Apply insulation adhesive over entire surface of barrier and around clips held with adhesive.

- .3 Cut insulation slightly over-size and press insulation boards firmly to barrier impaling them on clips without bending clips. Butt insulation boards tightly. install retainers to clips.
- .10 Automatic door operators to be supplied and installed by Section 08 70 00. Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.
- .11 Install aluminum door manufacturer's standard weatherstripping at door frame perimeter. Install weatherstripping throughout entire length and width of doors at jambs and heads.
- .12 Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.
- .13 Adjust operable parts for correct function.
- .14 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.
- .15 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.
- .16 Fully coordinate mullion location with Aluminum Composite Panels and aluminum panels in accordance with Sections 07 42 40 and 07 42 41 to ensure mullion alignment and knife plate connection locations are accurate for the seamless installation of the Aluminum Composite Panels and aluminum panels at the front entry.

3.3 ERECTION TOLERANCES

- .1 Tolerances: Non-cumulative.
 - .1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative or 12 mm/30 m, whichever is less.
 - .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
 - .3 Vertical and horizontal positions: +/- 3 mm.
 - .4 Racking of face: 6 mm, nil in elevation.
 - .5 Operable components: Consistent with smooth operation and weatherproof performance.
 - .6 Maximum perimeter sealant joint between Aluminum work and adjacent construction: 13 mm.

3.4 GLAZING PERIMETER AIRSEAL

- .1 Install glazing perimeter airseal at entire perimeter of each insulating glass unit to achieve an airseal from insulating glass unit to curtain wall frame. Do not obstruct path of cavity drainage and air pressure equalization.
- .2 Perform sealant work in accordance with manufacturer's written requirements.

3.5 AIRSEAL TRANSITION MEMBRANE

- .1 Install primer and airseal transition membrane in accordance with manufacturer's instructions and reviewed shop drawings.
- .2 Overlap airseal transition membrane 75 mm minimum and lap in direction of waterflow. Hand roll membrane to ensure 100% contact and adhesion to substrates.
- .3 Coordinate airseal transition to adjacent parts of Work. Continuity of weather and air seal to be maintained throughout window wall and at interface with adjacent components or systems.
- .4 Provide terminations fabricated from same material as airseal transition membrane or material recommended by membrane manufacturer at sills, lintels, openings, and where horizontal surfaces intersect with vertical surfaces to ensure moisture is shed to exterior.

3.6 JOINT BACKING AND ALUMINUM WORK SEALANT

- .1 Prepare substrate surface and mask as recommended by sealant manufacturer.
- .2 Install joint backing and sealant at Aluminum work and perimeter joints for weather tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.7 FIELD QUALITY CONTROL

- .1 Test sliding doors in accordance with ASTM E1105 for water penetration.
 - .1 Procedure A: test sliding door at 700 Pa, for uniform static air pressure difference for 15 minutes by applying water at a minimum rate of 3.4 L/m² minute.
 - .2 Procedure B: test sliding door at 700 Pa, for static air pressure difference for 4 cycles of 5 minutes each by applying water at a minimum rate of 3.4 L/m² minute.
 - .3 Failure criteria as per ASTM E1105.

3.8 CLEANING

- .1 Maintain Aluminum work, inside and outside, in clean condition throughout construction period.
- .2 Remove labels, protective material, and glass presence markers from prefinished surfaces.
- .3 Remove certification labelling when directed by Consultant, in writing.
- .4 Wash Aluminum work with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for vinyl windows and doors work in accordance with the Contract Documents.

1.2 **REFERENCE**

- .1 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.
- .2 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- .3 CAN/CGSB-19.13-M, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
- .4 CAN/CGSB 79.1-M, Insect Screens.
- .5 NFRC 100, Procedure for Determining Fenestration Product U-factors.
- .6 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 **DESIGN REQUIREMENTS**

- .1 Design windows to meet requirements of AAMA/WDMA/CSA 101/I.S.2/A440, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.
- .2 Design complete fixed window systems, including glazing, to meet the following performance criteria:
- .1 U-value, frame: Maximum $1.14 \text{ W}/(\text{m}^2 \cdot \text{K})$ [$0.20 \text{ Btu}/(\text{h} \cdot \text{ft}^2 \cdot ^\circ\text{F})$].
- .2 U-value, glass: Maximum $0.68 \text{ W}/(\text{m}^2 \cdot \text{K})$ [$0.119 \text{ Btu}/(\text{h} \cdot \text{ft}^2 \cdot ^\circ\text{F})$].
- .3 SHGC: Maximum 0.332.
- .4 Design complete casement window systems, including glazing, to meet the following performance criteria:
- .1 U-value, frame: Maximum $1.59 \text{ W}/(\text{m}^2 \cdot \text{K})$ [$0.28 \text{ Btu}/(\text{h} \cdot \text{ft}^2 \cdot ^\circ\text{F})$].
- .2 U-value, glass: Maximum $0.68 \text{ W}/(\text{m}^2 \cdot \text{K})$ [$0.119 \text{ Btu}/(\text{h} \cdot \text{ft}^2 \cdot ^\circ\text{F})$].
- .3 SHGC: Maximum 0.332.
- .5 Design windows in accordance with following Climatic Design Data for Cobourg contained in Ontario Building Code:
- .1 Design Temperature: January 1%, July 2 1/2% .
- .2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.
- .6 Design windows to accommodate following without detrimental effect:
- .1 Cyclic 40 degrees C daily, thermal swing of components.
- .2 Cyclic, dynamic loading and release of loads such as wind loads.

- .3 13 mm vertical deflection in the supporting structure and movement of supporting structure due to live, dead load, and creep or deflection, seismic load, sway displacement and similar items.
- .6 Design operable windows in accordance to AAMA/WDMA/CSA -101/I.S.2/ A440, to the following performance levels:
 - .1 Performance class: CW.
 - .2 Minimum performance grade (PG): 35.
 - .3 Minimum positive design pressure: 1680 Pa.
 - .4 Minimum negative design pressure: - 1680 Pa.
 - .5 Minimum water penetration test pressure: 290 Pa.
 - .6 Minimum air infiltration/exfiltration: A3.
 - .7 Condensation resistance: I57.
- .7 Restrict air infiltration/exfiltration, through fixed windows in accordance with AAMA/WDMA/CSA -101/I.S.2/ A440 at pressure differential as indicated:
 - .1 0.5 L/s m² at differential of 75 Pa.
- .8 Design and detail controlled drainage path to discharge water, which enters into, or forms within windows, to exterior. Prevent accumulation or storage of water within the windows.
- .9 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to L/175 maximum (under uniformly distributed positive load) and 10 mm maximum regardless of span.
- .10 Design anchorage inserts for installation as part of other Sections of the Work. Design anchorage assemblies to accommodate construction and installation tolerances.
- .11 Where the bottom edge of the glazing or window frame extends to a point below 1070mm above finished floor level and higher than 600mm above the floor or ground on the other side of the window, design vinyl windows and connections to substrate to withstand the lateral design loads for balcony guards required by OBC Article 4.1.5.14. and applicable local regulations. Provide a letter signed and sealed by a Professional Engineer certifying that the vinyl windows as installed conform to the OBC requirements.

1.4 SUBMITTALS

- .1 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Plans, elevations, sections, and details.
 - .2 Products and glazing types.
 - .3 Section reinforcement, anchorage, assembly fixings.
 - .4 Anchorage inserts, system installation tolerances
 - .5 Detailing, locations, and allowances for movement, expansion, contraction.
 - .6 Path of cavity drainage and air pressure equalization.

- .7 Clearly indicate materials and assemblies in large scale details for head, jamb, sill, top and bottom rails, stiles, and muntin bar conditions.
- .8 Calculations or modelling confirming windows, including but not limited to internal reinforcements, conform to specified performance and energy requirements.
- .2 **Samples:**
 - .1 **Submit two samples of following in accordance with Section 01 10 10.**
 - .1 250 mm long samples of each colour, allow for minimum two submissions. 250 mm long samples of each type of extrusion and finish.
 - .2 250 x 200 mm samples of insulating glass unit.
 - .3 One complete corner detail of window frame, glazing, and finish for each window type.
 - .4 Each window hardware item for Consultant's approval
 - .2 **Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 46 19, 07 62 00, 07 71 23, 08 44 00, 08 91 00 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.**
- .3 **Reports:** Submit substantiating engineering data, and independent test results of pre-tested, existing window designs to substantiate compliance with design criteria.
- .4 **Project close-out submittals:** Submit data for windows incorporated into Operation and Maintenance Manual as part of Section 01 78 00.
- .5 **Extended warranty:** Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 QUALITY ASSURANCE

- .1 **Installers qualifications:** Perform work of this Section by a company that has a minimum of ten 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.
- .2 **Retain a Professional Engineer, licensed in Province of Ontario, with experience in vinyl windows work of comparable complexity and scope to perform the following services as part of the work of this Section:**
 - .1 Design of Vinyl windows Work.
 - .2 Review, stamp, and sign shop drawings.
 - .3 Professional Engineer to include confirmation in a conspicuous location in the shop drawings and design calculations that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".

- .4 Conduct on-Site inspections and prepare and submit inspection reports. Number and frequency of inspection to be sufficient to satisfy Engineer that vinyl windows are being fabricated and installed in accordance with reviewed shop drawings and design intent.
 - .5 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- .3 Shop mock-up:
- .1 Provide one, full scale mock-up in shop of Vinyl windows Work for shop testing, including air leakage, water penetration, and deflection in accordance with AAMA 501, ASTM E283, ASTM E330, and ASTM E331. If a test fails, additional testing may be required by Consultant to ensure performance of Vinyl windows Work at no additional cost to Owner.
 - .2 Demonstrate conformance to specified design requirements. Mock-up shall show full range of Products, finishes, textures, quality of fabrication, and workmanship including, but not limited to, framing members, glazing units, anchorage, opening units, ~~doors~~, and membrane tie-ins and transitions to adjoining assemblies and materials.
- .4 Site Mock-up:
- .1 Construct one field sample mock-up of window ~~and door~~ in location and of type acceptable to Consultant.
 - .2 Demonstrate installation of anchoring devices and air/vapour retarder sealing and relation of window to surrounding construction, including caulking and tie-ins to interior and exterior air barriers.
 - .3 Arrange for Consultant's review and acceptance.
 - .4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
 - .5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.
- .5 Pre-installation meetings:
- .1 Mock-ups: Prior to installation of mock-ups, arrange meeting at the shop and on Site to be attended by Consultant, Construction Manager, and window wall Engineer and site superintendent to inspect substrates, and to review installation procedures 48 hours in advance of installation.
 - .2 Site: Prior to installation of window wall, arrange meeting at the Site to be attended by Consultant, Construction Manager, and window wall Engineer and site superintendent to inspect substrates, and to review installation procedures 2 weeks in advance of installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Protect windows during delivery and store in a dry, well ventilated place indoors and protect from injury.
- .2 Cross-brace large units. Package or crate units for shipment and storage before installation.
- .3 Provide methods for lifting units into place without causing damage.

- .4 Protect finish surface by sturdy protective wrappings.

1.7 EXTENDED WARRANTY

- .1 Vinyl windows Work: Submit an extended warranty for windows work in accordance with General Conditions, except that the warranty period is extended to 5 years.
 - .1 Warrant against failure to meet the design criteria and requirements such as interior leakage, loosening of whole or of parts of units, insulating glass unit failure, finish degradation, frame condensation.
 - .2 Coverage: Labour and materials to repair or replace Aluminum Work as required to correct deficient work and meetspecified requirements including affected adjacent work.
- 2 Glazing:
 - .1 Provide a 20 year warranty, commencing from date of Substantial Performance, against defects in the insulating glass units and warrant them to be free from material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause, under normal design conditions. Warrant the following:
 - .1 The insulating glass units shall be free from condensation, logging material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause under design conditions.
 - .2 The insulating glass units shall not change their mechanical design properties and shall not in any way deteriorate, degrade, delaminate or change their visual appearance.
 - .3 The glass units will not break due to thermal shock and temperature differential due to inherent glass faults, other than extrinsic glass breakage.
 - .4 Internal logging shall be deemed to occur when light transmission of the glass is reduced by 5% in a any 50 mm x 50 mm area,
 - .5 Failure will be deemed to occur when the internal dew point exceeds -40oC in a 21oC ambient temperature (when tested in accordance with ASTM E576).
 - .2 Warrant that glazing work is water and weather tight and free from distortion; that glazing materials will not deteriorate from exposure to the atmosphere and weather, will not be displaced, and will be free from permanent deformation under load; and that glass and insulating glass units will not be broken, cracked or scratched by causes resulting from defects in material, workmanship or design of glazing installation.
 - .3 Cracked or scratched glass, shrinking, cracking, staining, hardening, sagging of glazing materials; loosening or rattling of glass; and leaking of glazed joints will be considered defective work.
 - .4 Warranty shall provide for the removal of defective Products, replacement with new Products conforming to the specifications, and restoration of work.
- 3 Manufacturer's finish Warranty: Provide manufacturer's written warranty naming Owner as beneficiary and covering finish degradation or failure of factory-applied exterior fluoropolymer finish on Aluminum work within the warranty period; warrant finish per AAMA 2605 for colour fade less than 5 units, maximum chalk rating of 8, and greater than 30% gloss retention. Warranty period for finish: 5 years from date Work is certified as substantially performed

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 This specification is written on the basis of vinyl windows by Innotech Windows. Specified manufacturer's products establish the minimum acceptable standards for the work of this Section. Approved window systems consisting of similar configuration and components by Euroline Windows will be considered provided they meet the performance requirements listed in this Section and are deemed to be consistent with the system indicated and components listed below. Vinyl window systems not meeting the performance requirements or not comprised of similar configuration and components will not be acceptable.
- .2 Vinyl windows work systems and components are to be provided by a single manufacturer to ensure a single source of responsibility for the Work of this Section.
- .3 Vinyl windows: 'Defender 88PH+ XI' as manufactured by Innotech Windows, tilt & turn operable windows (**OP-1**) where indicated on Drawings, or approved alternative,
 - .1 'Energeto Neo Series' by Euroline Windows.
- .4 Finish:
 - .1 Interior: 'Bronze' or 'Matt Black', or 'White'.
 - .2 Exterior: 'Bronze' or 'Matt Black'.
 - .3 Colours to be coordinated with adjacent work colours' under Sections 07 46 19 and 07 71 23, as indicated on Drawings. Colours to be confirmed by Consultant upon submission of colour samples. **Allow for 5 colours submitted to be selected by Consultant.** Allow for **minimum** two submissions.
- .5 Contractor is responsible for ensuring that the listed alternative vinyl windows systems meet the performance requirements listed in this Section and are deemed to be consistent with the glazing systems indicated and components listed as basis of design.

2.2 MATERIALS

- .1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.
- .2 Unless detailed or specified herein, standard products in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 will be acceptable if construction details and installation meet intent of Drawings and Specifications.
- .3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.
- .4 Incorporate only new materials that are free from defects which impair strength, durability, or which are visible.
- .5 Glass and glazing materials: As specified in Section 08 80 00.

- .6 Airseal sealant: CAN/CGSB-19.13-M; One part silicone neutral cure low modulus sealant. Verify compatibility with insulating glass unit manufacturer's secondary sealant.
- .7 Frame sealant: Type as recommended by the window manufacturer.
- .8 Window sealant: In accordance with Section 07 92 00.
- .9 Glass presence markers: As specified in Section 08 80 00.
- .10 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304. Aluminum; screws and bolts, AS2024 or 6061, and nuts AS6262.
- .11 Window hardware: Manufacturer's standard heavy duty type.
- ~~.12 Door hardware:
 - ~~.1 Hinges: As recommended by manufacturer.~~
 - ~~.2 Passage set and deadbolt: Supplied by finish hardware supplier under Section 08-70-00 for installation by door manufacturer.~~~~
- .13 Screens: Fiberglass yarn 14 X 18 mesh screen, conforming to CAN/CGSB 79.1-M, in an extruded aluminium frame finish to match window frame.
- .14 Foam insulation: One component polyurethane foam-in-place moisture cured caulking sealant insulation, 16 kg per m^d to 32 kg per m^d density; injected from prepackaged pressurized containers for installation within closures and fillers; foam shall be CFC free. Enerfoam by DuPont de Nemours Inc. or approved alternative.

2.3 FABRICATION

- .1 Take site measurements of all openings for windows, ~~doors~~, frames and sash.
- .2 Fabricate generally to dimensions and profiles indicated on Drawings and to meet specified requirements. Maintain sight lines indicated and clearances to other construction components.
- .3 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.
- .4 Fabricate window and sash true and square, to component sizes to match existing, and overall sizes to suit existing frames or new openings.
- .5 Fabricate, fit and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Seal frame with sealant at joints for weatherproof seams.
- .6 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.
- .7 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing. Fabricate filler and closure pieces as necessary for a complete and weathertight installation.

- .8 Except where shipping makes impossible, fabricate units in shop and ship completely assembled.
- .9 Do not expose manufacturer's identification labels on window assemblies.
- .10 Certify windows as complying with the AAMA/WDMA/CSA 101/I.S.2/A440 design criteria and requirements using an easily removable label located on the inside face of glazing.
- .11 Fabricate frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.
- .12 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections in wherever possible.
- .13 Fabricate window flashings, closures and trim to profile shown. Make weathertight.
- .14 Secure weatherstripping in place by mechanical means only, and in a manner to enable its removal and replacement without special tools.
- .15 Install window hardware in accordance with reviewed shop drawings.
- .16 Ensure that continuity of weatherstripping is maintained around openings

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Install windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, reviewed shop drawings and manufacturer's instructions.
- .2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.
- .3 Install reinforcing and supporting members as specified or indicated as part of the work of this Section.
- .4 Do not force units into place, nor subject them to loads for which they were not designed.
- .5 Install window flashings, closures, and trim pieces.

- .6 Provide for thermal movement to take place between units and adjacent construction.
- .7 Conceal anchors, clips, blocking, and all other attachments. Provide all fastenings or anchors to be built in under other Sections.
- .8 Fill voids between framing and adjacent construction with foam insulation.
- .9 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.
- .10 Install units with consideration for finish variations. Abrupt variations of appearance or colour in adjacent components will not be acceptable without approval of Architect before installation.
- .11 Refer to drawings for glazing type locations. Install glass units in accordance with requirements of Section 08 80 00.
- .12 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up

3.3 ERECTION TOLERANCES

- .1 Tolerances: Non-cumulative.
- 2 Maximum variation from plumb: 1.5 mm/3 m non-cumulative .
- .3 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- 4 Vertical and horizontal positions: +/- 3 mm.
- .5 Racking of face: 6 mm, nil in elevation.
- .6 Maximum perimeter sealant joint between window and adjacent construction: 13
- .7 Deviation from true plumb over full height of building; maximum 6 mm.
- .8 Deviation from true straightness in plane over full length of each building face; maximum 6mm.
- .9 Joint width between base and sill panels; maximum 3 mm and of uniform width. Do not apply sealants to joints between panels.

3.4 GLAZING PERIMETER AIRSEAL

- .1 Install glazing perimeter airseal at entire perimeter of each insulating glass unit to achieve an airseal from insulating glass unit to frame. Do not obstruct path of cavity drainage and air pressure equalization.

3.5 JOINT BACKING AND SEALANT

- .1 Prepare substrate surface, mask as recommended by sealant manufacturer.
- .2 Install joint backing and frame sealant at window system joints and perimeter for weathertight installation in accordance with window sealant manufacturer's instructions. Remove excess sealant.
- .3 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in sealant. Seal between sill upstand and window-frame. Seal butt joints in continuous sills.

3.6 ADJUSTING

- .1 Adjust operable units to move smoothly, with proper tension, throughout their full range of motion and to fit tightly when closed and locked.
- .2 Lubricate hardware in accordance with manufacturer's instructions.
- .3 Ensure that weatherstripping makes weathertight contact and does not cause binding to affect closing and locking.

3.7 CLEANING

- .1 Maintain windows, inside and outside, in clean condition throughout duration of work.
- .2 Remove protective material, and glass presence markers from surfaces.
- .3 Remove AAMA/WDMA/CSA 101/I.S.2/A440 certification labeling when directed by Consultant, in writing.
- .4 Wash windows with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for finish hardware work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 BHMA, Builders Hardware Manufacturing Association.
- .2 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 **SUBMITTALS**

- .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating compliance with reference standards, transportation, storage, handling and installation requirements.
- .2 Shop Drawings:
 - .1 Submit Shop Drawings and 3 complete hardware lists in accordance with Section 01 33 00 indicating:
 - .1 Door locations, sizes, hardware manufacturer's catalogue numbers, finish symbols and quantities required.
 - .2 Locations and mounting heights of each type of hardware.
 - .2 Supply templates and required information to door and frame manufacturer to enable accurate sizes, locations of cut-outs and reinforcement for hardware.
 - .3 Submit templates to required trade to arrange for provisions for accurate setting and fitting of hardware.
- .3 Samples:
 - .1 Submit 2 samples in accordance with Section 01 33 00 of each item that is different from hardware specified and include manufacturer's parts lists and installation instructions.
 - .2 Submit hardware component samples illustrating style, colour and finish. Tag samples identifying applicable Specification article number, brand name and number, finish, building location, date and catalogue number.
 - .3 Do not order hardware until samples have been accepted. Submit new samples to replace rejected samples. Supply hardware and finishes identical to each accepted sample.
- .4 Closeout submittals:
 - .1 Submit the following in accordance with Section 01 78 23 for each Product for incorporation into Operation and Maintenance Manual:
 - .1 Maintenance data.
 - .2 Operating instructions and safety precautions.
 - .3 Parts list with name and address of supplier.
 - .4 Lubrication schedule and type of lubricant recommended.
 - .5 Keys, tools and special devices.

- .6 Inspection procedures related to preventive maintenance.

1.4 QUALITY ASSURANCE

- .1 General:
 - .1 Manufacturers: Companies specializing in manufacturing door hardware and registered with BHMA.
 - .2 Hardware supplier: Company specializing in supplying commercial door hardware and acceptable to manufacturer.
- .2 Certifications:
 - .1 Employ an Architectural Hardware Consultant to inspect completed installation and certify that hardware has been installed in accordance with manufacturer's printed instructions, Authorities having Jurisdiction and as specified.
 - .2 Submit manufacturer's certificate that finish hardware and fire rated hardware meets specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Be responsible for packaging of hardware, on a set by set basis. As material is received from various manufacturers identify it to correspond to Hardware List symbols.
- .2 Label packages legibly, indicating manufacturer's number, types, sizes, opening number and Hardware List reference number. Wrap hardware and include in package, screws, bolts and fastening necessary for correct installation. If hardware package is not complete, pay additional charges incurred by installer.
- .3 Deliver hardware to Site packaged, labelled and cross-referenced to hardware list for each item and its scheduled installation location.
- .4 Accept Products of this Section on Site and ensure that each item is undamaged.
- .5 Catalogue and store hardware in secure area.

2 Products

2.1 GENERAL

- .1 Provide hardware schedule to Consultant for approval indicating products, materials and finishes. Do not order products until schedule has been approved by Consultant
- .2 Finish hardware, general:
 - .1 Provide brushed stainless steel Sergeant heavy-duty hardware for interior applications.
 - .2 Automatic door operators shall be activated by 150 mm diameter stainless steel push button switches on either sides as indicated and be in accordance with requirements of the Ontario Building Code (OBC).

- .3 Carefully check and verify Hardware List against Contract Drawings to ensure that hardware listed can be used as specified. Inform Consultant of concerns regarding quality, quantity, operation or function of hardware selected:
 - .1 Verify hand of doors, examine details on Contract Drawings and at Site to ensure hardware supplied can be correctly installed and is correct for work as constructed.
 - .2 Select hardware in accordance with applicable codes and regulations and to approval of local Fire Marshal.
 - .3 Replace and pay for defective hardware including hardware which was incorrectly selected, and remedial and installation costs.
- .3 Ensure that hardware selected will function correctly, meets Contract requirements and Ontario Building Code and authorities having jurisdiction.
- .4 Ensure that each hardware item is of same type, design and by same manufacturer.
- .5 Manufacturer's names or trade marks are not permitted on exposed surfaces of hardware.
- .6 Include in packing slip a list of parts, name of supplier and door number in which lock is to be installed.
- .7 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.
- .8 Fire rated assemblies:
 - .1 Hardware: Selected and installed in accordance with applicable codes and regulations, NFPA-80 and to approval of Ontario Fire Marshal.
 - .2 Fire rated doors: ULC labelled hardware. Submit written certification of conformance to ULC requirements for each type of hardware prior to delivery.
 - .3 Locksets and latchsets on fire rated doors: 19 mm throw minimum.
- .9 Lock-sets to conform with Owner's existing building keying system.

2.2 ACCESSORIES

- .1 Items to be attached to masonry or concrete with expandable shields, lagscrews, bolts or other fastening devices as required. Exposed screws: Stainless steel, Phillips or Robertson heads.

2.3 FINISHES

- .1 Metal finishes: Free from defects, clean, unstained and of a uniform colour for each type of finish required. Exposed surfaces and anchors: Specified finish symbol of item.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install hardware in accordance with reviewed Shop Drawings, manufacturer's installation instructions, and applicable Codes and regulations.
- .2 Install hardware in accordance with hardware templates.
- .3 Adjust fixed and operable hardware for correct clearances and function.
- .4 Mount hardware measured from finished floor to centre of hardware, unless indicated otherwise or required by Code:
 - .1 Top hinge: 250 mm from head of door to top.
 - .2 Bottom hinge: 265 mm from finished floor to bottom of hinge.
 - .3 Intermediate hinge: Equal distance between top and bottom hinge.
 - .4 Locksets, latchsets: 1000 mm.
 - .5 Panic device crossbar: 1000 mm.
 - .6 Push plates: 1100 mm to bottom of plates.
 - .7 Guard bars: 1100 mm.
 - .8 Door pulls: 1100 mm to bottom of pulls.
 - .9 Blank strike: 1450 mm.
 - .10 Blank fronts: 1450 mm.
- .5 Include for supply and installation of wiring for electric strikes from electrical junction box to electric strike hardware.
- .6 Locate door stops to contact doors 75 mm from latch edge.
- .7 Install hardware and trim square and plumb to doors.
- .8 Replace wrappings for hardware provided by manufacturer after installation.
- .9 Safeguard keys to keep them out of unauthorized hands, tag them with door number, and deliver them to person designated by Consultant at building completion.

3.3 **FIELD QUALITY CONTROL**

- .1 Have hardware inspected after installation by hardware supplier's representative, obtain certification in writing that hardware has been supplied and installed in accordance with Specifications and hardware manufacturer's instructions and is functioning correctly.

- .2 Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements and Authorities having Jurisdiction.
- .3 Test access control system and electrified hardware devices for proper operation.
Verify electric door release hardware operates properly upon activation of fire alarm system.

3.4 ADJUSTING

- .1 Verify under work of this Section, that installed hardware functions properly.
- .2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by manufacturer's instructions.
- .3 Adjust doors with self closing devices or automatic closing devices for proper operation after the HVAC system is balanced and adjusted.
Verify spring power of non sized door closers is properly adjusted.

3.5 CLEANING

- .1 Remove wrappings at completion of the Project and clean hardware in accordance with manufacturer's instructions.

3.6 HARDWARE GROUPS/SCHEDULE

- .1 Hardware groups/schedule: To follow.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment, tools, and services necessary for glass and glazing work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM C920, Specification for Elastomeric Joint Sealants.
- .2 ASTM C1036, Standard Specification for Flat Glass.
- .3 ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- .4 ASTM C1376, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- .5 ASTM D2240, Test Method for Rubber Property - Durometer Hardness.
- .6 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E2190, Standard Specification for Insulating Glass Unit Performance and Evaluation.
- .8 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.
- .9 CAN/CGSB-12.3-M, Flat, Clear Float Glass.
- .10 CAN/CGSB-12.8, Insulating Glass Units.
- .11 Glass Association of North America (GANA) Glazing Manual.
- .12 NFPA 80, Standard for Fire Doors and Other Opening Protectives.
- .13 ULC CAN4 S104-M, Standard Method for Fire Tests of Door Assemblies.
- .14 ULC CAN4 S106-M, Standard Method for Fire Tests of Window and Glass Block Assemblies.

1.3 **DESIGN REQUIREMENTS**

- .1 In addition to design requirements specified herein, glass and glazing to be designed in accordance with Sections 08 11 13, 08 44 00, and 08 53 13.
- .2 Glass design:
 - .1 Design glass using a probability of breakage of 8 lites per 1000 at the first application of design load.
 - .2 Perform stress analysis. Design units to accommodate live, dead, lateral,

wind, seismic, handling, transportation, and erection loads.

- .3 Perform a thermal stress analysis on each glass unit with Low-E coating and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
 - .4 Perform a thermal stress analysis on each insulating thermal unit and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
 - .5 Where required, design glazing units so as not to allow thermal stress fracture due to heat build-up behind insulating units.
 - .6 Design windows and glazing to act as guards and meet requirements of CSA A500 and authorities having jurisdiction.
 - .7 Roller wave:
 - .1 Heat treated flat glass to be by horizontal (roller hearth) process with inherent roller wave distortion parallel to the bottom edge of the glass as installed.
 - .2 Maximum peak to valley roller wave 0.08 mm in the central area and 0.20 mm within 267 mm of the leading and trailing edge or 100 millidiopter over 95% of the glass surface.
 - .3 Maximum bow and warp 0.79 mm per 300 mm.
 - .4 Roll distortion is to run parallel to the width dimension when installed in the building.
 - .8 Coordinate with applicable Sections as required to meet intended energy and performance requirements for insulating glass units.
- .3 Structural glazing:
- .1 Carry out design of structural silicone joints by rational analysis including all movements specified herein. Maximum stress shall not exceed 138 kPa (20 psi) in tension or shear for short term loading. Maximum stress in shear for long term loading due to the dead load of glass shall not exceed 7 kPa (1 psi) or the limit imposed by sealant manufacturer, whichever is less.
 - .2 The joint shall be essentially rectangular in shape and shall include no internal corners which could precipitate tearing or create high local stresses.
 - .3 Single Source Responsibility for Sealants, Gaskets and Other Glazing Accessories: In order to ensure consistent quality of performance, provide all glazing sealants and seals from a single manufacturer.
 - .4 Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturer, samples of each glass, gasket, glazing accessory and glass-framing member that will contact or affect glazing sealants for compatibility and adhesion testing. Schedule submission of test samples to provide sufficient time for testing and analysis of results to prevent delay in the progress of work.
- .4 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
- .5 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .6 Design glazing in Aluminum Work which extend below 1070 mm above finished floor is to be designed to withstand the specified lateral loads for guards in accordance with OBC requirements.
- .7 Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of ULC certifying it for use in tested and rated fire protective assemblies.

1.4 **SUBMITTALS**

- .1 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating as a minimum:
 - .1 Fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .2 To sealant manufacturer for their review and approval of tensile bead contact/bite dimension and thickness.
 - .3 Information in the shop drawings should also include material standards, design criteria, (i.e. depth of members, deflection limits etc.) and design loads to be used for the design."
- .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00.
 - .2 Submit one sample of each type of glass.
 - .1 300 x 300 mm of each type of insulating glass unit, complete with each different Low-E coating.
 - .2 300 x 300 mm of each type of fire rated glass
 - .3 300 x 300 mm of glass film.
- .3 Certificates:
 - .1 Submit manufacturer's certification that glass and glazing materials are compatible.
- .4 Reports:
 - .1 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.
 - .2 Compatibility test report from manufacturer of insulating glass edge sealant, indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, setting blocks, edge blocks and any other material that contacts or can affect the edge seal.
- .5 IGMAC Compliance Audit: Submit in accordance with Section 01 33 00, a written certification of successful completion of a Compliance Audit within the last six months.
- .6 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.
- .7 IGMA Compliance Audit: Submit in accordance with Section 01 10 10, a written certification of successful completion of a Compliance Audit within the last six months.
- .8 Information in the shop drawings should also include material standards, design criteria (i.e. depth of members, deflection limits etc.) and design loads to be used for the design.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in glazing work of comparable complexity and scope to perform the following services as part of the Work of this Section:
 - .1 Design of glazing serving as guards to meet requirements of the 2024 Ontario Building Code and authorities having jurisdiction.
 - .2 Review, stamp, and sign shop drawings.
 - .3 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards and any other applicable standards and regulations related to the work".
 - .4 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of the Work is in accordance with Contract Documents and reviewed shop drawings.
 - .5 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.
- 2 Insulating glass unit fabricators shall be a certified member of the Insulating Glass Manufacturer's Alliance (IGMA). IGMA members must participate in the certification program and shall have successfully passed a Compliance Audit within the last six months.
- 3 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of glazing units of a similar size and nature.
- 4 Each lite fire rated glass shall bear permanent, nonremovable label of ULC certifying it for use in tested and rated fire protective assemblies.

1.6 SITE CONDITIONS

- .1 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures over 4 °C, and when positive that no moisture is accumulating on them from rain, mist, or condensation.
- 2 When temperature of glazing surfaces is below 4 °C, obtain from Consultant and material manufacturer approval of glazing methods and protective measures which will be used during glazing operations.

1.7 EXTENDED WARRANTY

- .1 In accordance with Section 08 44 00 and 08 53 13.

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 AGC Flat Glass.
- .2 Cardinal Glass Industries.
- .3 Guardian Industries.
- .4 Viracon Inc.
- .5 Vitro Architectural Glass (formerly PPG Industries Ltd.)

2.2 MATERIALS

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, primers, coatings, sealers, sealants, adhesives and cleaners are to have low VOC content limits.
 - .2 All coatings of a similar type shall be applied in a single production run to ensure colour match.
 - .3 Edges of glass shall be free from spalls, flake chips or rough chips which would be either visible or compromise the adhesion of the exterior weather seal or reduce the strength of glass when subjected to temperature differentials.
- .2 Tempered glass (**TGL-1**): CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear,:
 1. For IGU units (**TGL-1**): 6 mm thick, or as determined by P.Eng. for glass in windows functioning as guards by O.B.C.
 2. For Indoor screens (**TGL-2**): 13mm, or as determined by P.Eng., with polished edges.
- .3 Fire rated glass - Ceramic (**GL-4**): 20 min. to 3 hr. fire rating tested to ULC CAN4 S104-M and ULC CAN4 S106-M, 5 mm thick or as otherwise ~~noted on Door Schedule~~ required by door and screen lite sizes, as determined by P.Eng. with appropriate labelling stating fire rating and approval, clear polished glass with fire-rated surface film as approved by manufacturer. 'Firelite NT' by Technical Glass Products or approved alternative.
- .4 Glass film (**FT-1**): 'Scotchcal ElectroCut Special Effects Film' manufactured by 3M or approved alternative. Application pattern as indicated on drawings.
- .5 Insulating glass units:
 - .1 To CAN/CGSB-12.8-M, ASTM E2190 and IGMA requirements utilizing approved non-metallic edge spacer; 'Super Spacer' by Quanex or approved alternative.
 - .2 To comply with IGMA labelling requirements to be considered certified. Materials, excluding the glass, shall be from the same manufacturer as those employed for the certification of the insulating glass units.
- .6 Argon gas: 100% pure. Argon gas to be used to fill air space at all insulated glass units.

- .7 Low-E coating: High performance sputtered low-E coating. Provide insulating glass units with low-E coating edge deletion and low-E coating. Apply low-E coating to second surface unless otherwise indicated. Unless otherwise required to meet intended U-COG value as required for Project, provide one of the following:
 - .1 'EnergySelect R31 or R42' by AGC Flat Glass.
 - .2 'Cardinal LoE-270 or 272' by Cardinal Glass Industries.
 - .3 'SN 68' by Guardian Industries.
 - .4 'Solarban 60' Clear by PPG Industries Inc.
- .8 Low-E coating (Soft coat): ASTM C1376, high performance sputtered low-E coating. Provide insulating glass units with low-E coating edge deletion and low-E coating. Apply low-E coating to second surface unless otherwise indicated, applied individually or in combination to achieve required U-value of window units. Provide the following low-E coating types:
 - .1 LE-1: 'Cardinal LoE-i89' by Cardinal Glass Industries, or approved alternative by AGC Flat Glass or Guardian Industries.
 - .2 LE-2: 'Cardinal LoE-180' by Cardinal Glass Industries, or approved alternative by AGC Flat Glass or Guardian Industries.
 - .3 LE-3: 'Cardinal LoE-270' by Cardinal Glass Industries, or approved alternative by AGC Flat Glass or Guardian Industries.
 - .4 LE-4: 'Cardinal LoE-272' by Cardinal Glass Industries, or approved alternative by AGC Flat Glass or Guardian Industries.
- .9 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by sealant, spline, and glass manufacturer.
- .10 Glazing sealant: Silicone sealant as recommended by glazing manufacturer. Verify compatibility with insulating glass unit secondary sealant.
- .11 Glazing sealant (structural glazing - exterior):
 - .1 Silicone, One Part in accordance with ASTM C920, Type S or M, Grade NS, Class 25.
 - .2 Structural glazing tensile bead: 'Proglaze SSG' by Tremco or 'Dowsil 795' by Dow Consumers Solution.
 - .3 Structural glazing weather bead: 'Spectrem 2 Sealant' by Tremco or 'Dowsil 795' by Dow Consumers Solution.
 - .4 Structural glazing (factory glazed): Two-part, neutral cure silicone sealant, 'Proglaze II' by Tremco or 'Dowsil 983' by Dow Consumers Solution.
- .5 Colour: Colour to be selected by the Consultant from full colour range to match curtainwall framing in accordance with Section 08 44 00. Allow for custom colour matching.
- .12 Glazing sealant (structural glazing - interior):
 - .1 Silicone, One Part in accordance with ASTM C920, Type S or M, Grade NS, Class 25.
 - .2 Structural glazing tensile bead: 'Proglaze SSG' by Tremco or 'Dowsil 795' by Dow Consumers Solution.
 - .3 Structural glazing (factory glazed): Two-part, neutral cure silicone sealant, 'Proglaze II' by Tremco or 'Dowsil 983' by Dow Consumers Solution.
 - .4 Colour: Colour to be selected by the Consultant from full colour range.

- .13 Heel & toe bead: Silicone sealant as recommended by glazing manufacturer.
- .14 Glazing gasket: 'Visionstrip' or Polyshim II' by Tremco Ltd., glazing seal, size as recommended by manufacturer.
- .15 Glazing tape: 'Polyshim II' glazing tape EPDM shim.
- .16 Glazing tape (fire rated glass): Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.
- .17 Glazing splines: EPDM or neoprene, extruded shape to suit glazing channel retaining slot, colour as selected.
- .18 Setting blocks (regular): EPDM, 80 - 90 Shore A durometer hardness to ASTM D2240, sized to suit glazing method, glass unit weight and area.
- .19 Setting Block (Structural Glazing): Silicone setting blocks with Shore, Type A durometer hardness of 85, plus or minus 5 to ASTM D2240, sized to suit glazing method, glass unit weight and area.
- .20 Edge blocks: EPDM, 60-70 Shore A Durometer hardness, self adhesive on face, sized with 3 mm clearance from glass edge and spanning glass thickness(es).
- .21 Glass presence markers: Easily removable, non-residue depositing.
- .22 Screws, bolts and fasteners: Type 304 stainless steel.
- .23 S/L Hardware: UCBS3812CL (1 5/8" x 1 5/8") aluminum top u channel clad w/ st. steel w/ GG12100 black rubber, SR4SBS3812CL (2" x 4") aluminum bottom rail clad w/ st. steel w/ GG12100 black rubber, SREC4SBS end caps, by C.R. Laurence, or approved alternative, Brush Stainless Steel finish.

2.3 GLAZING AND FILM SCHEDULE

- .1 General: Glass types shall be as indicated below unless otherwise required due to thermal stress analysis.
- .2 **IGU-1:** 6 mm **TGLT-1** outside with **LE-4** low-e coating on surface #2, 13 mm argon filled air space, 6 mm **TGLT-1** inside with **LE-1** low-e coating on surface #4. Standard at aluminum doors and windows in curtainwall aluminum frames unless noted otherwise. 25 mm overall thickness.
- .3 **IGU-2:** 6 mm **TGLT-1** outside with **LE-4** low-e coating on surface #2, 13 mm argon filled air space, 6 mm **TGLT-1** middle with **LE-2** low-e coating on surface #4, 13 mm argon filled air space, 6 mm **TGLT-1** inside with **LE-1** low-e coating on surface #6. Standard at aluminum curtainwall framing unless noted otherwise. 45 mm overall thickness.

- .4 **IGU-3:** 4 mm **TGLT-1** outside with **LE-3** low-e coating on surface #2, 17 mm argon filled air space, 4 mm **TGLT-1** middle, 17 mm argon filled air space, 4 mm **TGLT-1** inside with **LE-2** low-e coating on surface #5. Standard at vinyl windows ~~and doors~~ unless noted otherwise. 46 mm overall thickness.
- .5 Shadow boxes (**SBX-1**): in accordance with Section 08 44 00.
- .6 Film Type 1 (**FT-1**): GF as specified above where indicated in Drawings. Allow for 150 mm tall lettering the length of windows and screen units, including door lites on interior screens, exterior windows and doors with glazing in them. Font and design of lettering to be confirmed.

2.4 **FABRICATION**

- .1 Verify glazing dimensions on Site.
- .2 Clearly label each glass lite with maker's name and glass type. Ensure labels are easily removable, non-residue depositing type. Do not remove labels until after Work is accepted by Consultant.
- .3 Fabricate glazing not less than 3 mm smaller than rebate size in either dimension; allow for edge spacers, shims, and setting blocks as necessary.
- .4 Work shall have smooth finished surfaces free from distortion and defects detrimental to appearance and performance.
- .5 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Consultant's acceptance.
- .6 Grind and polish a 1.5 mm arris to both edges of exposed glazing at locations where glazing is not encapsulated in framing and where edges are exposed to occupants.
- .7 Fabricate argon filled thermal units with air space filled minimum 90% with argon gas.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that openings for glazing are correctly sized and within tolerance.
- .3 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- .4 Laminated glass edges shall be completely covered by tape to protect against sealants and water if required by manufacturer.

3.2 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- .1 Provide glazing in accordance with FGIA recommendations. Provide continuous contact between glazing tapes and gasket to the glazing.
- .2 Install glazing to the work of Sections 08 11 13, 08 36 13, 08 44 00, and 08 53 13.
- .3 Provide neat, straight sight lines. Trim excess glazing tape flush with top of stops and fixed leg of frames.
- .4 Remove protective coatings, glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.
- .5 Apply primer/sealer to contact surfaces, prior to glazing.
- .6 Apply glazing tape as per manufacturer's instructions including recommended corner sealant.
- .7 Use setting blocks at 1/4 points and spacers to centre glass unit in frame.
- .8 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .9 Apply a continuous heel bead of sealant around perimeter of inboard lite of the sealed unit and the metal framing.
- .10 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.
- .11 Install glazing gasket in accordance with manufacturer's recommendations.
- .12 Do not cut or abrade tempered, heat treated, or coated glass.
- .13 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.
- .14 Remove, dispose of, and replace broken, cut, abraded glass, and defective glass including but not limited to production dimples, roller wave or marks, tong marks, chips, cracks, etc.

- .15 Exterior glass: Glaze units with gasket on exterior side and glazing tape on interior side. Seal gap between glazing and stop with sealant to depth equal to bite of frame. Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
- .16 Structural glazing: Glaze units in accordance with reviewed shop drawings and in accordance with manufacturer's written instructions.
- .17 Interior glass: Glaze interior glass using glazing gasket glazing tape.
- .18 Fire rated glass:
 - .1 Install fire rated glass in accordance with ULC and NFPA 80 requirements
 - .2 Place setting blocks located at quarter points of glass with edge block no more than 150 mm from corners.
 - .3 Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
 - .4 Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
 - .5 Place glazing tape on free perimeter of glazing in same manner described above.
 - .6 Install removable stop and secure without displacement of tape.
 - .7 Install so that appropriate ULC markings remain permanently visible.
- .19 Glass film:
 - .1 Install glass film with adhesive, applied in accordance with film manufacturer's instructions.
 - .2 Place without air bubbles, creases or visible distortion.
 - .3 Fit tight to glass perimeter with razor cut edge.

3.4 CLEANING

- .1 Immediately remove sealant and compound droppings from finished surfaces.
- .2 Remove labels, protective material, and glass presence markers from prefinished surfaces.
- .3 Clean glass surfaces with cleaning agents and methods in accordance with Manufacturer's written instructions.
- .4 Do not wash glass film for 30 days after installation.
- .5 Do not use bristle brushes on glass film.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Design, labour, Products, equipment and services necessary for louvres work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 American Architectural Manufacturers Association (AAMA) Aluminum Association Designation System for Aluminum Finishes.
- .2 ASTM B209M Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 ASTM B211M Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
- .4 ASTM C920, Specification for Elastomeric Joint Sealants.
- .5 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint.

1.3 DESIGN REQUIREMENTS

- .1 Design louvre work in accordance with OBC and to withstand live, dead, lateral, wind, seismic, handling, transportation and erection loads.
- .2 Aerodynamic performance: 46% free area minimum.
- .3 Limit deflection of louver members to not more than 1/180 of span between supports when subjected to wind load of 1 Kpa applied horizontally to louvre face.
- .4 Design louvers to accommodate expansion and contraction of components due to temperature changes.

1.4 SUBMITTALS

- .1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating fabrication and erection details, including anchorage, accessories, thicknesses, profiles, finishes, pressure drop, face area, and free area.
- .2 Samples: Submit duplicate 600 x 600 mm samples of louvres in accordance with Section 01 33 00 indicating frame and reinforcing, insect screens finished in selected colours. **allow for minimum two submissions.**
 - .1 **Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 46 19, 07 71 23, 08 44 00, 08 53 13 and 09 97 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.**
- .3 Certification: Submit certified data from independent laboratory substantiating aerodynamic performance.

- .4 Close-out submittals: Submit operation and maintenance data for incorporation into Operations and Maintenance Manual in accordance with Section 01 33 00.

1.5 QUALITY ASSURANCE

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of louvres of a similar size and nature and that is approved by manufacturer. Submit to Consultant, installer's current certificate of approval by the material manufacturer as proof of compliance.

2 Products

2.1 MANUFACTURED UNITS

- .1 Fixed aluminum louvre:
- .1 Acceptable products and manufacturers: 'Model EHP' 2" Deep, 30 Fixed blade Non-Drainable Louvre by Price Louvres, or approved alternative by Construction Specialties Inc. or Ten Plus Architectural Products Ltd.
 - .2 Aluminum sheet: ASTM B209M.
 - .3 Depth: 30 mm.
 - .4 Frame and mullion: ASTM B211M; Extruded aluminum alloy Aluminum Association alloy 6063-T5 assembled with fastenings. 2.06 mm thickness minimum for head, sill, and jamb. Mullions: Concealed at 1500 mm maximum centres.
 - .5 Blade: Stormproof with centre watershed in blade, 1.73 mm thick minimum; maximum blade length: 1500 mm.
 - .6 Finish: DuraNar XL' by PPG in accordance with AAMA 2605 in colour to match vinyl windows **Exterior finish per Section 08 53 13**, as selected by Consultant. **Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.**
 - .7 Options:
 - .1 Duct collars.
 - .2 Extended sill, finished to match louvre.

2.2 ACCESSORIES

- .1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.
- .2 Isolation coating: CAN/CGSB-1.108-M; Bituminous solvent type paint.
- .3 Bird screen: Crimped 1.6 mm diameter aluminum wire mesh secured to 2 mm minimum thick extruded aluminum U frame mitred at corners. Mesh size: 12.7 mm.

- .4 Anchors and fasteners: AISI Type 304 stainless steel.
- .5 Sealant: ASTM C920, Type S, Grade NS; One-part, ultra-low modulus, moisture curing silicone sealant, 'Dowsil 790' by Dow Consumer Solutions or Spectrem 1 by Tremco Ltd. Colour: As selected by Consultant. Primer and joint backing as recommended by sealant manufacturer.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Coordinate framing and anchorage for louvres with other parts of the Work.
- .2 Install bird screen to inside face of louvres.
- .3 Install louvres in accordance with manufacturer's instructions and accepted shop drawings. Securely anchor into opening.
- .4 Apply isolation coating to separate dissimilar metals, and metals and masonry or concrete unless neoprene washers are shown.
- .5 Install duct collars as required and extended sills as indicated.
- .6 Seal louvre perimeter with sealant and joint backing for weather tight seal in accordance with requirements of Section 07 92 00.

3.3 CLEANING

- .1 Maintain louvre work in clean condition throughout construction period. Remove all corrosive or foreign materials or droppings resulting from work of this Section or other trades.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for gypsum board work.

1.2 **REFERENCES**

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .3 ASTM C645, Specification for Nonstructural Steel Framing Members.
- .4 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board.
- .5 ASTM C834, Standard Specification for Latex Sealants.
- .6 ASTM C840, Specification for Application and Finishing of Gypsum Board.
- .7 ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .8 ASTM C1177, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .9 ASTM C1178, Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .10 ASTM C1278, Specification for Fiber-Reinforced Gypsum Panel.
- .11 ASTM C1396, Specification for Gypsum Board.
- .12 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .13 ASTM F1267, Standard Specification for Metal, Expanded, Steel.

1.3 **DESIGN REQUIREMENTS**

- .1 Design gypsum board wall and ceiling systems with a maximum deflection of $l/360$.
- .2 Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.
- .3 Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.
- .4 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

- .5 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.
- .6 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.
- .7 Design wall framing system and reinforce as necessary to accommodate and support items attached to and supported by wall framing system.
- .8 Design wall framing system for wall assemblies with a height greater than 3000 mm and those assemblies incorporating non-standard gypsum board assemblies including, but not limited to, abuse resistant gypsum board.

1.4 REGULATORY REQUIREMENTS

- 1. Provide fire separations and fire protection exactly as specified in test design specification that validates the specified rating. Verify that work specified in other Sections, as a part of the entire assembly, meets applicable validating test design specification.

1.5 SUBMITTALS

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Shop Drawings:
 - .1 Submit Shop Drawings in accordance with Section 01 33 00 indicating:
 - .1 Wall assemblies, suspension systems, adjacent construction, elevations, sections and details, dimensions, thickness, finishes and relationship to adjacent construction.
 - .2 Framing and blocking for items being supported of wall systems.
 - .3 Information in the shop drawings should also include material standards, design criteria (i.e. depth of members, deflection limits etc.) and design loads to be used for the design.
 - .4 Fire protected (rated) designs:
 - .1 Material type, core thickness, metal studs, corner beads, etc. per designated ULC product design.
 - .2 Floor plans and sections indicating locations and types of all conditions.
 - .3 Products per system, identifying the assembly, system No. product and material.
 - .4 Individual systems ULC product design cut sheets and product data sheets
- .3 Certifications: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.6 QUALITY ASSURANCE

- .1 Qualifications: Execute the work of this Section by skilled, qualified, and experienced workers trained in the installation of the work of this Section.
- .2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in work of comparable complexity and scope, to perform following services as part of work of this Section:
 - .1 Design of wall systems with height greater than 3000 mm and at non- standard gypsum board assemblies including, but not limited to, assemblies incorporating abuse resistant gypsum board.
 - .2 Design of suspended gypsum board assemblies.
 - .3 Design of wall framing systems and reinforcing to accommodate items attached to and supported by the wall framing system.
 - .4 Design gypsum board fire rated assemblies and fire protected assemblies.
 - .5 Review, stamp, and sign Shop Drawings and design calculations.
 - .6 Professional engineer to include confirmation in a conspicuous location in the shop drawings that "The proposed Work will conform to the 2024 Ontario Building Code (OBC, Ontario Regulation 163/24, as amended by 247/25), applicable CSA and ASTM standards, and ULC designs, and any other applicable standards and regulations related to the work".
 - .7 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed Shop Drawings.
 - .8 Refer to Section 01 78 00 regarding submission requirements for the subject licensed Professional Engineer as it relates to sign-off letter.

1.7 SITE CONDITIONS

- .1 Do not begin work of this Section until:
 - .1 Mechanical and electrical work above the ceiling is complete.
 - .2 Substrate and ambient temperature is above 15°C.
 - .3 Relative humidity is below 80 %.
 - .4 Ventilation is adequate to remove excess moisture.
- .2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and 24 h after installation.

2 Products

2.1 MATERIALS

- .1 General: All materials under work of this Section, including but not limited to, sealants, adhesives, and primers are to have low VOC content limits.

- .2 Wood stud framing: in accordance with Section 06 10 00.
- .3 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, 38 x 19 mm cold rolled, channels.
- .4 Resilient channel: ASTM C645; 0.5 mm thick galvanized metal, 57 mm wide x 12 mm deep for walls and ceiling to reduce sound transmission.
- .5 Furring channels: ASTM C645; Formed from galvanized steel sheet, 22 mm winged flange type, cold rolled.
- .6 Furring channels (hat type): ASTM C645; 0.5 mm base steel thickness, galvanized.
70 mm wide x 22 mm deep hat shaped channel.
- .7 Heavy duty furring channels: ASTM C645; 0.9 mm steel thickness, galvanized hat shaped channel with a wider and deeper size as required by manufacturers.
- .8 Hanger wires: 4.1 mm minimum diameter galvanized pencil rod.
- .9 Tie wire: 1.6 mm thick minimum diameter, soft annealed, galvanized steel wire.
- .10 Corner bead, casing bead, and special shapes: Formed from 0.6 mm thick minimum, galvanized steel sheet, designed to be concealed by joint compound.
- .11 Control joint strip: Roll formed from galvanized steel sheet, with a tape protected recess, 6 mm wide x 11 mm deep.
- .12 Screw fasteners: ASTM C1002 Type S; Corrosion resistant.
- .13 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.
- .14 Batt insulation: In accordance with Section 07 21 00.
- .15 Standard sealants:
 - .1 Acoustic sealant (non-rated): Non-hardening acoustic sealant for use at non-rated assemblies, ASTM C834; Acrylic, mould resistant sealant, paintable. 'Smoke and Acoustic Sealant CP506' by Hilti or approved alternative.
 - .2 Standard sealants: In accordance with Section 07 92 00.
- .16 Fire rated seal: Provide one of the following for use at fire rated assemblies:
 - .1 Fire-rated sealant: Non-hardening sealant for use at fire-rated assemblies: ASTM E84; Acrylic based firestop sealant, colour: red or white as selected by Consultant. 'Flexible Firestop Sealant CP606' by Hilti or approved alternative.

- .2 Fire-rated seal: Non-hardening seal for use at fire-rated assemblies: ASTM E84; Flexible seal for installation between top track and substrate. 'Firestop Top Track Seal CFS-TTS' by Hilti or approved alternative.
- .3 Acoustic sealant (rated): Non-hardening acoustic sealant for use at rated assemblies, ASTM C834; Acrylic, mould resistant sealant, paintable. 'Acoustical Sealant' by USG Sheetrock or approved alternative.
- .17 Polyethylene vapour retarder: In accordance with Section 07 26 00.
- .18 Vibration isolation ceiling hangers: Unit shall consist of a high-deflection steel spring in series with a resilient, molded neoprene noise and vibration isolation pad. The steel spring and neoprene pad shall be incorporated into a stamped steel hanger assembly; Compact Spring Ceiling Hanger with Precompressed 30 Series Springs; '30CSCH' to match grid system by Mason Industries
- .19 Sound isolation wall clips: Unit shall consist of galvanized steel sound isolation decouple clip with natural organic rubber isolator, for mounting of drywall furring channels; 'IsoMax Sound Isolation Clips' by Kinetics Noise Control or approved alternative by PAC International or Mason Industries Inc.
- .20 Gypsum board **(GB-1)**: ASTM C1396; gypsum board 12.7 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Board by Certainteed Gypsum Canada, CGC Inc., or Georgia-Pacific Canada LP.
- .21 Fire rated gypsum board **(GB-2)**, Type X: ASTM C1396; gypsum board 15.9 mm thick, with minimum surface mass of 10.7 kg/m² (2.2 lbs/ft²), of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Type X Board by Certainteed Gypsum Canada, CGC Inc., or Georgia-Pacific Canada LP.
- .22 Fire rated gypsum board , Type C: ASTM C1396; gypsum board 12.7 mm thick of gypsum mineral core in maximum practical lengths to minimize end joints, unless indicated otherwise. Type C by Certainteed Gypsum Canada, Firecode C Board by CGC Inc. or approved alternative by Georgia-Pacific Canada LP.
- .23 Gypsum Board, Abuse Resistant Panels **(GB-4)**:
 - .1 Standard panels: ASTM C1396; 12.7 mm thick unless indicated otherwise on drawings; 'Abuse Resistant' by Certainteed Gypsum Canada, 'Sheetrock AR' by CGC Inc. or 'ToughRock' by Georgia-Pacific Canada LP.
 - .2 Fire rated panels: ASTM C1396; 15.9 mm thick, Type X, Fire rated wallboard shall be classified as to fire resistance by a testing agency recognized by governing authorities and be labelled in conformance with label service for application specified, with minimum surface mass of 10.7 kg/m² (2.2 lbs/ft²). Acceptable manufacturer's: Certainteed Gypsum Canada, CGC Inc. or Georgia-Pacific Canada LP.

- .24 Mould and Mildew Resistant board (**GB-3**): 12.7 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise; 'M2Tech Moisture and Mould Resistant' by Certainteed Gypsum Canada, 'Sheetrock Mold Tough' by CGC Inc. or 'DensArmor Plus High Performance Interior Panel' by Georgia-Pacific Canada LP.
- .25 Tile Backer: Water resistant tile backer board meeting ASTM C1178 or ASTM C1278, thickness as indicated. 'Diamondback Tile Backer' by Certainteed Gypsum Canada, 'Fiberock Aqua-Tough Underlayment' by CGC Inc. or 'Dens Shield' by Georgia-Pacific Canada LP.
- .26 Cement Board: ASTM C1177, 15.9 mm thick high strength Portland cement building panel with self-adhesive glass tape; provide board with heavier mesh reinforcement for suspended applications. 'Durock Cement Board with Edgeguard.' By CGC Inc., or approved alternative by Certainteed Gypsum or Georgia-Pacific Canada LP.
- .27 Levelling compound: Aggregated powder levelling compound with perlite aggregate; 'Cover coat Leveling Compound', by CGC Inc. or approved alternative; degree of texture to match Consultant's approved sample.
- .28 Special trim pieces: to include, but not limited to, the following:
 - .1 F reveal: Formed from extruded aluminum alloy 6063 T5. 'FDM-625-75' manufactured by Fry Reglet, Gordon Trims, or approved alternative.
 - .2 L trim: Formed from extruded aluminum alloy 6063 T5. Manufactured by Fry Reglet, Gordon Trims, or approved alternative.
 - .3 J moulding: Formed from extruded aluminum alloy 6063 T5. '1054' manufactured by Fry Reglet, Gordon Trims, or approved alternative.
 - .4 End closure: Formed from extruded aluminum alloy 6063 T5. 'DMEC-200' manufactured by Fry Reglet, Gordon Trims, or approved alternative.
 - .5 Circular column trim:
 - .1 At gypsum board ceilings: Formed from extruded aluminum alloy 6063 T5; '904-RT-12' manufactured by Gordon Trims, or approved alternative.
 - .2 At acoustical ceilings: Formed from extruded aluminum alloy 6063 T5; 'CWA-3-50' manufactured by Gordon Trims, or approved alternative.
- .29 Latex Fortified Mortar: Of type recommended by cementitious board manufacturer to suit application.
- .30 Shaftwall gypsum system:
 - 1. Steel J-Runner: ASTM C645; Rolled formed sheet steel, 25 gauge, by CGC, Gypsum Corporation or approved alternative.
 - 2. C-H stud: hot-dipped galvanized by CGC, Gypsum Corporation or approved alternative.
 - 3. Liner Panel: ASTM C1396; Gypsum wallboard panel, Thickness: 25.4 mm, Width: 610 mm. 'M2Tech Shaftliner Type X' by Certainteed Gypsum Canada, or approved alternative by CGC or Gypsum Corporation.

- 4. Face Panel: ASTM C1396; Gypsum wallboard panel, 1 layer, Thickness: 15.9 mm, Width: 1219 mm. 'GlasRoc Shaftliner Type X' by Certainteed Gypsum Canada, or approved alternative by CGC or Gypsum Corporation
- .31 Primer: Where indicated by board manufacturer, provide primer as required to achieve finishes as defined in ASTM C840.
- .32 Joint reinforcing tape:
 - .1 Standard gypsum board: ASTM C475; 50 mm wide x 0.25 mm thick, perforated paper, with chamfered edges.
 - .2 Moisture resistant and tile backer boards: ASTM C475; fibreglass mat joint tape as recommended by board manufacturer to suit location.
 - .3 Cement Board: Mesh reinforcing tape recommended by cement board manufacturer
- .33 Bonding adhesive: Type for purpose intended and as recommended and approved by manufacturer.
- .34 Joint and patching compound: ASTM C475; Asbestos-free, supplied by manufacturer of gypsum board used.
- .35 Fast setting patching compound: ASTM C475; Asbestos-free, Sheetrock or Durabond by CGC Inc., 'Moisture and Mold Resistant Setting Compound with M2Tech' by Certainteed Gypsum Canada or approved alternative. Access doors: Supplied by other Sections for installation as part of the work of this Section.
- .36 Acoustical outlet backer pads: Resilient acoustic putty pads for application to backside of outlet boxes; 'IsoBacker' by Kinetics Noise Control or approved alternative.
- .37 Corner guards (**CG**): Brushed stainless steel edge, continuous at all exposed gypsum corner edges (common areas only).
 - .1 'ECK-K' by Schluter Systems or approved alternative. Width 50mm, 90° angle, height 200 cm.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUSPENSION FRAMING

- .1 Install ceiling systems in accordance with reviewed Shop Drawings and manufacturer's written instructions.

- .2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.
- .3 Install vibration isolation hangers at all locations where indicated in strict accordance with manufacturer's printed instructions.
- .4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.
- .5 Install additional hangers at lighting fixture and ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.
- .6 Install main carrying channels transverse to structural framing members. Lap main carrying channels 200 mm minimum at splices and wire each end with two loops and prevent clustering or lining-up of splices.
- .7 Install furring channels at 400 mm o.c., not less than 25 mm, and not more than 150 mm from perimeter walls, at openings, at interruptions in ceiling continuity, and at change in plane. Install furring channels to a tolerance of 3 mm maximum in 3600
- .8 Install additional main carrying and furring channels to frame and to reinforce openings such as recessed lighting fixtures, access hatches, ceiling grilles, outlet boxes, ventilating outlets and similar items.

3.3 WOOD STUDS

- .1 Installed in accordance with Section 06 10 00.

3.4 ACOUSTIC ISOLATION CLIPS AND FURRING

- .1 Install acoustic isolation clips and drywall furring in accordance with reviewed Shop Drawings and manufacturer's written instructions.

3.5 FIRE RATED ASSEMBLIES

- .1 Install Products in fire rated assemblies in strict accordance with applicable ULC tested and approved designs.
- .2 Stiffen fire rated walls over 3.66 m high, where linear length of wall is greater than 2.44 m between perpendicular wall supports, with diagonal bracing above the ceiling extending perpendicular to wall at a 45° angle to structure above. Locate diagonal bracing at maximum 2.44 m o.c.

- .3 Where double layers of gypsum board are shown, and required for fire rating, screw first layer to studs and furring and laminate the second layer to the first using joint filler as an adhesive. Stagger joints between first and second layers.

3.6 BATT INSULATION

- .1 Install non-rated and fire-rated/acoustic insulation as required for Work of this Project in accordance with Section 07 21 00.

3.7 ACOUSTICAL SEALANT

- .1 Install acoustical sealant to acoustically insulated partitions in accordance with the manufacturer's instructions and Contract Drawings.
- .2 Install acoustical sealant under floor runner track, at partition perimeter both sides and at openings, cut-outs, and penetrations, concealed from view in the final installation.
- .3 Install firestop fill material behind fire rated acoustical sealant and provide firestop identification tag.
- .4 Smooth acoustical sealant with trowel prior to skin forming.

3.8 GYPSUM BOARD

- .1 Comply with ASTM C840. Install gypsum board in accordance with reviewed Shop Drawings and manufacturer's written instructions.
- .2 Install gypsum board vertically or horizontally, whichever results in fewer end joints. Locate end joints over supporting members.
- .3 Install gypsum board in lightly butted contact at edges and ends and with 1.6 mm maximum open space between boards; do not force gypsum board into place. Do not install imperfect, damaged or damp boards.
- .4 Install gypsum board butting paired tapered edge joints, and mill-cut or field-cut end joints; do not place tapered edges against cut edges or ends.
- .5 Install vertical joints minimum 300 mm from the jamb lines of openings and stagger vertical joints over different studs on opposite sides of partitions.
- .6 Do not locate joints within 200 mm of corners or openings, except where control joints occur at jamb lines or where openings occur adjacent to corners. Where necessary, place a single vertical joint over the centre of wide openings.

- .7 Install gypsum board over concrete and concrete masonry units with adhesive as recommended by gypsum board manufacturer where indicated on Drawings.
- .8 Cut, drill and patch gypsum board as may be necessary to accommodate the work of other trades.
- 9. Fire Separations:
 - 1. Construct gypsum board assemblies, where located, in accordance with tested assemblies to obtain required or indicated fire rated assemblies.
 - 2. Install assemblies tightly to enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges.

3.9 SHAFTWALL LINER

- .1 Plan and lay out metal framing components to ensure that all wall sections are plumb and properly aligned.
- .2 Install J-track along the ceiling line and vertically at columns and abutting partitions, positioning the long legs closest to the shaft, using powder actuated fasteners or other approved method. Secure each piece with the appropriate fasteners spaced a maximum 610 mm O.C.
- .3 Attach J-track to the floor with fasteners spaced at 610 mm O.C.
- .4 Install Shaftliner panels vertically. The leading edge of the first panel must be attached to the long leg of the vertical J-track with 41 mm Type S screws spaced 610 mm O.C. Secure the top and bottom edges using the same fasteners and spacing.
- .5 Friction-fit C-H stud into the top and bottom tracks and slide it snugly against the Shaftliner panel. Make sure the edge of the board is in full contact with the centre web of the stud and covered by all the tabs.
- .6 Place the next Shaftliner panel between the tabs and flange on the opposite side of the C-H stud and secure it to the top and bottom track with 41 mm Type S screws spaced 610 mm O.C.
- .7 Install subsequent Shaftliner panels and C-H studs in the same manner. Check periodically to ensure they are plumb.
- .8 At the end of a partition run, cut the last Shaftliner panel slightly narrower and shorter than the opening to facilitate installation.
- .9 For walls exceeding 3.7 m in height, Shaftliner panel end joints shall fall alternately in the upper and lower 1/3 of the partition. Use a C-H stud placed horizontally between panels to secure each joint.

- .10 Frame all cut openings in the shaft side with J-track, providing adequate structural support for openings over 1219 mm.
- .11 Anchor elevator door frames to shaftwall enclosures; however, they must remain independently supported by the building frame.

3.10 CORNER, CASING BEADS AND TRIM

- .1 Corner reinforcing bead: Install along all external angles, erect plumb, level and with a minimum of joints. Secure with screws at 225 mm o.c. apply filler over flanges flush with nose of the bead and extending at least 75 mm onto surface of board each side of corner. When filler dries, apply a thin coat of topping cement and blend onto adjoining surfaces.
- .2 Casing bead: Install where wallboard butts against a surface having no trim concealing the juncture and where shown on drawings. Erect casing beads plumb or level, with minimum joints, and secure with screws at 300 mm o.c. apply filler over flange flush with bead and extending at least 75 mm onto surface of board. When dry, apply a thin coat of topping cement and blend onto adjoining surfaces.
- .3 Recess channels and trim: Install recess channels and special metal trim where shown. Secure to substrate. Provide casing beads full height on wallboard edges at recess channels and metal trim.

3.11 JOINT TAPING AND FINISHING

- .1 Install reinforcing tape and a minimum of 3 coats of joint compound over gypsum board joints, metal trim and accessories, and screw fasteners in accordance with the gypsum board manufacturer's instructions.
- .2 Fill gaps between ,and any imperfections in, gypsum boards with joint compound, allow to dry, and sand smooth ready for painting.
- .3 Install finished gypsum board work smooth, seamless, plumb, true, flush, and with square, plumb, and neat corners.
- .4 Finish gypsum board in accordance with ASTM C840 to the following grades:
 - 1. Level 0: No taping, finishing, or accessories required. Use above suspended ceilings and within other concealed spaces, unless the assembly is fire rated, sound rated, sound or smoke controlled, or unless the space serves as an air plenum.
 - 2. Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable. Use above suspended ceilings and within other concealed spaces if the gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or the space serves as an air plenum.

3. Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories. Use for water resistant gypsum board indicated for use as a substrate for ceramic tile.
4. Level 3: At joints and interior angles embed tape in joint compound with two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use where heavy grade wall coverings are the final decoration.
5. Level 4: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use for all locations except those indicated for other finish levels.
6. Level 5: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply a thin skim coat of joint compound, or a material manufactured especially for this purpose, to the entire surface. Leave surface smooth and free of tool marks and ridges. Use where semi-gloss or gloss finish coatings are the final decoration.

3.12 ACCESS DOORS

- .1 Install access doors, supplied as part of other parts of the work, in accordance with manufacturer's written instructions.

3.13 SITE TOLERANCES

- .1 Install metal support systems to ensure that, within a tolerance of +3 mm and -1.5 mm for plaster thickness, finish surfaces will be flat within 3 mm under a 3 m straightedge, and with no variation greater than 1.5 mm in any running 300 mm, and that surface planes shall be within 3 mm of dimensioned location.

1. REPAIR

1. Make good cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.
2. Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Design, labour, Products, equipment and services necessary for acoustical ceilings work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM C635, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- .3 ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- .4 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.
- .5 ASTM E1264, Classification for Acoustical Ceiling Products.

1.3 DESIGN REQUIREMENTS

- .1 Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.
- .2 Design tile ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Acoustic panel system is not designed to carry the weight of electrical equipment.
- .3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.
- .4 Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.
- .5 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

1.4 SUBMITTALS

- .1 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Suspension system layout including hangers and supports for acoustic tile system.

- .2 Acoustic panel system including suspension system, hangers, supports and panel sizes and locations.
 - .3 Conditions at abutting, intersecting, and penetrating construction.
 - .4 Dimensioned locations of lighting fixtures, diffusers, sprinkler heads and other items that pierce the ceiling plane.
- .2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00:
 - .1 One full-size sample of each type of tile panels to be used.
 - .2 One of each type of suspension system members.
 - .2 Allow for minimum two submissions.
 - .3 Submit samples in tandem with those of sections 06 20 00, 09 65 00, 09 65 19, 09 67 23 and 09 91 00. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .3 Certificates: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in Province of Ontario, to perform the following services as part of the work of this Section:
- .1 Design of acoustical ceiling work.
 - .2 Design of anchors, supports and accessories to meet seismic requirements.
 - .3 Review, stamp, and sign shop drawings.
 - .4 Conduct on-Site inspections and prepare and submit inspection reports.
- .2 Mock-up:
- .1 Construct one 3 m² mock-up for each type of ceiling system incorporating typical light fixture and other typical mechanical and electrical fixtures.
 - .2 Test the adequacy of the suspension system to support the fixtures without deflection of ceiling or failure of hanging wire anchorage. Supply copy of Test Results to Consultant.
 - .3 Change materials and installation methods if tests indicate proposed system is inadequate and re-test as necessary until system approved.
 - .4 Give early notice to Consultant and Mechanical and Electrical Trades and co-operate with them in selecting suitable location for sample ceiling and timing of installation and test.
 - .5 Do not commence general installation work until sample ceiling approved, then install ceiling to conform with approved samples.
 - .6 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.6 SITE CONDITIONS

- .1 Do not install the work of this Section until:
 - .1 Mechanical and electrical work above the ceiling is complete.
 - .2 Relative humidity is below 80 %.
 - .3 Ventilation is adequate to remove excess moisture.
 - .4 Areas are closed and protected against weather, and maintained at no less than 10°C.
- .2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and after installation.

1.7 MAINTENANCE

- .1 Submit extra acoustic ceilings amounting to 2% of gross ceiling area, allowing proportionately for each pattern and type specified to nearest full carton. Submit Products which are part of same production run as installed Products. Store maintenance Products as directed by Consultant.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Transport, handle and store material in manner to prevent warp, twist, damage to panel edges and surfaces in accordance with Manufacturer's recommendations.
- .2 Any warped and/or damaged panels and trim shall be rejected and be replaced by new, straight, undamaged and acceptable material at no cost to Owner.
- .3 Bent, twisted or otherwise damaged Tee grid suspension components shall not be used under any circumstances. Replace such damaged items with new undamaged material at no additional cost to Owner.
- .4 Store material in warm, dry place away from water and the elements. Protect against undue loading stresses and shock.
- .5 All packaged material shall be delivered in original manufacturers wrappers and containers with labels and seals intact. All cartons shall bear U.L. label.

2 Products

2.1 MATERIALS

- .1 Wherever possible, acoustical ceiling tiles, steel suspension system and framing used in work of this Section are to contain recycled content.
- .2 Galvanized steel sheet: ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.

- .3 Main carrying channels: ASTM C645; Channels formed from galvanized steel sheet, 38 x 19 mm cold rolled.
- .4 Subframing: ASTM C645; Channels formed from galvanized steel sheet, dimensions and spans as required.
- .5 Hangers: 2.6 mm minimum diameter, galvanized steel wire.
- .6 Tie wire: 1.6 mm minimum diameter, soft annealed galvanized steel wire.
- .7 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.
- .8 Wall mouldings and accessories, including but not limited to, corner caps, edge mouldings, panel hold over clip, metal closures, and trim. Finish and colour: same as main tees.
- .9 Exposed main, cross tees, and relocatable cross tees: ASTM C635, 38 mm high steel, bulb tee design double steel web, rectangular single spans without exceeding a deflection of 1/360 of the span. Splices to be integral and reversible; cross tee interlocking into main tee. Colour and finish: Manufacturer's standard white.
 - .1 Suspension system:
 - .1 'Prelude XL' by Armstrong World Industries Inc.
 - .2 'Donn DX/DXL' by CGC Inc.
 - .3 'Classic Stab' by Certainteed Ceilings Canada.
 - .4 'Seismic 1200' by Rockfon/Chicago Metallic.
- .10 Acoustic Tile Ceiling (**C2**): ASTM E1264, type 3, Form 2, Pattern E. Wet-formed mineral fiber with acoustically transparent membrane and factory applied latex paint. 305 x 1220 x 25 mm thick in edge profile to be selected by Consultant; 'Optima PB' as manufactured by Armstrong Ceiling Tiles, or approved alternative.
- .11 Wood Ceiling Units: Ceiling Panels Type (**C3**) Surface Texture Smooth, Composition Solid Wood (Poplar), Finish Tinted, UV Cured Topcoat, Golden Maple (GGM) Finish on Solid Wood (Poplar) and backstage Noir Square Lay-in. Panel Dimensions 24-inch x 48-inch. School Zone Fine Fissured Acoustical Performance Infill. WoodWorks 6723F51L4T5 Grille Tegula, As manufactured by Armstrong World Industries.
 - .1 Suspension system: 'Prelude XL 15/16' Exposed Tee Main beam item 7301BL
- .12 Allow for 5 finishes submitted to be selected by Consultant. Allow for minimum two submissions.
- .13 Wall mouldings: To match acoustical ceiling suspension system.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUSPENSION SYSTEM

- .1 Coordinate locations and openings of mechanical and electrical services support, and penetration through the acoustical ceilings. Coordinate field conditions, clearances, measurements, and mechanical and electrical services testing and commissioning, above the acoustical ceilings.
- 2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.
- 3 Install acoustical ceiling systems in accordance with manufacturer's written instructions, reviewed shop drawings, and ASTM C636, listed in order of precedence.
- 4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.
- 5 Install additional hangers at lighting fixture and air distribution ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.
- 6 Install acoustical ceiling suspension system to a tolerance of 1:1200 of span and 0.4 mm maximum between adjacent metal members. Tolerances are not cumulative. Refer to Electrical Contract Drawings for fixture layout.
- .7 Do not bend or twist hangers as a means of levelling. Form double loops tightly and lock to prevent vertical movement or rotation within the loop.
- .8 Install edge moulding at intersection of ceiling and vertical surfaces.
- 9 Centre acoustical ceiling suspension systems on room axis; install equal border pieces. Install hangers onto the ends of main tee runners at not more than 150 mm from ends of runners, adjacent and perpendicular to walls.
- .10 Support the suspension system independently of walls, columns, ducts, pipes and conduits.
- .11 Install main runners in maximum available lengths. Layout joints in suspension members to avoid the perimeters of recessed fixtures. Lock grid members to form a rigid assembly. Install additional tee, suspension system framing around recessed fixtures, diffusers, grilles and other items for a complete assembly.

3.3 ACOUSTIC LAY-IN TILES

- .1 Install acoustic tile in grid system openings supported by bottom flanges of members. Provide special shapes and sizes to provide a complete installation by cutting tile to fit into openings. Fit tile moderately tight between upright legs of members.
- .2 Carefully cut and trim acoustic tiles to accommodate items piercing the finished ceiling plane.
- .3 Remove and replace acoustic tiles with broken edges, or damaged, marked, discoloured, soiled, or stained faces.

3.4 ADJUSTMENTS AND CLEANING

- .1 Clean soiled or discoloured surfaces of exposed work on completion of work.
- .2 Replace components which are visibly damaged, marred or uncleanable.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for resilient base work and accessories in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ASTM F1861, Specification for Resilient Wall Base.

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Samples: Submit two 250 mm long samples of resilient base in accordance with Section 01 33 00.
 - .1 Allow for minimum two submissions.
 - .2 Submit samples in tandem with those of sections 06 20 00, 09 51 00, 09 65 00, 09 65 19, 09 67 23 and 09 91 00. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .3 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.4 SITE CONDITIONS

- .1 Maintain air temperature and structural base temperature at installation area above 20°C for 48 hr before, during and 48 hr after installation.
- .2 Store materials for 2 days prior to installation in area of work to achieve temperature stability.
- .3 Do not install base in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.
- .4 Provide adequate ventilation during installation.

1.5 MAINTENANCE

- .1 Submit extra 5% or to nearest full roll of each colour, pattern and type of base required for maintenance use. Identify each carton. Store where directed.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers, and adhesives are to have low VOC content limits.
- .2 Rubber base: Refer to Section 09 65 19 for Interior Material Finishes for rubber base types, and colours.
- .3 Primers and adhesives: Low VOC, waterproof, recommended by base manufacturer for specific material on applicable substrate, above, at or below grade.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this Section.

3.2 **RESILIENT BASE APPLICATION**

- .1 Install resilient base in accordance with manufacturer's written instructions.
- .2 Lay out base to keep number of joints at minimum.
- .3 Prior to installing base, fill cracks and irregularities with a filler recommended by base manufacturer.
- .4 Set base in adhesive using a 3 kg hand roller, against wall and floor surfaces.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions.
- .7 Cope internal corners.

3.3 **CLEANING**

- .1 Forty-eight hours after installation, clean resilient base surfaces with a mild soap solution approved by finish manufacturer.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for resilient tile flooring work and accessories in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- .2 ASTM F1066, Specification for Vinyl Composition Floor Tile.
- .3 ASTM F1344, Standard Specification for Rubber Floor Tile.
- .4 ASTM F1861, Specification for Resilient Wall Base.
- .5 ASTM F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- .6 ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes.
- .7 ASTM F2195, Standard Specification for Linoleum Tile Flooring.

1.3 SUBMITTALS

- .1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00:
- .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
- .2 Product transportation, storage, handling and installation requirements.
- .2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00:
- .1 Two 250 x 200 mm samples of each type of tile material and colour.
- .2 Two 250 mm long samples of each base, accessory and colour.
- .2 Allow for minimum two submissions.
- .3 Submit samples in tandem with those of sections 06 20 00, 09 51 00, 09 65 00, 09 67 23 and 09 91 00. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- ~~.4 LEED submittals:~~
- ~~.1 Submit applicable supporting documentation in accordance with LEED~~

~~requirements for the approval of the Consultant.~~

- ~~.2 Submit completed LEED Material Submittal Form and LEED Emissions
Submittal Form in accordance with Section 01 60 13.~~

- .4 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.
- .5 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00.

1.4 **QUALITY ASSURANCE**

- .1 LEED requirements:
 - .1 The LEED requirements shall apply to all Sections and Work for this Project, whether specifically indicated or not.
 - .2 Compliance with requirements needed to obtain LEED prerequisites and credits will be used as one criterion to evaluate requests for substitutions or alternates.

1.5 **SITE CONDITIONS**

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20°C for 48 hr before, during and 48 hr after installation.
- .2 Store materials for 2 days prior to installation in area of Work to achieve temperature stability.
- .3 Do not lay flooring in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.
- .4 Provide adequate ventilation during installation.

1.6 **MAINTENANCE**

- .1 Submit extra 5% or to nearest full carton of each colour, pattern and type of flooring material and base required for maintenance use. Identify each carton. Store where directed.

2 **Products**

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers, adhesives, sealers, and waxes are to have low VOC content limits.
- .2 Vinyl floor tile type 1 (**VFT-1**): Laminated vinyl plank Expona, Simplay PUR Light Grey Concrete 2567, Warm Grey Concrete 2568, Cold Grey Concrete 2566, Dark Grey Concrete 2569 or Black Slate 2582, by Polyflor or approved alternative, with minimum 0.7 mm thick wear layer, 600 x 600 mm and 5.0 mm thick, R10 slip resistance in accordance with standard DIN 51130. Allow for a minimum of 5 colours samples **submitted** to be selected by Consultant from manufacturer's full colour range. **Allow for minimum two submissions.**

- .3 Vinyl floor tile type 11 (**VFT-11**): Laminated vinyl plank Expona, Commercial PUR, Light Micro Terrazzo 5123, Grey Micro Terrazzo 5124, Warm Micro Terrazzo 5125, Silica Micro Terrazzo 5126 or Black Textile 5077, by Polyflor or approved alternative, with minimum 0.55 mm thick wear layer, 609.6 x 1219.2 mm and 2.5 mm thick, R10 slip resistance in accordance with standard DIN 51130. Allow for a minimum of 5 colours samples submitted to be selected by Consultant from manufacturer's full colour range. Allow for minimum two submissions.
- .4 Vinyl floor tile type 2 (**VFT-2**): Laminated vinyl plank Expona, Simplay PUR Honey Wild Oak 2572, American Oak 2503, Light Cherry 2501, Medium Classic Oak 2521 or Brown Wild Oak 2570, by Polyflor, or approved alternative, with minimum 0.7 mm thick wear layer, 178 x 1220 mm and 5.0 mm thick, R10 slip resistance in accordance with standard DIN 51130. Allow for a minimum of 5 colours samples submitted to be selected by Consultant from manufacturer's full colour range. Allow for minimum two submissions.
- .5 Vinyl floor tile type 22 (**VFT-22**): Laminated vinyl plank Next Floor, Botanica, 587 002 Spring Oak, 587 201 Roasted Sesame, 587 003 Classic Oak, 587 201 Chateau Tan or 587 009 Tawny Oak, or approved alternative, with minimum, 200 x 1220 mm and 6.5 mm thick, 0.95 Coefficient of Friction in accordance with ASTM 2047. Allow for a minimum of 5 colours samples submitted to be selected by Consultant from manufacturer's full colour range. Allow for minimum two submissions.
- .6 Solid colour Rubber Stair Tread (**SRST**) with Integrated Riser AngleFit by Tarkett/Johnsonite, Raised Round texture, Colour ~~40-Black~~ 190 Greege, with flexible vinyl stair nosing and black grit tape for the visually impaired, or approved alternative. Allow for a minimum of 5 colours samples submitted to be selected by Consultant from manufacturer's full colour range. Allow for minimum two submissions.
- .7 Tactile Warning Indicator (**TWS1**) for floor thickness lesser than 5mm: Rubber tile with integral non-slip surface stamped into tile on top of domes. Tile shall incorporate an in-line pattern of truncated domes measuring nominal 5 mm high x 23 mm base diameter x 11 mm top diameter, space 61 mm o.c. diagonally and 43 mm side by side. Tiles shall be in colour as selected by Consultant; 'Eon Tile' by Kinesik Engineered Products or approved alternative. Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.
- .8 Rubber Tactile Warning Surface (**TWS1**) for floor thickness greater than 5mm: Solid rubber tactile walking surface indicators, 4.0 mm dome height with 3.2 mm base thickness; 7.2 mm overall thickness. Homogeneous composition of 100% synthetic rubber, high quality additives, and colorants to meet the performance requirements of ASTM F 1344, Class 1-A and 1-B Standard Specification for Rubber Floor Tile. 'Tactile Walking Surface Tile Resilient' by Tarkett or approved alternative. Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.
- .9 Rubber base (**RB-F4**): ASTM F1861, Type TP, Group 1, rubber wall base, approximately 114 mm high x 9.5 mm thick, profile as indicated, in lengths as long as possible including premoulded end stops and inner and outer corners. Colour: Allow for a minimum of 5 six (6 five) colours samples to be selected by Consultant. 'Millwork Wall Base - Mandalay MW-XX-H4' by Tarkett or approved alternative. Allow for minimum two submissions.

~~.10 Rubber base (RBF2): ASTM F1861, Type TP, Group 1, rubber wall base, approximately 100 mm high x 3 mm thick, profile as indicated, in lengths as long as possible including premoulded end stops and inner and outer corners. Colour: As selected by Consultant. 'Baseworks Thermoset Rubber' by Tarkett or approved alternative.~~

- .11 Primers and adhesives: Low VOC, waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
- .12 Concrete skim coat compound: High-performance, rapid-setting cement based skim coating compound. 'Ultra SkimCoat' by Mapei or approved alternative for filling minor voids and leveling existing substrate.
- .13 Sealer and wax: Type recommended by flooring manufacturer.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Ensure concrete floors meet the following minimum requirements and requirements of the flooring manufacturer. If there is a conflict between these requirements and those of the flooring manufacturer, the more stringent shall apply.
 - .1 Internal Relative Humidity Test: Perform internal relative humidity testing in accordance with ASTM F2170. Results shall not exceed 80% RH.
 - .2 Moisture Test: Moisture emissions from concrete subfloors (cured for a minimum of 28 days) must not exceed 3 lbs per 1000sf per 24 hours (1.4 kg H₂O/24 hr/93 m²) for acrylic adhesive and Slbs for polyurethane adhesive via the Calcium Chloride Test Method (ASTM F1869).
 - .3 The pH level of the subfloor surface shall not be higher than 9.9. If higher, subfloor must be neutralized.
- .3 Ensure that sub-floors have been provided as specified without holes, protrusions, cracks, depressions or other major defects.
- .4 Ensure that control joints have been filled and levelled.
- .5 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this Section.

3.2 SUBFLOOR TREATMENT

- .1 Flooring shall be installed over subfloors conforming to ASTM F710 for concrete.
- .2 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

- .3 Apply sub-floor filler to low spots and cracks to achieve floor level to a tolerance of 1:1000, allow to cure.
- .4 Meet ASTM F710 Standard for Concrete or other monolithic floors.
- .5 Clean and remove all deleterious materials from surfaces to receive this work in accordance with the adhesive manufacturer's recommendations.
- .6 Prime concrete to flooring manufacturer's printed instructions

3.3 RESILIENT TILE FLOORING ADHERED APPLICATION (VFT)

- .1 Install resilient tile flooring in accordance with manufacturer's written instructions.
- .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive that can be covered by flooring before initial set takes place.
- .3 Lay flooring with joints straight and parallel to building lines to produce symmetrical tile pattern. Install equal size perimeter tile on each side.
- .4 Install flooring to square grid pattern with all joints aligned.
- .5 As installation progresses, and after installation, roll flooring in 2 directions with minimum 45 kg minimum roller to ensure full adhesion.
- .6 Remove adhesive seepage at seams or surface while adhesive is still wet, in accordance with manufacturer's recommendation.
- .7 Cut tile and fit neatly around fixed objects.
- .8 Install feature strips and floor markings where indicated. Fit joints tightly.
- .9 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

3.4 RESILIENT TILE FLOORING INTERLOCKING APPLICATION (SPC)

- .1 Install resilient tile flooring in accordance with manufacturer's written instructions.

3.5 RESILIENT BASE APPLICATION

- .1 Install resilient base in accordance with manufacturer's written instructions.
- 2 Lay out base to keep number of joints at minimum.
- 3 Prior to installing base, fill cracks and irregularities with a filler recommended by base manufacturer.
- 4 Set base in adhesive using a 3 kg hand roller, against wall and floor surfaces.
- 5 Install straight and level to variation of 1:1000.

- .6 Scribe and fit to door frames and other obstructions.
- .7 Cope internal corners.

3.6 EDGE PROTECTION TRIM

- .1 Install edge protection trim at unprotected or exposed edges where flooring terminates and at edges where there are two finishes of different thicknesses.
- .2 Install accessories in accordance with manufacturer's written instructions.

3.7 CLEANING AND WAXING

- .1 Forty-eight hours after installation, clean vinyl tile surfaces with a mild soap solution approved by finish manufacturer. Rinse clean, dry and apply 2 coats of wax. Polish thoroughly.

3.8 PROTECTION OF FINISHED WORK

- .1 Protect floors from time of final set of adhesive until final waxing.
- .2 Prohibit traffic on floor for 48 hours after installation.
- .3 Cover waxed and polished surfaces with fibre reinforced, clean, non-staining kraft paper. Secure in position with gummed tape to prevent drifting. Remove covering when directed by Consultant.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for epoxy flooring work in accordance with the Contract Drawings.

1.2 SUBMITTALS

- .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Two copies of manufacturer's Product data on characteristics, performance criteria, and limitations.
 - .2 Preparation, installation requirements and techniques, Product storage, and handling criteria.
- .2 Samples: Submit duplicate samples of each type and colour of epoxy flooring mounted on 250 x 200 mm hardboard in accordance with Section 01 33 00.
 - .1 Allow for minimum two submissions.
 - .2 Submit samples in tandem with those of sections 06 20 00, 09 51 00, 09 65 00, 09 65 19 and 09 91 00. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.
- .3 Reports: Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of floor prior to installation.
- .4 Close-out submittals: Submit maintenance data for incorporation into Operations and Maintenance manuals in accordance with Section 01 33 00.

1.3 QUALITY ASSURANCE

- .1 Perform work of this Section by a company that has a minimum of five years proven experience in 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.
- .2 Mock-up:
 - .1 Construct one 3 m² mock-up of each type and colour of epoxy flooring in location acceptable to Consultant.
 - .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
 - .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
 - .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.
- .3 Pre-installation meetings: Arrange with manufacturer's representative and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.4 SITE CONDITIONS

- .1 Do not install the work of this Section outside of the following environmental ranges without Product manufacturer's written acceptance:
 - .1 Ambient air and surface temperature: 15°C to 30°C.
 - .2 Relative Humidity: In accordance with manufacturers' requirements.
 - .3 When no dust is being raised.
 - .4 In well-ventilated and broom clean areas.
- .2 Do not apply epoxy flooring over materials that contain over 4% moisture.
- .3 Install temporary protection and facilities to maintain the Product manufacturer's, and the above specification, environmental requirements for 24 hours before, during, and 24 h after installation.
- .4 Post do not enter and appropriate warning signs at conspicuous locations.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Package, seal and label each epoxy flooring material to show manufacturer's and product name, and colour.
- .2 Store materials at site in an area specifically set aside for purpose that is locked, ventilated, and maintained at a minimum temperature of 16°C.
- .3 Ensure that health and fire regulations are complied with in storage area, and during handling and application.

2 Products

2.1 MATERIALS

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, primers and epoxy flooring are to have low VOC content limits.
 - .2 Each material used in the application of each flooring system shall be as recommended or manufactured by the supplier of the flooring system.
- 2. Epoxy flooring and cove base: Troweled system, 100% epoxy pigmented base/binder, broadcast integrally coloured flakes, with one coat of 100% solids chemical free resistant epoxy top coat. Colours and finishes to later selection by Consultant from manufacturer's full colour range; total system thickness maximum 2 mm. 'Neoflake' by Neogard Canada Inc. or approved alternative. **Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.**
- .3 Primer: As recommended by epoxy flooring and gypsum concrete topping manufacturers.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that concrete floor has cured 28 days minimum and that substrate is acceptable to epoxy manufacturer.
- .3 Test surfaces for moisture content to ensure that they are suitable for application.

3.2 **PREPARATION**

- .1 Prepare substrate using steel aggregate blast method and vacuum substrate free of debris and dust.
- .2 Fill minor cracks and voids and prime surfaces in accordance with manufacturer's recommendations.
- .3 Protect adjacent surfaces from damage resulting from this work. Mask and/or cover adjacent surfaces, fixtures, and equipment as necessary.
- .4 Fill open control joints, and other cracks and voids with material compatible with epoxy materials.
- .5 Clean prime and seal surfaces as recommended by epoxy manufacturer.

3.3 **APPLICATION**

- .1 Apply epoxy flooring in accordance with manufacturer's printed instructions. epoxy manufacturer shall supervise application.
- .2 Stop epoxy in a straight line on each side of control joints; fill space over expansion joint with a self-levelling, non-sag polyurethane sealant.
- .3 Apply epoxy with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform colour, sheen and texture, all within limitations of materials and areas concerned.
- .4 Match colours and textures of approved samples.
- .5 Make clean true junctions with no visible overlap between adjoining applications of epoxy.
- .6 Chase edge of adjacent floor systems so that epoxy finishes flush with adjacent floor systems.

3.4 **SITE TOLERANCES**

- .1 Finish surfaces shall be level, or straight where sloped to drains, within a tolerance of 1.5 mm in 3 m, and shall not vary more than 0.8 mm in any running 300 mm.

3.5 **REPAIR**

- .1 Touch-up and refinish minor defective work. Refinish entire coated surface areas where finish is damaged or otherwise unacceptable.

3.6 **CLEANING**

- .1 Remove promptly as work progresses spilled or spattered materials from surfaces of work performed under other Sections. Clean floors on completion of work. Do not mar surfaces while removing.
- .2 Leave storage and mixing areas in same condition as equivalent spaces in project.

3.7 **PROTECTION**

- .1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of epoxy flooring, and for 48 hours following completion of application.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for painting work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 Master Painters Institute (MPI), Painting Specification Manual.
- .2 SSPC Steel Structures Painting Council, Standards.

1.3 **SUBMITTALS**

.1 Product data:

- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.

.2 Samples:

- .1 Submit following samples in accordance with Section 01 33 00.
 - .1 Three 300 x 150 mm draw downs of each colour minimum 4 6 weeks before paints are required. Allow for a minimum of 5 colours samples to be selected by Consultant. Allow for a minimum of 2 submissions.
 - .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.
 - .3 Submit samples in tandem with those of sections 06 20 00, 09 51 00, 09 65 00, 09 65 19 and 09 67 20. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.

.4 Certificates:

- .1 Submit certification from paint manufacturer, on company letterhead, indicating each product proposed for use is Manufacture's premium grade, first line Product.
- .2 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
- .3 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

.4 Reports:

- .1 Submit written field inspection and test report results after each inspection.
- .2 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.

- .3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

1.4 QUALITY ASSURANCE

- .1 Finishing work: Perform work to MPI requirements for premium grade.
- .2 Supervision: Have work supervised by a full-time qualified foreperson who has 10 years minimum experience on Contracts of similar complexity and scope.
- .3 Mock-up:
 - .1 Construct three 3 m² mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.
 - .2 Obtain Consultant's acceptance in writing before proceeding with the work of this Section.
 - .3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.
 - .4 Repaint over mock-ups which do not form part of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.
- 2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO₂ fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.
- .3 Maintain storage enclosures at minimum 10°C ambient temperature and to manufacturer's instructions.

1.6 SITE CONDITIONS

- .1 Apply coatings under the following conditions:
 - .1 Exterior coatings (except Latex): 5°C minimum.
 - .2 Exterior latex coatings: 10°C minimum.
 - .3 24 hours minimum after rain, frost, condensation, or dew.
 - .4 When no condensation is possible (unless specifically formulated against condensation).
 - .5 Interior coatings: 7°C minimum.
 - .6 Relative humidity: 85% maximum.
 - .7 Not in direct exposure to sunlight.
- .2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.
- .3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

- .4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of work not being painted including, but not limited to, the following:
 - .1 Light fixtures, fire and smoke detectors.
 - .2 Data cabling and data infrastructure.
 - .3 Sprinkler heads.
 - .4 Prepainted diffusers and registers.
 - .5 Prepainted equipment.
 - .6 Fire rating labels and equipment specification plates.
 - .7 Finished surfaces.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- 1. Provide paint products meeting MPI "Green Performance Standard GPS-1-12.

1.8 MAINTENANCE

- 1. Deliver to Owner's place of storage on completion of work, sealed containers of each finish painting material applied, and in each colour. Label each container as for original, including mixing formula. Provide the following:
 - .1 1 L of extra materials when less than 50 L are used for Project;
 - .2 3.78 L of extra stock when 50 to 200 L are used;
 - .3 7.57 L of extra stock when over 200 L are used.

2 Products

2.1 MATERIALS

- .1 Paint:
 - .1 All materials under work of this Section, including but not limited to, primers, stains, and paints are to have low VOC content limits.
 - .2 Products in accordance with the MPI Painting Specification Manual, Exterior and Interior Systems;
 - .1 For each MPI paint code, manufacture's premium grade, first line Products is to be use.
 - .2 Uniform dispersion of pigment in a homogeneous mixture.
 - .3 Ready-mixed and tinted whenever possible.
 - .3 Products within each MPI paint system code: From single manufacturer.
 - .4 Acceptable manufacturers:
 - .1 AkzoNobel.
 - .2 Benjamin Moore.
 - .3 PPG Industries Inc.
 - .4 Sherwin Williams.
- .2 Wood sealer: Three coat wood sealer system as manufactured by Sikkens or approved alternative.
 - .1 Wood basecoat: One coat of translucent oil alkyd basecoat 'Cetol 1RE' by Sikkens.

- .2 Wood topcoat: Two coats of 'Cetol 23RE' by Sikkens topcoat consisting of translucent alkyd resin and UV absorbers, in colour as selected by the Consultant.
- .3 Anti-Graffiti Coating:
 - .1 Water-borne, breathable, fluorsilane, low VOC coating, conforming to AST D6578/D6578M and capable of withstanding a minimum of 5 cycles without loss of repellency.
 - .2 Anti-Graffiti Coating, 'Blok-Guard & Graffiti Control WB 15' by Prosoco.
 - .3 For use on exterior brick veneer surfaces, all elevations, datum to U/S Ground floor windows headers.

2.2 COLOUR SCHEDULE

- .1 Consultant will select choice of colours and gloss when compiling a Colour Schedule after award of Contract; allow for colour selection beyond paint manufacturer's standard colour range.
- .2 Refer to Colour Schedule for selected colour references.
- .3 Conform to gloss reflectance definitions listed in MPI Specification Manual.
- .4 **PNT-1**: Colour to be selected by architect. Allow for 5 colours.
- .5 **PNT-10 + PNT11**: Benjamin Moore. Abuse-resistant paint, BM HP3420 Pre-Catalyzed Waterborne Epoxy Eggshell, or approved alternative; allow for 5 colours to be selected.

2.3 PAINTING AND FINISHING SCHEDULE

- .1 Refer to Table 1, MPI Painting and Finishing Schedule coded systems, comply with MPI Painting Specification Manual.

Table 1: Painting and Finishing Schedule				
EXTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Galvanized steel	HM doors & frames, handrails	EXT 5.3	EXT 5.3K	WBlight industrial coating
Masonry units – Anti-Graffiti	Brick Veneer			Blok-Guard & Graffiti Control WB 15
INTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat

Table 1: Painting and Finishing Schedule				
Concrete floors		INT 3.2	INT 3.2C	Epoxy
Concrete block masonry		INT 4.2	INT 4.2A	Latex
Galvanized metal	HM doors & door frames, handrails	INT 5.3	INT 5.3K	WBlight industrial coating
Dressed lumber	Doors and frames requiring stain finish	INT 6.3	INT 6.3E	Polyurethane varnish
Dressed lumber	Doors and frames	INT 6.3	INT 6.3K	Poly-urethane
Wood paneling & casework	Partitions, panels, millwork	INT 6.4	INT 6.4C	Semi-transparent stain
Wood paneling & casework	Partitions, panels, millwork	INT 6.4	INT 6.4E	Poly-urethane
Wood stairs a	Stair and handrails	INT 6.5	INT 6.5C	Poly-urethane
Gypsum board,	Drywall, walls, ceilings	INT 9.2	INT 9.2A	Latex
Gypsum board,	Wet areas	INT 9.2	INT 9.2F	Epoxy-modified latex

3 Execution

3.1 EXAMINATION

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

- .1 General:
 - .1 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
 - .2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool and sand paper marks, shallow gouges, marks, and nibs.
 - .3 Clean, sweep, and vacuum floors and surfaces to be painted, debris and dust-free prior to painting.
 - .4 Refer to MPI Painting Specification Manual for surface preparation requirements of substrates not listed here.
- .2 Where finish hardware has been installed remove, store, re-install finish hardware, to accommodate painting. Do not clean hardware with solvent that will remove permanent lacquer finishes.
- .3 Alkali Content tests and neutralization:
 - .1 Test for ph level using litmus paper on dampened substrate.
 - .2 Neutralize surfaces over 8.5 ph with 4% solution of Zinc Sulphate for solvent based systems and tetrapotassium pyrophosphate for latex based systems, to below 8.0 ph, and allow to dry.
 - .3 Brush-off any residual Zinc Sulphate crystals.
 - .4 Coordinate paint system primer / sealer to be alkali-resistant.
- .4 Substrate moisture tests:
 - .1 Test for moisture content over entire surface to be painted, minimum one test/ 2 m² in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
 - .2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before paint system application. Install temporary drying fans if necessary.
 - .3 Re-test employing same criteria.
- .5 Mildew removal: Scrub with solution of trisodium phosphate and sodium hypochlorite (Javex) bleach, rinse with water, and allow to dry completely.
- .6 Cementitious and masonry (Concrete, block, brick, stucco, cement rendering):
 - .1 Allow 28 days cure before painting.
 - .2 Coordinate repair of protrusion-chipping and grinding, and honeycomb filling with responsible trades.
 - .3 Remove dirt, loose mortar, scale, powder, efflorescence, and other foreign matter.
 - .4 Remove form oil and grease with trisodium phosphate, rinse, and allow to dry thoroughly.
 - .5 Remove rust stains with solution of sodium metasilicate after thorough wetting; allow to dry thoroughly.
- .7 Concrete floors (new):
 - .1 Allow 28 days cure before painting.

- .2 Remove contamination, acid etch, rinse with water, and allow to dry completely. Test and adjust for neutral ph.
- .8 Galvanized steel sheet:
 - .1 Z275 (Satin & Spangled Sheet): SSPC SP7 brush blast.
 - .2 ZF075 (Wiped Coat): Remove contamination, wash with Xylene solvent.
 - .3 Touch-up damaged galvanized areas with organic zinc rich primer.
- .9 Galvanized iron and steel: Prepare galvanized and ungalvanized metal surfaces as follows:
 - .1 Unpassivated, unweathered and weathered: Remove contamination, wash with Xylene or Toluol solvent, allow to dry thoroughly. Make paint system primer/sealer an etching type primer.
 - .2 Manufacturer pre-treated (including passivated): SSPC SP7.
 - .3 Touch-up damaged galvanized areas with organic zinc rich primer.
- .10 Wood and Millwork:
 - .1 Wood surfaces to be clean and dry with a moisture content of less than 15%.
 - .2 Remove foreign matter prior to prime coat; spot coat knots, pitch streaks and sappy sections with sealer.
 - .3 Fill nail holes and fine cracks after primer has dried.
 - .4 Backprime interior and exterior woodwork.
- .11 Wood decks/steps:
 - .1 Apply primer/sealer paint to seal areas that will be unreachable after construction is complete.
 - .2 Moisture content must not be above 12%.
 - .3 When clear/stain finish is specified remove all discolourations such as water stains, pencil and scuff marks etc. and sand all rough areas.
- .12 Gypsum board:
 - .1 Apply primer/sealer paint to reveal defects and deficiencies and to equalize absorption areas.
 - .2 Coordinate repairs and touch-ups with the responsible trade.
 - .3 Re-prime repairs.
- .13 Coordinate with other trades to prevent:
 - .1 Damage, and inadvertent activation of fire and smoke detectors.
 - .2 Odour and dust distribution by permanent HVAC systems including fouling of ducts and filters.
- .14 Field-mix Products in accordance with manufacturer's written instructions.

3.3 **APPLICATION**

- .1 Apply painting systems in accordance with the MPI Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.

-
- .2 Painting systems listed are required minima, apply additional coats if necessary to obtain substrate hiding acceptable to the Consultant.
 - .3 Tint intermediate coats lighter than final top coats for identification of each succeeding coat and to facilitate inspections. Include only manufacturer's recommended reducing and tinting accessories. Do not add adulterants.
 - .4 Primer to be specialized primer coating system as required by manufacturer for selected colour. Standard primer being tinted shall be tinted to a maximum of 1.5% by volume.
 - .5 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.
 - .6 Apply paint uniformly in thickness, colour, texture, and gloss, as determined by the Consultant under adequate illumination and viewed at a distance of 1500 mm. Apply finishes free of defects in materials and application which, in the opinion of the Consultant, affect appearance and performance. Defects include, but are not limited to:
 - .1 Improper cleaning and preparation of surfaces.
 - .2 Entrapped dust, dirt, rust.
 - .3 Alligating, blisters, peeling.
 - .4 Scratches, blemishes.
 - .5 Uneven coverage, misses, drips, runs, and poor cutting in.
 - .7 Do not apply coatings on substrates which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.
 - .8 Repaint entire areas of damaged or incompletely covered surfaces, to the nearest inside or outside corner; patching will not be permitted.
 - .9 Miscellaneous painting requirements:
 - .1 Paint projecting ledges, and tops, bottoms and sides of doors both above and below sight lines to match adjacent surfaces.
 - .2 Paint door frames, access doors and frames, door grilles, prime coated butts, and prime coated door closers to match surface in which they occur.
 - .3 Finish closets and alcoves as specified for adjoining rooms.
 - .4 Paint light coves white whether a light lense is installed or not, unless otherwise indicated.
 - .5 Paint interior columns to match walls of room.
 - .6 Allow for:
 - .1 2 wall colours per room, one ceiling colour per room.
 - .2 Different door colours in each functionally different area.
 - .3 Different colours on both sides of same door.
 - .10 Mechanical, electrical and other painting coordination:
 - .1 Paint following items unless specified or indicated on drawings not to be painted.
 - .2 Paint mechanical services in accordance with Mechanical Identification Division 21, 22 and 23.

- .3 Coordinate painting of pipes, ducts, and coverings with the work of Division 21, 22 and 23 to precede pipe colour banding, flow arrows, and other pipe identification labeling installation.
- .4 Paint exposed conduit, pipes, hangers, ductwork, grilles, gratings, louvres, access panels, fire hose cabinets, registers, convector and radiator covers, enclosures, and other mechanical and electrical equipment including services concealed inside cupboard and cabinet work; apply colour and sheen to match adjacent surfaces, except as noted otherwise.
- .5 Paint portions of surfaces such as duct interiors, piping, ductwork, hangers, insulation, walls, and similar items, visible through grilles, louvres, convector covers etc., matte black in colour.
- .6 Remove the following to accommodate painting, carefully store, clean, then re-install on completion of each area and when dry:
 - .1 Switch and receptacle plates, fittings and fastenings, grilles, gratings, louvres, access panels, convector covers, and enclosures .

3.4 **FIELD QUALITY CONTROL**

- .1 Dry film thickness tests:
 - .1 Test for film thickness over entire surface to be painted, minimum one test/2 m² in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
 - .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
 - .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
 - .4 Re-test employing same criteria after repair.

3.5 **CLEANING**

- .1 Remove spilled, splashed, and spattered paint promptly as work proceeds and on completion of work. Clean surfaces soiled by paint spillage and paint spatters. Repair or replace damaged work, as directed by Consultant.

3.6 **PROTECTION**

- .1 Post Wet Paint signs during drying and restrict or prevent traffic where necessary.
- .2 Post sign, after Consultant's inspection and acceptance of each room, reading:
PAINTING COMPLETE - NO ADMITTANCE WITHOUT
CONTRACTOR'S PERMISSION.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for exterior steel coating work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 CAN/CGSB 85.10, Protective Coatings for Metals.
- .2 SSPC Steel Structures Painting Council, Standards.
- .3 SSPC-SP1, Solvent Cleaning.
- .4 SSPC-SP6, Commercial Blast Cleaning.
- .5 SSPC-SP7, Brush-Off Blast Cleaning.
- .6 SSPC-SP10, Near-White Blast Cleaning.
- .7 American Society for Testing and Materials (ASTM) D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

1.3 **DEFINITIONS**

- .1 General: Standard coating terms defined in ASTM D 16.
- .1 Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85 degree meter.
- .2 Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60 degree meter.
- .3 Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60 degree meter.
- .4 Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60 degree meter.
- .2 Environments: The following terms distinguish between different corrosive exposures:
- .1 "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.
- .2 "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.

- .3 "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.4 SUBMITTALS

- .1 .Product data
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Material List: An inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - .2 Preparation instructions and recommendations.
 - .3 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - .4 Complete set of colour chips representing manufacturer's full range of available colours and finishes.
 - .5 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .6 Product transportation, storage, handling and installation requirements.
 - .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.
- .2 Samples:
 - .1 For each finish product specified, submit following samples in accordance with Section 01 33 00.
 - .1 Three 300 x 150 mm draw downs of each colour minimum ~~4~~ 6 weeks before paints are required. **Allow for a minimum of 5 colours samples to be selected by Consultant. Allow for a minimum of 2 submissions.**
 - .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.
 - .3 **Submit samples in tandem with those of sections 04 20 00, 07 41 13, 07 46 19, 07 62 00, 07 71 23, 08 44 00 and 08 53 13. All submissions must be completed prior to consultant review. The Consultant will commence review and return the documentation only upon receipt of all required samples from all required listed sections.**
- .3 Certificates:
 - .1 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
 - .2 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

- .4 Reports:
 - .1 Examination and confirmation of existing conditions, primers and finishes.
 - .2 Recommendation for preparation work, adhesion testing.
 - .3 Confirmation of recommended paint and coating system.
 - .4 Submit written field inspection and test report results after each inspection.
 - .5 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.
 - .6 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.
- .5 Closeout submittals: Submit maintenance instructions in accordance with Section 01 78 00 for incorporation into Operation and Maintenance Manual

1.5 QUALITY ASSURANCE

- .1 Applicators qualifications: Perform work of this Section by a company that has a minimum of 10 years proven experience in the application of coatings of a similar nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.
- .2 Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- .3 Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a colour of finish is not indicated, Architect will select from standard colours and finishes available.
- .4 Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
- .5 Mock-up:
 - .1 Construct three 3 m² mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.
 - .2 Obtain Consultant's acceptance in writing before proceeding with the work of this Section.
 - .3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.
 - .4 Do not proceed with remaining work until workmanship, colour, and sheen are approved by the architect.
 - .5 Refinish mock-up area as required to produce acceptable work
 - .6 Repaint over mock-ups which do not form part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.
- .2 Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 10° C to manufacturer's instructions. Maintain storage containers in a clean condition, free of foreign materials and residue.
- .3 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.
- .4 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO² fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.

1.7 SITE CONDITIONS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- .2 Apply coatings under following conditions:
 - .1 Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 10° and 32°C.
 - .2 Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 10° and 32°C.
 - .3 24 hours minimum after rain, frost, condensation, or dew.
 - .4 When no condensation is possible (unless specifically formulated against condensation).
 - .5 Not in direct exposure to sun light.
 - .6 Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 3° C above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- .3 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.
- .4 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

- .5 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of work not being painted such as:
 - .1 Prepainted equipment.
 - .2 Fire rating labels and equipment specification plates.

1.8 MAINTENANCE

- .1 Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- .2 Quantity: Furnish Owner with an additional three percent, but not less than 5L or 1 case, as appropriate, of each material and colour applied.

1.9 EXTENDED WARRANTY

- .1 Submit an extended written warranty for exterior steel coating system in accordance with the General Conditions, except that warranty period is extended to 10 years.
 - .1 Warrant Work against corrosion, and chipping, peeling, blistering, fading, and degradation of coating.
 - .2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 All materials under work of this Section, including but not limited to, coatings are to have low VOC content limits.
- .2 Each material used in the application of each coating system shall be as recommended or manufactured by the supplier of the coating and be in accordance to CAN/CGSB 85.10.
- .3 Coating Formula (galvanized steel):
 - .1 Applies to principal entrance canopy, exterior guards and railings, and other outdoor exposed steel as noted on section 05 50 00.
 - .2 One coat epoxy primer, minimum 2 mil (0.051 mm) to 3 mils (0.076 mm) dry film thickness. 'Devran 201H Epoxy Primer' by Devoe High Performance Coatings (AkzoNobel) or 'Amercoat Amerlock 2 High Solids Epoxy Coating' by PPG Protective & Marine Coatings, minimum 4 mils (0.102 mm) to 8 mils (0.204 mm) dry film thickness.
 - .3 Top coat: Minimum two (2) coats of 'Devthane 349QC Polyurethane' by Devoe High Performance Coatings (AkzoNobel), minimum 4 mils (0.102 mm) to 9 mils (0.230 mm) dry film thickness for each coat or 'Pitthane Ultra 95- 812 Series' by PPG Protective & Marine Coatings, minimum 3 mils (0.076 mm) to 5 mils (0.127 mm) dry film thickness per coat.

- .4 Colour and gloss: To be selected by Consultant from manufacturer's full colour range. Allow for custom colour ~~matching~~ to match that of section 08 53 13. Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.
 - .4 Ferrous Metal: Provide the following finish systems over ferrous-metal surfaces:
 - 1. Polyurethane System: Over Shop Coat Primer – Intermediate Epoxy.
 - .1 Primer: Quick Dry Shop Applied Primer – (conforming to CISC/ CPMA 2-75) applied at a spreading rate recommended by manufacturer. NOTE: Primer shall be compatible to accept high performance coatings. If compatibility is unknown a test sample of chosen Intermediate Epoxy shall be applied and adhesion shall be checked as per ASTM D3359 (Test Method A) with a minimum result of 3A.
 - .2 Intermediate Coat: High Build Epoxy - applied at a dry film thickness of 3-8 dry mils per coat in 2-3 coats, with total thickness minimum 10 mils for rust protection. PPG Amercoat 278 Two-component high solids, zinc phosphate epoxy primer and buildcoat.
 - .3 Topcoat: Aliphatic Polyurethane Topcoat - applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.0-3.0mils per coat – apply two coats. PPG Amercoat 450HSG Semigloss Aliphatic Polyurethane.
 - .4 Colour and gloss: To be selected by Consultant from manufacturer's full colour range. Allow for custom colour to match that of section 08 53 13. Allow for 5 colours submitted to be selected by Consultant. Allow for minimum two submissions.
- 3 Execution
- 3.1 EXAMINATION
- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
 - .2 Do not begin installation until substrates have been properly prepared.
 - .3 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
 - .4 Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - .1 Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
 - .2 If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
 - .1 Confirmation of primer's suitability for expected service conditions.
 - .2 Confirmation of primer's ability to be top coated with materials specified.

3.2 PREPARATION

- .1 Galvanized steel shop painting preparation:
 - .1 Prepare surfaces in accordance with manufacturer's written instructions and specifications.
 - .2 Clean steel prior to application of coating in accordance with Steel Structures Painting Council Standards published in Steel Structures Painting Manual, Vol. 2, Systems and Specifications.
 - .3 Prior to abrasive blast cleaning, remove oil and grease in accordance with SSPC-SP1.
 - .4 Prior to application of prime coat prepare steel surfaces in a manner as specified as SSPC-SP6, to an average 2 mil profile.
 - .5 Prepare galvanized steel surfaces in a manner as specified as SSPC-SP7 to create a surface profile as recommended by coating manufacturer.
 - .6 Cover or mask surfaces adjacent to those receiving coating to protect work of others and property from damage and soiling.
- .2 Ferrous Metal shop painting preparation:
 - .1 Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
 - .2 Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 - .1 Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - .3 Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified, and as reported in the examination and confirmation of existing conditions report.
 - .1 Provide barrier coats over incompatible primers or remove and reprime.
 - .2 Provide barrier coats over incompatible primers or remove primers and reprime substrate.
 - .3 Ferrous Metal Substrates: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
 - .1 Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 6 or higher, to achieve a surface profile of 1.0 to 3.0 mils.
 - .2 Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - .3 Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.

- .4 Nonferrous-Metal Substrates: Clean nonferrous and galvanized surfaces according to manufacturer's written instructions for the type of service, metal substrate, and application required.
 - .1 Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- .4 Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
 - .1 Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 - .2 Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 - .3 Use only the type of thinners approved by manufacturer and only within recommended limits.
 - .4 Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the colour of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- .1 Galvanized steel - Shop application:
 - .1 Shop apply coating in accordance with coating manufacturer's written application instructions and specifications.
 - .2 Apply coatings with no runs, laps, voids, or other marks or irregularities, and with uniform colour, sheen and texture.
 - .3 Apply each successive coat only after the previous coat has dried.
- .2 Galvanized steel - Shop application:
 - .1 Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type material being applied.
 - .2 Apply high-performance coatings according to manufacturer's written instructions.
 - .1 Use applicators and techniques best suited for the material being applied.
 - .2 Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 - .3 Coating surface treatments, and finishes are indicated in the coating system descriptions.
 - .4 Provide finish coats compatible with primers used.
 - .5 The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

- .3 Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - 1. The number of coats and film thickness required is the same regardless of application method.
 - 2. Completed Work: Match approved Samples for colour, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 FIELD QUALITY CONTROL

- .1 The Contractor is to facilitate the manufacturer's representative review and to test the thickness of the coating at any time and as often as deemed necessary during the period when paint is being applied:
 - .1 The manufacturer's representative will identify and record any non-compliant conditions and work, and report these to the Contractor and Owner.
 - .2 The Contractor shall take remedial action including apply additional coats, repair, or completely remove and reapply any portion or component of the coating system deemed non-compliant or deficient by the manufacturer's representative.
- .2 Dry film thickness tests:
 - .1 Test for film thickness over entire surface to be painted, minimum one test/2 m2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
 - .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
- .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
- .4 Re-test employing same criteria after repair.

3.5 TOUCH-UP AND CLEANING

- .1 Refinish entire coated surface where finish is damaged or otherwise unacceptable..
- .2 Surfaces exhibiting pin holes or other defects shall be recoated Touch-up coating with top coats as required or where requested by the Consultant.
- .3 Remove spilled, splashed, and spattered paint promptly as work proceeds and on completion of work. Clean surfaces soiled by paint spillage and paint spatters.
- .4 After completing painting, clean glass and paint spattered surfaces. Remove spilled, splashed, and spattered paint promptly as Work proceeds and on completion of Work. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- .1 Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- .2 Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
- .3 After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services for washroom accessories work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ASTM A167, Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A312, Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
- .3 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .4 CAN/CSA B651-M, Barrier Free Design.

1.3 SUBMITTALS

- .1 Product data: Submit Product data to requirements of Section 01 33 00 indicating each washroom accessory describing size, finish, details of function, attachment methods, hardware and locks, description of rough-in frame, and building-in details of anchors for grab bars.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating elevations, sections, details, dimensions, materials, gauges, and finishes.
- .3 Samples:
 - .1 Submit samples demonstrating materials and finish for each type of washroom accessory in accordance with Section 01 33 00.
- .4 Closeout submittals:
 - .1 Submit for each Product operation and maintenance instructions for incorporating into the Operations and Maintenance Manuals in accordance with Section 01 78 23.
 - .1 Supply 2 keys for each lockable washroom accessory to Consultant.
 - .2 Master key washroom accessories which are keyed.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in sealed cartons and containers with manufacturer's name and product description clearly marked.

1.5 EXTENDED WARRANTY

- .1 Submit an extended warranty for washroom accessories work in accordance with the General Conditions, except that the warranty period is extended to 10 years.
 - .1 Against cracked or scratched mirrors, spoiling or deterioration of silvering or backing, loosening of fastenings or adhesive.
 - .2 Coverage: complete replacement including effected adjacent work.

1.6 MAINTENANCE

- 1. Maintenance Tools: Provide special tools necessary for accessing, assembly/disassembly or removal of toilet, bath and cleaning accessories in accordance with Section 01 78 23.

2 Products

2.1 MATERIALS

- .1 Stainless steel:
 - .1 Sheet metal: ASTM A167, Type 304.
 - .2 Tubing: ASTM A312, Type 304.
- .2 Sheet steel: ASTM A653M, Z275; Cold rolled, commercial quality, surface preparation and pretreatment as required for applied finish.
- .3 Fasteners, screws and bolts: ASTM A167, Type 304 stainless steel, tamper-proof.

2.2 ACCESSORIES

- .1 Refer to drawings for quantity and location of washroom accessories.
- .2 Toilet tissue dispenser (suites):
 - .1 #B-5436 by Bobrick or approved alternative; Surface mounted, single roll dispenser.
 - .2 Finish: Type 304 stainless steel with satin finish.
- .3 Towel bar: Steel towel bar with a brushed nickel finish, 'Model YB0424CH' by Moen or approved alternative by ASI Group Canada or Bobrick.
- .4 Grab bar (straight):
 - .1 Series B-6806-99 by Bobrick or #3800-P Series by ASI Group Canada; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons. Lengths and configurations as indicated on drawings.
 - .2 Finish: Type 304 stainless steel with a satin finish and peened grip.

- .5 Grab bar (L-shaped):
 - .1 'Series 6806-99 - L30x30' by Bobrick Washroom Equipment or approved alternative; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons.
 - .2 Length and configuration: 762 x 762 mm, in L-shaped configuration as shown on Contract Drawings.
 - .3 Finish: Type 304 stainless steel with a satin finish and peened grip.
- 6. Shower curtain rod:
 - .1 #B6047 by Bobrick or #1204 by ASI Group Canada; 32 mm diameter, 1.0mm thick tube, complete with 81 mm diameter flanges, #B204-1 by Bobrick or #1200-SHU by ASI Group Canada stainless steel curtain hooks. Length as indicated on drawings.
 - .2 Finish: Type 304 stainless steel satin finish.
- 7. Shower curtain hooks: Stainless steel, #B204-1 by Bobrick or approved alternative.
- 8. Medicine cabinet: Surface mounted aluminum case with adjustable glass shelves and hinged door with mirror face; 'Model 4581' by Glacier Bay or approved alternative.
- 9. Medicine cabinet (**MC1**): Recessed chrome medicine cabinet with brushed finish and bevelled glass mirror, sized at 500 x 650 mm (20" x 26"); 'Model 4581' by Glacier Bay or approved alternative by ASI Group or Bobrick.
- 10. Medicine cabinet (Barrier Free) (**MC2**): Recessed chrome medicine cabinet with white enamel finish and tilting bevelled glass mirror, sized at 406 x 650 mm (16" x 26"); 'Model 375-ATM-W' by Basco Inc. or approved alternative by ASI Group or Bobrick.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Verify and coordinate templates, inserts, and rough-in frames and verify exact location of washroom accessories for installation.
- .2 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of washroom accessories.
- .3 Provide fastening and mounting kits for washroom accessories.
- .4 Locate washroom accessories where indicated on Drawings and where directed by Consultant.

- .5 Install washroom accessory fixtures, accessories, and items in accordance with manufacturer's instructions and CAN/CSA B651-M. Provide exposed tamper-proof screws of stainless steel to match units.
- .6 Install washroom accessories plumb, level, and securely and rigidly anchored to substrate surfaces and framing. Adjust accessories for proper operation and verify mechanisms function smoothly.
- .7 Clean and polish exposed surfaces and fill accessories with necessary supplies prior to acceptance by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for mailboxes work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).
- .2 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

1.3 **DESIGN REQUIREMENTS**

- .1 Design front loading mail boxes to meet requirements of Canada Post. Front loading main door to incorporate Crown Lock provided by Canada Post.
- .2 Individual apartment unit mail box dimensions to be approximately 125 H X 160 W X 380 D.
- .3 Provide number and size of boxes as indicated on Drawings.

1.4 **SUBMITTALS**

- .1 Product data: Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00.
- .2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating elevations, sections, details, materials, dimensions, gauges, finishes and relationship to adjacent construction.
- .4 Templates: Provide all necessary templates and instructions where fastenings or anchors are to be built in by others.
- .5 Closeout submittals:
 - .1 Supply 2 keys for each mail box to Consultant.
 - .2 Supply 2 master keys to Consultant.

2 Products

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

.1 'Model 1200-FL' by Canadian Mailbox Company.

.2 'Model 6000' by Riopel Mailboxes.

.3 All mailboxes front load.

.4 See drawings for number and sizes of mailboxes.

2.2 MATERIALS

.1 Aluminum sheet: ASTM B209 and ANSI H35.1, aluminum alloy 6061 T6.

.2 Galvanized sheet steel: ASTM A653/A653M Grade A, ZF075 zinc coating.

.3 Hinges: Full door length, cadmium plated, continuous 180 degree hinge. 0.75 mm thick, 6 mm long knuckle, 2.25 mm diameter pin.

.4 Lock: 5 pin cylinder cam style.

.5 Number plates: Opaque plastic.

.6 Label Holders: 280 mm long X 12 mm wide

.7 Aluminum trim: Snap-on extruded aluminum trim with clear anodized finish, 31.75 mm wide.

.8 Fasteners: Manufacturer's standard non-corroding.

2.3 FABRICATION

.1 Fabricate work in accordance with reviewed shop drawings.

.2 Fabricate work free from defects impairing function, appearance, strength and durability.

.3 Doors: Stamped from 6 mm thick aluminum sheet in required dimensions to form front closures. Doors to receive number plate engraved with required numerals. Secure plates with 2 self tapping screws inside door.

- .4 Frames: Stamped from 5 mm thick aluminum sheet.
- .5 Boxes: 0.7 mm galvanized sheet steel, all welded construction.
- .6 Fabricate individual mail boxes so that they are self stacking, easily assembled, secured to parent structure and bolted together.

2.4 FINISHES

- .1 Aluminum: Polished horizontally with #80 fine grain finish and painted with a clear, transparent, backed lacquer.
- .2 Steel sheet: Finished with baked enamel paint.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Install mail boxes plumb and true in accordance with reviewed shop drawings and manufacturer's written instructions.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for miscellaneous specialties work as listed below in accordance with the Contract Documents.
.1 Door peephole.

1.2 **SUBMITTALS**

- .1 Product data:
.1 Submit duplicate copies of manufacturer's Product data for each Product specified in accordance with Section 01 33 00 indicating:
.1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
.2 Product transportation, storage, handling and installation requirements.
.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating elevations, sections, details, dimensions, materials, gauges, and finishes.
.3 Closeout submittals: Submit cleaning and maintenance instructions for miscellaneous specialties for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.3 **DELIVERY, STORAGE, AND HANDLING**

- .1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.

2 Products

2.1 **MANUFACTURED UNITS**

- .1 Floor mounted Auto Door Operator Mounting Post/pedestal (**AO**): 48" in height (42" switch height) in 1/8" thick stainless steel brush-finished, flame and vandal-resistant cap, heavy-duty steel surface mounting base, and stainless steel fasteners. In-ground (concrete) mounting base for exterior installation.
.2 Door peephole: wide angle 132 view with a screen size of 38 mm. With viewing capabilities from up to 915 mm away. 'WideVista Door Security Door Viewer' by Casa Door Viewer and Peepholes or approved alternative. Refer to door schedule for installation height. Allow for 2 (two) installed on each suite entrance door.
.3 Stainless steel corner guard (**CG**): 51 mm x 51 mm x ~~2340 mm~~ full height of wall x 90°, stainless steel corner guard, at all gypsum wall finish walls outside corners on common areas. Surface mounted 'CO-8' by C/S Group or approved alternative by McGill Architectural Products

- .4 Wall-mounted Handrails (**HR**): Wood handrail with stainless steel end caps, size approximately 140 mm high x 38 mm wide, mounted 38 mm off wall; unit shall be complete with external and internal corners and end caps at ends of rail. 'HRWS-6C' by C/S Products; wood finish to match '060 Light Oak'.
- .5 Pin-mounted lettering: Unit entrance door signage lettering, 3 mm thick stainless steel with pin standoff anchored to substrate; 600 x 450 mm, font to be selected by Consultant.
- .6 Fire safety plan box:
 - .1 Fully recessed stainless steel cabinet with 1.2 mm thick frame and 2.6 mm thick door, 380 mm H x 342 mm W x 125 mm D.
 - .2 Lettering: 'Fire Safety Plan' in red colour.
 - .3 Lock: Cam lock/deadbolt lock complete with lock core to suit application and installation.
 - .4 Acceptable manufacturers: Mikor Metal Products or approved alternative by Safety Media Inc.
- .7 Janitor's shelf with mop and broom holders and hooks:
 - .1 #B-239 x 34 by Bobrick Washroom Equipment of Canada or approved alternative.
 - .2 330 mm H by 205 mm deep. Shelf constructed of minimum 1.2 mm stainless steel, mop and broom holders to have spring loaded rubber cam to grip handles up to 30 mm in diameter, and stainless steel hooks positioned below shelf.
 - .3 Finish: Type 304 stainless steel with satin finish.
- .8 Metal Folding Attic Ladder: Attic folding pull down metal ladder for 60 minutes (1 hour) rating, in accordance with NFPA 288 and ASTM E119-14, 30" x 56.5". 'LMF 60 Fire-Rated' by Fakro, **including thick insulated hatch door (approx. 3 3/8 inches) with an R-value of 12 and triple weather seals.**
- .9 Bicycle rack pavement mount (**BR-1**):
 - .1 Bicycle rack post and ring system constructed of OD tubular steel post flanked by two .375 x 1.5 in (10 x 38 mm) steel bars, powder coat over galvanized finish.
 - 2 'BRBS-102' by Victor Stanley or approved alternative by BikeRack Manufacturing & Distributing Company or Bike-Up Bicycle Parking Systems.
 - .3 Install racks in accordance with reviewed shop drawings and manufacturer's instructions 1200 mm o.c..
- .10 Bicycle rack post mount (**BR-2**):
 - .1 Bicycle wall mounting system constructed of minimum 16 gauge hot rolled steel with 19 mm steel rod sliding arm and locking pin to lock frame and front wheel to parking system.
 - .2 'Lock-Up' by BikeRack Manufacturing & Distributing Company or 'Bike-Up' by Bike-Up Bicycle Parking Systems.
 - .3 Install racks in accordance with reviewed shop drawings and manufacturer's instructions 610 mm o.c. from wall.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

- .1 Verify substrate surfaces are solid, free from surface water, dust, oil, grease, projections and other foreign matter detrimental to performance.
- .2 Items to be built-in: Provide information and templates required for installation of work of this Section, and assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with products specified in this Section in order that they function as intended.
- .3 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of miscellaneous specialty items as required.

3.3 INSTALLATION

- .1 Install miscellaneous specialties level and securely and rigidly anchored to substrate in accordance with authorities having jurisdiction, reviewed shop drawings, and manufacturer's written instructions.
- .2 After installation, adjust miscellaneous specialties in accordance with manufacturer's written instructions.

3.4 CLEANING

- .1 Clean and polish exposed surfaces prior to acceptance by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Freestanding side-by-side refrigerator.
- .2 Built-in electric smooth-top cooktop.
- .3 Built-in electric side-swing single wall oven.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA Group):
 - 1. CSA C22.2 No. 63 – Household Refrigerators and Freezers.
 - 2. CSA C22.2 No. 61 – Household Electric Ranges.
- .2 Underwriters Laboratories (UL / cUL): Listed for use in Canada.

1.3 **SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Manufacturer's specifications, dimensions, electrical/service requirements, and installation instructions.
- .3 Operation and Maintenance (O&M) Data: Include manufacturer's cleaning guidelines, warranty details, and component replacement parts list.

1.4 **WARRANTY**

- .1 Provide manufacturer's standard one (1) year warranty for parts and labour from the date of Substantial Performance.

2 Products

2.1 **MANUFACTURERS**

- .1 **Supply and install all listed appliances, unless noted otherwise.**
- .2 Whirlpool Canada.
- .3 Frigidaire Canada.

2.2 REFRIGERATOR (REF-1)

- .1 Manufacturer and Model: Whirlpool WRS312SNHW.
- .2 Type: Freestanding Side-by-Side Refrigerator.
- .3 Capacity: Total 614 L (21.7 cu. ft.) configuration.
- .4 Dimensions: 841 mm W x 1692 mm H x 854 mm D (33.1"w x 66.6"h x 33.6"d).
- .5 Features:
 - .1 No water or ice dispenser on exterior door panel.
 - .2 Frameless glass shelving, LED interior lighting, and adaptive defrost.
- .6 Finish: White (W).
- .7 Electrical: 115V, 60Hz, 15A dedicated circuit.

2.3 COOKTOP (CKP-1)

- .1 Manufacturer and Model: Whirlpool WCE55US0HB .
- .2 Type: Freestanding Side-by-Side Refrigerator.
- .3 Capacity: Total 614 L (21.7 cu. ft.) configuration.
- .4 Size: 762 mm (30") nominal width.
- .5 Cooking Surface: Ceramic glass with 4 radiant elements, including one FlexHeat Dual Radiant Element.
- .6 Controls: Right side-mounted dishwasher-safe knobs with Hot Surface indicator light.
- .7 Finish: Black Only (B).
- .8 Electrical: 240V, 60Hz, 30 Amp or 40 Amp flexible installation.

2.4 WALL MOUNT OVEN (OV-1)

- .1 Manufacturer and Model: ~~Whirlpool WCE55US0HB~~ Frigidaire FGEW276SPF.
- .2 Type: 686 mm (27") Single Built-in Electric Wall Oven.
- .3 Door Configuration: Side Swing Reversible Door.
- .4 Oven Features: 107.6 L (3.8 cu. ft.) capacity, True Convection system, Self-Clean cycle, and Express-Select touch controls.
- .5 Finish: Smudge-Proof Stainless Steel.
- .6 Electrical: 208/240V, 60Hz, 20 Amp minimum circuit required (15.4 Amps at 240V).

2.5 ALL REMAINING APPLIANCES

- .1 Range hoods by divisions 23 and 26.
- .2 Stoves and fridges in standard suites are supplied and installed by owner.

3 Execution

3.1 **INSPECTION**

- .1 Verify that rough-in openings, cabinetry alcoves, and millwork dimensions match the manufacturer's provided dimension guides before installing.
- .2 Ensure corresponding electrical receptacles and wiring drop locations are complete, live, and safe.

3.2 **INSTALLATION**

- .1 Install all appliances strictly in accordance with manufacturer's printed instruction sheets.
- .2 Set cooktop securely into the countertop cutout using provided brackets, sealing perimeter to prevent fluid penetration.
- .3 Anchor the wall oven flush into millwork framing and confirm the side-swing door opens to a full 90 degrees without contacting adjacent cabinetry.
- .4 Level the refrigerator using integrated adjustable legs. Ensure it sits stable on finished floor surfaces.

3.3 **TESTING AND CLEANING**

- .1 Test each appliance to confirm complete operational sequence (verify heating cycles on cooktop/oven, and cooling cycles on refrigerator).
- .2 Remove all protective plastic coatings, internal shipping ties, and merchandising stickers.
- .3 Clean surfaces using only manufacturer-approved, non-abrasive stainless steel and glass cleaners.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 Comply with Division 01 - General Requirements.

1.2 SECTION INCLUDES

- .1 Partially buried waste and recycling collection containers

1.3 RELATED SECTIONS

- .1 Section 03 30 00 - Cast-in place Concrete.
- .2 Section 03 20 00 - Concrete Reinforcing.
- .3 Section 31 05 16 - Aggregate Materials.
- .4 Section 31 22 13 - Rough Grading.
- .5 Section 31 23 16 - Excavating.
- .6 Section 31 23 23 - Backfilling.

1.4 REFERENCES

- .1 ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate installation with other site works.

1.6 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00 – Submission Procedures.
- .2 Product Data: Information to include unit dimensions and capacity, materials and colour options.

1.7 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00 – Submission Procedures.
- .2 Shop Drawings: Detailed product data, including components, materials and finish/colour options.
- .3 Installation Data: Manufacturer's special installation requirements including special procedures, site location details requiring special attention.

1.8 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10 – Submission Procedures.
- .2 Operation and Maintenance Data:
 - .1 Include description of system operation, adjusting and testing requirements.
 - .2 Identify system maintenance requirements, servicing cycles, lubrication requirements and spare parts listings.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver materials in original packaging clearly labelled with project information, and other pertinent information clearly identified (if applicable).
- .2 Storage and Handling Requirements:
 - .1 Handle containers carefully, ensuring not to drop or roll the containers. Lift from delivery truck using the pallet only, with a tether through each side pocket and connected to a spread bar. Ensure that the spread bar and tethers do not make contact with the lid or sides of the container.

Part 2 Products

2.1 MANUFACTURERS

- .1 This specification is written on the basis of waste collection systems by EarthBin Products, Hamilton, ON. Specified products establish the minimum acceptable standards for the work of this Section. Approved waste collection systems consisting of similar configuration and components will be considered provided they meet the performance requirements of EarthBin Model EB500. waste collection systems not meeting the performance requirements or not comprised of similar configuration and components will not be acceptable.
- .2 Product: EarthBin Model EB500, by EarthBin Products, Hamilton, ON or approved alternative.
- .3 Product Description: EarthBin Front-load Semi-in-ground garbage container. Rectangular above ground container with doors, round below ground sleeve liner and container.

2.2 MATERIALS & COMPONENTS

- .1 Waste Container:
 - .1 Rigid roto-moulded premium virgin polyethylene ground sleeve liner
 - .2 Rigid roto-moulded premium virgin polyethylene two (2) piece bin, 6.5 cu. yd. (5000 lt. capacity)
 - .3 Vacuum formed polyethylene architectural panels, brown in colour (other colour options available).
 - .4 100% recycled plastic lockable service lid with textured surface finish, black in colour
 - .5 Vacuum formed polyethylene lockable feed doors with textured surface finish, grey, green, black, yellow or blue in colour. Two (2) lockable feed doors per container.
 - .6 Steel frame with a super durable powder coated body colour matched finish.
 - .7 Aluminum "GARBAGE" signage.
 - .8 Black protective bumpers.
 - .9 Manual lid strut on both feed doors.
 - .10 Automatic gravity latches both sides on main service lid.
- .2 Recycling Container:
 - .1 Rigid roto-moulded premium virgin polyethylene ground sleeve liner
 - .2 Rigid roto-moulded premium virgin polyethylene two (2) piece bin, 6.5 cu. yd. (5000 lt. capacity)

- .3 Vacuum formed polyethylene architectural panels, brown in colour (other colour options available).
- .4 100% recycled plastic lockable service lid with textured surface finish, black in colour
- .5 Vacuum formed polyethylene lockable feed doors with textured surface finish, grey, green, black, yellow or blue in colour. Two (2) lockable feed doors per container.
- .6 Steel frame with a super durable powder coat body matched finish.
- .7 Aluminum "RECYCLING" signage.
- .8 Black protective bumpers.
- .9 Manual lid strut on both feed doors.
- .10 Automatic gravity latches both sides on main service lid.
- .3 Cardboard Container:
 - .1 Rigid roto-moulded premium virgin polyethylene ground sleeve liner.
 - .2 Rigid roto-moulded premium virgin polyethylene two (2) piece bin, 6.5 cu. yd. (5000 lt. capacity)
 - .3 Vacuum formed polyethylene architectural panels, brown in colour (other colour options available).
 - .4 100% recycled plastic lockable service lid with textured surface finish, black in colour.
 - .5 Vacuum formed polyethylene lockable feed doors with textured surface finish, grey, green, black, yellow or blue in colour. Two (2) lockable feed doors per container.
 - .6 Steel frame with a super durable powder coat body matched finish.
 - .7 Aluminum "CARDBOARD" signage.
 - .8 Covered and lockable cardboard slot.
 - .9 Black protective bumpers.
 - .10 Manual lid strut (optional).
 - .11 Automatic gravity latches both sides on main service lid.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify actual site dimensions and conditions prior to commencing work. Ensure that the ground slope is no more than 5%.
- .2 Ensure the area is clear of overhead obstructions (powerlines, trees, etc.), and clear of fire hydrants, transformers, and other utility boxes.
- .3 Ensure that there are no underground services and utilities under the proposed locations.
- .4 Refer to a geotechnical report if available for soil and groundwater conditions. If the report indicates a high water table, contact the manufacturer for an engineered solution (additional fees will be charged for the design).
- .5 Report conditions contrary to contract requirements that would prevent installation. Do not proceed with installation until unsatisfactory conditions have been corrected.
- .6 Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 EXCAVATION

- .1 Ensure that site area is clear of all above and below grade obstructions. Owner is responsible for removal of obstructions prior to commencement of work.
- .2 Excavate trench 84" (2135mm) wide by 66" (1676mm) deep (measured from highest finished grade). Length of trench is dependant on the proposed number of containers and the truck approach angle.

3.3 INSTALLATION

- .1 Place 4" (100mm) deep granular base to bottom of trench, compacted to a Standard Proctor Density of 95%
- .2 Place eight (8) 12" (300mm) long lengths of 15M rebar into openings at the base of the ground sleeve liner
- .3 Lift liner and place in trench. Use a lifting strap around the top of liner beneath the top lip.
- .4 Centre liner in trench. If installing more than one liner ensure they are in line. Distance between liners to be dependant on the truck approach angle.
- .5 Level liner, using plastic shims if necessary.
- .6 Pour 0.65 cu. yd. (0.5 cu. m.) of 20 Mpa (2600 psi) concrete per container around the ground sleeve liner. Concrete to have a minimum cover of 4" (100mm) above the rebar. Vibrate concrete to ensure that the rebar is bedded and that there are no voids.
- .7 Recheck level and position of liners before concrete sets. Backfill once concrete has set sufficiently to be stood on.
- .8 Recommended backfill material is as defined by ASTM D2321 – Class 1 or Class 2. If frost heave is anticipated Class 1A or Class 1B are recommended, with Class 1B if a high or fluctuating water table is anticipated. Ensure that the backfill material contains no sharp objects, tree roots, or rocks larger than 4" (100mm) in diameter.
- .9 Low slump concrete is a backfill option, especially where space makes backfilling and compaction is difficult. Ensure that the low slump concrete is not dropped more than 48" (1200mm) from the discharge nozzle.
- .10 Backfill in 12" (300mm) lifts, compacting to a Standard Proctor Density of 95%. Ensure no backfill or debris falls into the liner.
- .11 Backfill to a depth of 24" (600mm) and check roundness of ground sleeve liner. Measurements are not to differ by more than 1" (25mm). If necessary cut 2" x 4" timber to appropriate length, and insert in a cross pattern at top rim to maintain roundness.
- .12 Continue backfilling to approximately 4" (100mm) of finished grade. Distance from top of grade to top of ground sleeve liner to be minimum 3" (75mm).
- .13 Set up concrete forms as required and install 4" (100mm) wide foam bond break around top of liner.
- .14 Pour minimum 4" (100mm) slab (actual depth as determined by Contractor or Engineer) of 25 Mpa (3600 psi) concrete with a broom finish. Ensure a minimum 4% slope from liner.

- .15 Once concrete has set, remove formwork and saw cut concrete as required.

3.4 PROTECTION OF FINISHED WORK

- .1 Protect ground sleeve liner and garbage container from other site works until completion of project.

3.5 SCHEDULES

- .1 Refer to Site Plan for location of waste collection containers and enclosures (if required).

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for manually operated window covering work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 CAN/ULC-S109, Flame Tests of Flame-resistant Fabrics and Films.

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, limitations, and finishes.
 - .2 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Elevations, sections and details of opening size, clearances, handling of operating components, anchorage, dimensions, gauges, materials, and finishes.
- .3 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00.
 - .1 Two 300 x 300 mm samples of fabric type.
- .4 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.
- .5 Closeout submittals:
 - .1 Submit following for each Product for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00:
 - .1 Functional description detailing operation and control of components.
 - .2 Performance criteria and maintenance data.
 - .3 Operating instructions and precautions.
 - .4 Safety precautions.

1.4 EXTENDED WARRANTY

- .1 Manufacturer shall provide warranty that all components are free of manufacturing defects for two years from date of installation. This warranty is void if the product has been improperly installed or subjected to improper care.

2 Products

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

- .1 Manual roller shade: Factory assembled, manual chain operated, roller type fabric shades with "snap-in" mounting, end brackets, shade tube, aluminum fascias, soffit, hembar and fabric as indicated on drawings and as specified herein. 'Open Roll' by Sun Glow or approved alternative by Elite Pro Shading Systems or SunProject Inc. Allow for installation in all aluminum and vinyl windows.

2.2 SHADING FABRIC (1% OPENNESS)

- .1 Yarn: Vinyl coated polyester, 0.46 mm thick, basket weave design.
Openness factor 1 %
Weight (g/sq.m) 23(oz./sq.yd.)
Thickness (ins.) 0.038
Breaking strength (lbs) Warp - 340
Fill -
Stretch % Warp - 1.5%
Fill - 4%
- .2 Flame retardance: Fabric shall be certified by an independent laboratory to pass CAN/ULC-S109.
- .3 Fabric colour: Selected by Consultant from full colour range of any of the specified manufacturers. Shade fabric on any one floor shall be from the same dye lot.
- .4 Fabric shall be sealed under heat and pressure to retain weave pattern, with additional heat seal at sides, to prevent fraying and to eliminate rough edges.
- .5 Location: For use at South-facing windows, unless otherwise indicated.

2.3 SHADING FABRIC (3% OPENNESS)

- .1 Yarn: Vinyl coated polyester, 0.46 mm thick, basket weave design.
Openness factor 3 %
Weight (g/sq.m) 21(oz./sq.yd.)
Warp ends per 25.4 mm (1") approx. 42
Fill ends per 25.4 mm (1") approx. 31
Grab tensile strength Warp - 1180 N
Fill - 667 N
Stretch (% at 12.2 kg.wt.) Warp - 2%
Fill - 3%
Set % Warp - 1.5%
Fill - 1.5%
Abrasion resistance
(500 Taber cycles) - Yarn rupture none
Wear - trace
U.V. Deterioration(200 Sun Fade hours) - Fade none
Tensile retention - 96%

- .2 Flame Retardance: Fabric shall be certified by an independent laboratory to pass CAN/ULC-S109.
- .3 Fabric colour: Selected by Consultant from full colour range of any of the specified manufacturers. Shade fabric on any one floor shall be from the same dye lot.
- .4 Fabric shall be sealed under heat and pressure to retain weave pattern, with additional heat seal at sides, to prevent fraying and to eliminate rough edges.
- .5 Location: For use at West-facing windows, unless otherwise indicated.

2.4 SHADING FABRIC (5% OPENNESS)

- .1 Yarn: Vinyl coated polyester, 0.9 mm thick, basket weave design.

Openness factor	5 %
Weight (g/sq.m)	18 (oz./sq.yd.)
Breaking strength (lbs)	Warp - 315 Fill - 260
Stretch (% at 12.2 kg.wt.)	Warp - 1% Fill - 7%
Wear	- trace
U.V. Deterioration(200 Sun Fade hours)	- Fade none
Tensile retention	- 96%
- .2 Flame Retardance: Fabric shall be certified by an independent laboratory to pass CAN/ULC-S109.
- .3 Fabric colour: Selected by Consultant from full colour range of any of the specified manufacturers. Shade fabric on any one floor shall be from the same dye lot.
- .4 Fabric shall be sealed under heat and pressure to retain weave pattern, with additional heat seal at sides, to prevent fraying and to eliminate rough edges.
- .5 Location: For use at North-facing windows, unless otherwise indicated.

2.5 OPAQUE FABRIC

- .1 Yarn: Vinyl coated polyester, 4 ply (1 ply woven fibreglass, 3 ply PVC film).

Weight (g/sq.m)	12 (oz./sq.yd.)
Tougue tear (lbs)	Warp - 12 Fill - 8
Breaking Strength	- Warp 240 - Fill 179

Tear Strength	- Warp 1,360
- Fill 720	
Tensile Strength	- Warp 246
	- Fill 207
Flame Test	- NFPA 701 small scale

- .2 Flame Retardance: Fabric shall be certified by an independent laboratory to pass CAN/ULC-S109.
- .3 Fabric colour: Selected by Consultant from full colour range of any of the specified manufacturers. Shade fabric on any one floor shall be from the same dye lot.
- .4 Location: For use residential bedroom windows, unless otherwise indicated.

2.6 FABRICATION

- .1 Extruded aluminum shade tube: 1.52 mm thick, 38 mm diameter with three internal, continuous fins 4.82 mm high for strength and drive capabilities when attached to the nylon sprocket. The fins shall be spaced 120 degrees apart.
- .2 Fascias and soffit: 1.7 mm thick, extruded aluminum cover, complete with three continuous screw flutes which accept end brackets to form unitized unit (totally assembled). To cover front and rear of shade and soffit return at underside to conceal roller and hardware, notched for chain clearance.
- .3 Drive assemblies:
 - .1 Factory set, spring clutch type drive assembly to suit size and travel of fabric shades, complete with built-in shock absorber system to prevent chain breakage under normal conditions, and balancing spring or lift assist mechanism.
 - .2 Capable of being field adjusted from exterior of shade without having to disassemble shades.
- .4 Hembar: Extruded aluminum in clear anodized finish with plastic end finials; 'Slim Bar' by Sun Glow or approved alternative.
- .5 Drive chain:
 - .1 No. 10 "bright" finished series 300 stainless steel bead type chain forming continuous loops and capable of withstanding 400 N pull test.
 - .2 Provide drive chains with upper and lower stops to prevent overwinding or underwinding, and integral child safety device.
- .6 End bracket: Two piece moulded ABS construction with a nylon drive sprocket. Incorporate snap-in clip on each end bracket to engage snap-in mounting hardware. Bracket colour shall coordinate with the fascia colour.
- .7 Colour: Exposed surfaces (excluding fabric) shall be colour selected by Consultant, and not necessarily from manufacturer's full colour range. Metal components shall be pretreated and finished with an acceptable baked enamel finish.

- .8 Fasteners: Non-corrosive metal screws for attachment to windows or curtain wall framing, concealed in completed installation.
- .9 Mounting System: Snap-in brackets which allow the shade to be removed without disassembling the shade unit.
- .10 Shade and mounting system to be designed to allow air between shade and glass.
- .11 Fabric shall hang flat, without buckling or distortion. Trimmed edges shall hang straight without curling or raveling.
- .12 Unguided vertical shades shall not drift sideways more than 3 mm in total run.
- .13 Provide stops at highest and lowest shade positions to prevent over winding and unrolling.
- .14 Design and fabricate shades so that there is a maximum 12 mm gap both sides of fabric.
- .15 Shades shall be fully factory assembled units of unitized construction consisting of end brackets, shade tube, extruded aluminum fascias, soffit return, hembar and specified fabric.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions. Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

- .1 Install shades in accordance with accepted shop drawings and manufacturer's written instructions.
- .2 Install shades in locations shown using specified fasteners, plumb, true, square, straight, and level in proper planes, complete with all fascias/soffits, trims and accessories.

3.3 ADJUSTMENT AND CLEANING

- .1 The shade cloth fabric shall hang flat, without buckling or distortion. The edge, when trimmed, shall hang straight without ravelling. An unguided roller shade cloth shall roll true and straight, without shifting sideways more than 3 mm in either direction due to warp distortion, or weave design.
- .2 Adjust, correct and lubricate fabric shade as required, to provide smooth and efficient operation without binding.
- .3 Clean shade surfaces and remove all finger marks and smudges from fascias, soffits, and trim surfaces. Remove all protective films.
- .4 Leave fabric shade in raised position and in first-class condition upon completion of the work of this Section.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment, tools, supervision, and services necessary for the manufacture, delivery, installation, testing, maintenance, and adjusting of gearless, Electric traction passenger elevators in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- .2 ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
- .3 BS EN 12016, Electromagnetic Compatibility. Product Family Standard for Lifts, Escalators and Moving Walks. Immunity.
- .4 CSA B651, Accessible Design for the Built Environment.
- .5 CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
- .6 CSA C22.2 No.141-M, Unit Equipment for Emergency Lighting.
- .7 Elevating Devices Act and Ontario Regulation 463/86.

1.3 **DESIGN REQUIREMENTS**

- .1 Design elevator with electric operating and control equipment in accordance with the Elevating Devices Act and Regulation in accordance with the requirements of ASME A17.1/CSA B44 safety code and latest supplement.
- .2 Design elevator equipment to fit into space provided for hoistway, pit and areas shown on Contract Drawings.
- .3 Provide smooth acceleration and deceleration of car without perceptible steps so adjusted as not to cause passenger discomfort.
- .4 Elevator to travel between typical floors in not more than 10s. Measure time from instant doors start to close until car has stopped level with next floor.
- .5 Permit doors to start opening in advance of stop at floor level such that doors are at least 3/4 open when car is stopped level with floor.
- .6 Design guide rail brackets for attachment to elevator pit and shaft walls as shown on Contract Drawings.

- .7 Design car and counterweight safety to release when car or counterweight moves in "up" direction.
- .8 Seismic Design Criteria:
 - .1 Design and assemble elevator equipment and components to withstand earthquake forces for Oakville contained in the Ontario Building Code.
- .9 Elevator Characteristics:
 - .1 Rated net capacity: 2500 lb (1135 kg).
 - .2 Rated speed: 100 feet/minute.
 - .3 Travel Distance (nominal): As indicated on Drawings.
 - .4 No. of Stops: As indicated on Drawings.
 - .5 No. of Openings: As indicated on Drawings.
 - .6 Elevator dimensions: As indicated on Drawings.
 - .7 Clear cab height: 2438 mm
 - .8 Clear car entrance height: 2134 mm.
 - .9 Door type: single.
 - .10 Door Operation: side opening in single speed.
 - .11 Provide clear door opening of: 1067 mm wide x 2134 mm high.
- .10 Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
- .11 Include independent service on cars as follows:
 - .1 By means of switch in service cabinet, allow removal of that car from group service and operate in response to car calls only.
 - .2 Open doors automatically on arrival at floor.
 - .3 Render hall signals inoperative when operating on independent service.
- .12 Furnish car lighting and ventilation operation with energy saving mode as follows:
 - .1 Automatically extinguish regular interior lighting and stop car fan or blower.
 - .2 Disable power circuits to convenience outlets and plug receptacles on top and bottom of car.
 - .3 Resume normal function of lighting and fan when power is reinstated.
 - .4 Arrange circuits so that power to lighting and fan or blower is not interrupted by overload, blown fuse or other abnormal condition.
- .13 When car without registered car calls arrives at floor where both up and down calls are registered, initially respond to hall call in direction of travel. If no car or hall call is registered for future travel in that direction, close doors, immediately reopen them and respond to hall call in opposite direction.
- .14 Operate lanterns to correspond with next direction of travel. When responding to hall call, operate lantern to correspond with direction of call being answered.
- .15 Fire Fighter's Operation: In accordance with Authorities having Jurisdiction.
- .16 Arrange emergency power to operate position indicators in cars.

- .17 Power Supply:
 - .1 Equipment Power: Indicated on electrical drawings.
 - .2 Lighting: 120 V, 15 A, single phase, 60 Hz, alternating current.
- .18 Arrange elevator components in control closet or machinery space so equipment can be removed for repairs or replaced with minimal disturbance to other equipment and components.
- .19 Were permitted by code, provide all elevator equipment including controls, drives, transformers, and rescue features within the elevator hoistway.

1.4 SUBMITTALS

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data for each Product specified in accordance with Section 01 10 10 indicating:
 - .1 Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and trouble-shooting protocol.
 - .2 Signal and operating fixtures, operating panels, indicators, car design and components, doors and frame details, door protective devices, microprocessor controller, and telephone.
 - .3 Product transportation, storage, handling and installation requirements.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 10 10. In addition to the requirements of ASME A17.1/CSA B44, shop drawings shall indicate:
 - .1 Elevations, sections and details of elevator and operating components, dimensions, gauges, finishes and relationship of operating components to adjacent construction.
 - .2 Size and location of machine and controller.
 - .3 Weights of principal components.
 - .4 Complete electrical wiring diagrams including electrical schematics and sequence of operation.
 - .5 Complete engineering design data to confirm that elevators meet design criteria specified.
 - .6 Electrical power information including voltage confirmation sheet, recommended fuse ratings, sizes and types, equipment starting and running current.
 - .7 Size and location of car, hoisting beam, Guides, buffers, buffer supports, and other components in hoistway.
 - .8 Details of work required by other trades.
 - .9 Rail bracket spacing and maximum loads on guide rails.
 - .10 Forces on guide rails, and at other points of support.
 - .11 Rating of drive motor.
 - .12 Top and bottom clearance and over travel of car.
 - .13 Location of disconnects, circuit breaker, light switches and feeder extension points.
 - .14 Heat dissipation rate for elevator equipment.
 - .15 Hoistway entrances and doors showing method of operation, details of construction, and method of fastening to structural members of structure.

- .16 Signal and operating fixtures including hall lanterns, carrying lanterns, hall buttons, car position indicator, control switches.
 - .17 Wiring diagram showing connections from each source.
 - .18 Loads on hoist beams.
 - .19 Seismic design data.
- .3 Samples:
 - .1 Eight weeks after Notification of Award, submit 2 samples of the following in accordance with Section 01 10 10.
 - .1 Elevator operating buttons, car interior, car ceiling, car door, hoistway entrance door and frame finishes.
- .4 Reports:
 - .1 Prior to installation of elevators, submit to the Consultant 2 approved copies of submissions made to the Technical Standards and Safety Authority (TSSA).
 - .2 Provide inspection certificates upon elevator completion.
- .5 Operations and Maintenance Manuals:
 - .1 Submit following for each Product for incorporation into Operations and Maintenance Manuals in accordance with Section 01 10 10 :
 - .1 Identification: Manufacturing name, type, year, serial number, number of units, capacity, and identification of related systems.
 - .2 Functional description detailing operation and control of components.
 - .3 Performance criteria and maintenance data.
 - .4 Operating instructions and precautions.
 - .5 Safety precautions.
 - .6 Component parts availability including names and addresses of spare part suppliers.
 - .7 Consumables.
 - .8 Maintenance and troubleshooting guidelines/protocol, and recommended equipment for analysis and repair.
 - .9 Final tests and commissioning reports.
 - .10 Items to be submitted to Consultant: keys, tools, special devices, maintenance materials.
 - .11 Record drawings.
 - .12 Description of operation and control equipment.
 - .13 Equipment maintenance check chart.
 - .14 Equipment trouble shooting guide and instructions.
 - .15 Name, address, telephone and facsimile numbers for major component manufacturers.
 - .2 Manual documents that are larger than standard size sheets shall be neatly folded and housed in large envelopes or drawing pockets. These documents shall be inserted and housed in each manual binder.

1.5 QUALITY ASSURANCE

- .1 Manufacturer/Installer's Qualifications: Specialize in manufacturing and installing elevator equipment, with a minimum of 10 years successful experience.
- .2 Regulatory Requirements:
 - .1 Elevator design, clearances, construction, workmanship, materials, and installation, unless specified otherwise, shall be in accordance with ANSI/ASME A17.1, handicap accessibility, Americans with Disabilities Act, and other codes having legal jurisdiction.
 - .2 ANSI/ASME A17.1 shall govern, except where codes having legal jurisdiction include more rigid requirements or conflict with ANSI/ASME A17.1.
 - .3 Elevator shall follow design and manufacturing procedures certified in accordance with ISO 9001-2000 to meet product and service requirements for quality assurance for new products.
 - .4 Where product is in variance to the published ANSI/ASME A17.1 model code, provide a 3rd party AECO certification demonstrating equivalent function, safety, and performance.
- .3 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Elevator Work of comparable complexity and scope, to perform following services as part of Work of this Section:
 - .1 Design of elevators.
 - .2 Review, stamp, and sign shop drawings and design calculations.
- .4 Pre-installation Meeting:
 - .1 Convene pre-installation meeting before start of installation of elevators.
 - .2 Require attendance of parties directly affecting work of this section, including Contractor, Architect, and elevator manufacturer/installer.
 - .3 Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery: Deliver materials to site in manufacturer/installer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer/installer.
- .2 Storage: Store materials in clean, dry area indoors in accordance with manufacturer/installer's instructions.
- .3 Handling: Protect materials during handling and installation to prevent damage.

1.7 PROJECT CONDITIONS

- .1 Temporary Electrical Power:
 - .1 Owner will arrange for temporary 220 VAC, single-phase, 60 Hz., GFCI-protected electricity to be available for installation of elevator components.
 - .2 Comply with Section 01 51 00 – Temporary Utilities.

.2 Installation of the Elevator:

- .1 General Contractor will provide permanent three-phase power prior to installation start.
- .2 General Contractor will provide clear, rollable access to a 20' x 10' secure and dry storage area prior to delivery.
- .3 General Contractor will provide a clean, dry, and complete hoistway along with temporary installation platform and all required OSHA-compliant barricades prior to delivery.

.3 Temporary Use of Elevator:

- .1 Owner will negotiate with manufacturer/installer for temporary use of elevator, if required.
- .2 Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

1.8 **SCHEDULING**

- .1 Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays.

1.9 **WARRANTY**

- .1 Manufacturer/installer shall guarantee materials and workmanship of equipment installed under these specifications and make good, defects not due to ordinary wear or to improper use, which may develop within 1 year after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

1.10 **MAINTENANCE SERVICE**

- .1 Provide complete service and maintenance of elevator system components during building contract and 12 month warranty period at no additional cost to Owner.
- .2 Provide Maintenance Control Program (MCP) complying with ASME A17.1/CSA B44, and any other local authority rulings and requirements. MCP shall be turned over to the Owner upon completion and will be maintained as necessary.
- .3 Maintenance to include systematic examination, adjustment of elevator equipment and repair or replace parts whenever required as per planned maintenance tasks and frequencies. Use genuine parts produced by the manufacturer of specific equipment.
- .4 Perform work without removing cars during peak traffic periods.
- .5 Provide emergency call back service during regular operating hours for the maintenance period.

- .6 Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Consultant.

2 Products

2.1 **MATERIALS**

- .1 Electric Traction Passenger Elevators: Drawings and specifications are based on the '3300' Gearless Traction Elevator by Schindler Elevator Corporation and shall be base bid.
- .2 Elevator Equipment Summary: Application: Machine Room Less (MRL)
 - .1 Counterweight Location: Side.
 - .2 Machine Location: Top of the hoistway mounted on car and counterweight guide rails.
 - .3 Control Space Location: Top landing entrance frame or entrance frame at one floor below the top landing.
 - .4 Service: General Purpose Passenger.
 - .5 Quantity: 1 Unit.
 - .6 Capacity: 2500 lbs.
 - .7 Speed: 100 fpm.
 - .8 Travel: 22' 11 3/5".
 - .9 Landings: 3.
 - .10 Front Openings: 3.
 - .11 Rear Openings: 0.
 - .12 Rear Door Hand: N/A.
 - .13 Operation: Microprocessor Single Car Automatic Operation.
 - .14 Clear Inside Dimensions: 5' 9-5/16" Wide X 4' 4-7/8" Deep.
 - .15 Cab Height: 7' 9".
 - .16 Guide Rails: Equivalent to 12 lb. per foot.
 - .17 Entrance Type and Width: Two Speed Side Opening 3' 0" Wide X 7' 0" High doors.
 - .18 Entrance Height: 7'-0".
 - .19 Power Supply: 600 Volts 3 Phase 60 Hz.
- .3 Performance:
 - .1 Car Speed: -10% to +5% of contract speed under any loading condition or direction of travel.
 - .2 Car Capacity: Safely lower, stop and hold up to 125% of rated load per code.
- .4 Ride Quality:
 - .1 Vertical Vibration (maximum): 25 mg
 - .2 Horizontal Vibration (maximum): 15 mg
 - .3 Vertical Jerk (maximum): 2 ft/sec³
 - .4 Acceleration (maximum): 1.6 ft/sec²
 - .5 In Car Noise: 53-60 dB(A)
 - .6 Stopping Accuracy: ±5mm
 - .7 Starts per hour (maximum): 180

- .5 Elevator Operation:
 - .1 Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. When all calls have been answered, the car shall park at the last landing served.
 - .2 Group Automatic Operation with Demand-Based Dispatching: Provide reprogrammable group automatic system that assigns cars to hall calls based on a dispatching algorithm designed to minimize passenger waiting time.
- .6 Operating Features - Standard:
 - .1 Door Light Curtain Protection
 - .2 Door Light Curtain Protection
 - .3 Static AC Drive
 - .4 Phase Monitor Relay
 - .5 Cab Overload with Indicator
 - .6 Load-weighing
 - .7 Central Alarm
 - .8 Remote Monitoring
 - .9 Firefighter's Operation
 - .10 Automatic Evacuation
 - .11 When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. If the car is at a floor when the power fails, it remains at that floor, opens its doors, and shuts down. If the car is between floors, it is raised or lowered to the first available landing, opens its doors, and shuts down.
 - .12 Independent Service,
- .7 Operating Features - Optional:
- .8 If another manufacturer's equipment is used, adjust surrounding construction to suit other manufacturer's product. If requirements or characteristics of lift equipment differ from that which is specified herein, such as: power requirements, electrical conductor size from control box to lift controller, motor hp size, or other such difference; list such differences at the time of bidding in accordance with the Contract Documents. Alternatives by the following will be considered provided they are approved prior to purchase.
 - .1 'MonoSpace' by KONE Inc.
 - .2 'OTIS-GEN2' by Otis Elevator Company.
 - .3 ThyssenKrupp Elevator.
- .9 Use components only which have performed satisfactorily together under conditions of normal use in not less than two other elevator installations of similar design and for a period of at least one year. Furnish names and addresses of Owners or managers of buildings, in which proposed combination of major components has so performed.
- .10 Stainless steel sheet and plate: ASTM A167, Type 316, brushed finish #4. Sizes and shapes indicated.
- .11 Aluminum brushed round straight railing on left, rear and right walls.
- .12 Standard car front (Stonehenge).

2.2 SOUND ISOLATION

- .1 Include resilient pads to effectively isolate machine from machine beams or flooring.
- .2 Prevent lateral displacement of machine.

2.3 CONTROL ROOM EQUIPMENT

- .1 Controller: Provide microprocessor-based control system to perform all the functions of safe elevator operation, as well as perform car and group operational control.
- .2 All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
- .3 The controller shall be distributed throughout the elevator system located in the overhead, cab and inspection and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.
- .4 High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
- .5 Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC).
- .6 Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the BS EN 12016.
- .7 Provide multi-bus control architecture to reduce cabling, material, and waste
- .8 Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. Provide stable start without high peak current, quickly reaching a low energy consumption level.

2.4 HOISTWAY COMPONENTS

- .1 Machine:
 - .1 Gearless asynchronous AC motor with integral drive sheave, service, and emergency brakes.
 - .2 Design machine to enable direct power transfer, thereby avoiding loss of power.
 - .3 Design machine to be compact, lightweight, and durable to optimize material usage and save space.
 - .4 Mount to structural support channels on top of guide rail system as applicable in hoistway overhead
- .2 Governor:
 - .1 Tension type over-speed governor with remote manual reset.
 - .2 Mount to structural support channels as applicable in hoistway overhead.

- .3 Buffers, Car and Counterweight:
 - .1 200 fpm Compression spring type buffers shall be used.
- .4 Hoistway Operating Devices:
 - .1 Emergency stop switch in the pit.
 - .2 Terminal stopping switches.
 - .3 Emergency stop switch on the machine.
- .5 Positioning System: System consisting of proximity sensors and door zone vanes.
- .6 Guide Rails and Attachments: Provide Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guides rails to building fastening.
- .7 Coated Steel Belts: Five polyurethane coated belts with 12 high-tensile-grade, zinc-plated steel cords in each.
- .8 Suspension System: Noncircular Elastomeric coated suspension media with high tensile grade steel cords.
- .9 Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.
- .10 Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.
- .11 Hoistway Entrances:
 - .1 Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of 14-gauge (2 mm) sheet steel.
 - .2 Sills shall be extruded aluminum.
 - .3 Doors: Entrance doors shall be of hollow metal construction with vertical internal channel reinforcements.
 - .4 Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.

2.2 ELEVATOR CONTROLLER CABINET

- .1 Provide elevator controls in an EEMAC 12 ventilated galvanized steel cabinet mounted adjacent to or attached to the power unit.
- .2 Provide controller with hinged doors, designed to allow ready access to all internal components.
- .3 Controller shall house contactors, relays, switches, timers, fuses and other control and operating devices. Clearly label all components with permanently marked tags or designations, corresponding to the electrical circuit wiring diagrams. Provide similar switch and relay units of same manufacturer.

2.3 VOLTAGE CONTROL

- .1 Include voltage control as follows:
 - .1 Effect voltage control by means of uniformly varying ac voltage applied to motor.
- .2 Include manufacturers standard AC variable voltage variable frequency drive system.
- .3 Include solid state motor drive as follows:
 - .1 Convert 3 phase, 60 hz ac to variable ac voltage for motor operation.
 - .2 Use automatic closed loop control system.
 - .3 Provide instant and noiseless response according to power required.
 - .4 Conform to ASME A17.1/CSA B44.
 - .5 Design circuitry with redundant systems to fail safe.
 - .6 Filter power supply to give essentially ripple free current.
- .7 Design solid state devices to handle 200% current for 30 s and 300% for 10 s.
- .8 Eliminate surges on the ac line which might cause blowing of the dc line fuses or which might cause trouble in other equipment connected to ac line. Filter dc if necessary.
- .9 Modify frequencies emanating from rectifier drive which are objectionable to personnel or which interact with various parts of building.
- .10 Design motor to suit control system.
- .11 Automatically re-start equipment which has stopped due to ac power failure.
- .12 Withstand damage and do not malfunction due to any variation of power supply to a maximum of +/- 10% flux.
- .13 Cause no adverse effects on power supply, or other equipment connected to power supply, under operating conditions.
- .14 Include governor switch set to trip at no more than 90% of governor tripping speed; activated by overspeed in both directions.

2.4 BUFFERS

- .1 Do not compress oil buffers when car is level with bottom landing.
- .2 Use reduced stroke buffers and emergency terminal stopping devices where pit depth or overhead height does not permit installation of normal stroke buffers.
- .3 Include buffer extensions where necessary to suit pit depth as indicated.
- .4 Provide buffer switch on spring return buffers.

2.5 CAR GUIDE RAILS

- .1 Provide steel "T" section car guide rails, complete with brackets and sliding rail clips. Size rails to accommodate a 1500 mm vertical span between adjacent guide rail supports, even when the actual distances between supports are less.
- .2 Fasten rails to hoistway construction using fastening devices and members as provided by this Section.

- .3 Accurately machined car guide rail joints. They shall have tongues and grooves in the ends and centre of each rail head and base, so as to form matching joints between the rail head and base.
- .4 Maximum joint gap to be 1.5 mm. All rail joints to be filed smooth.
- .5 Provide fitted fishplates to the back of each rail joint. Each fishplate shall contain no less than eight through bolts. Fishplates shall be accurately machined surfaces for all surfaces which contact the guide rails.
- .6 Locate rail joints so fishplates will not interfere with the relative motion of the guide rail column with respect to rail clips, brackets and beams.
- .7 Positioned and aligned car guide rails so they are within 3 mm plumb and parallel from top to bottom.
- .8 Where rail shims are used, ensure they remain securely fastened, even though fastening bolts may become loose. Do not use shim packing for gaps exceeding 25
- .9 Cut car guide rails off at the top so there is a minimum clearance of at least 50 mm between the underside of the hoistway ceiling or nearest obstacle above the rail head.
- .10 Guide rails shall be cleaned, filed smooth and de-rusted before Substantial Completion of the work.

2.6 ROLLER GUIDES

- .1 Equip car with roller guides mounted on top and bottom of car frame.
- .2 Provide each guide with durable, oil resistant, resilient tired ball bearing rollers running on three finished rail surfaces.
- .3 Do not lubricate guide rails. Maintain each roller on its respective guide in uniform contact with rail surface at all times by means of substantial springs or by resilient mountings.
- .4 Provide guide operation which is inaudible to passengers in car or outside hoistway with car operating at rated speed and car fan turned off.
- .5 Use tire material which will not develop flat spots after standing idle for 24 h under average environmental conditions.

2.7 HOISTWAY SWITCHES

- .1 Provide normal terminal stopping devices at each top and bottom landing level. Arrange these enclosed switches so that as the elevator approaches either landing, a roller with a noiseless tread, mounted on a movable arm, will come in contact with cams mounted on the elevator car. The activation of this device will cause the elevator to automatically come to a smooth stop at that terminal landing. The switch roller shall engage the full surface area on the car cam.

- .2 Provide a final terminal stopping device at the top and bottom of the hoistway.
- .3 Operate final limits by a fixed car cam which is securely attached to the elevator car's structure.
- .4 Locate switches so they will only be activated in the event the elevator travels a predetermined distance above or below the corresponding terminal landing.
- .5 These switches shall be independent of the normal stopping devices.
- .6 Through bolt final limit switches once the car has passed TSSA final acceptance inspections.
- .7 Hoistway switches shall be of a type that can operate without noise being heard from inside the elevator cab whenever the ventilation fan is OFF.

2.11 HOISTWAY ENTRANCE

- .1 Hoistway doors and frames: stainless steel; 1.5 mm thick. Fascia panels constructed same as doors.
- .2 Door and frame construction: ULC rated for with applicable fire rating; test to CAN4-S104; sandwich panel construction, 32 mm thick minimum.
- .3 Frames: bolted construction.

2.12 OPERATING PANEL AND BUTTONS

- .1 One operating panel per car with stainless steel faceplate mounted in each car, containing buttons with integral illumination corresponding to floors served, alarm button and "DOOR OPEN", "DOOR CLOSE" buttons.
- .2 One riser with single call button at terminal landings, each with integral illumination and faceplate.
- .3 Button Illumination:
 - .1 Include LED illumination of each button in each landing and car operating fixture.
 - .2 Illuminate corresponding "up" or "down" button and car button whenever call is registered. Extinguish illumination when call has been answered.
- .4 Signal Illumination: Illuminate signal fixtures with sufficient intensity to produce distinct and well-defined indications under ambient lighting conditions.

2.13 DOOR OPERATION

- .1 Automatic door operation: at each landing by means of power operator mounted on top of car.
- .2 Door protective devices: multiple infrared light beams with solid state electronics providing extensive criss-crossed continuous scan across car entrance, unaffected by dust, humidity and vibration.

- .3 Door operating sequence to minimize car and hall door open and close times. Provide independently adjustable door open times
- .4 Include arrangement specifically designed to minimize delays and return of car to service, should doors be prevented from closing for predetermined time.
- .5 If doors are prevented from closing for approximately 10 s because of obstruction or operation of safety devices, automatically disconnect door control device and allow doors to close more slowly and recycle until obstruction is cleared. Sound alarm.

2.14 AUTOMATIC SELF LEVELING FEATURE

- .1 Install self-leveling feature which will automatically bring car to floor landings. Correct for over-travel, independent of operating device.
- .2 Maintain car floor level within 10 mm of landing floor with two-way automatic maintaining leveling device.

2.15 LOAD WEIGHING DEVICE

- .1 Include automatic load weighing device to:
 - .1 Dispatch elevator from main terminal if filled to predetermined capacity;
 - .2 Cause elevators to bypass hall calls without canceling them if elevator is filled to predetermined capacity.
- .2 Arrange load weighing dispatch and load weighing bypass to be independently adjustable.

2.16 CAR PLATFORM AND ENCLOSURE

- .1 Structural steel platform frame: filled with wood or steel subflooring. Threshold plate: durable and easily maintainable.
- .2 Enclosure: Sheet steel panels attached to steel frame.
- .3 Floor, walls and ceiling: 19 mm plywood, fire retardant treated surfaces and edges. Attach with flush mechanical fasteners.
- .4 Enclose car on all sides except entrance, suitable for removing or resurfacing for maintenance purposes.
- .5 Panels: Three, removable, retained securely with hidden fastenings. Design for removal of panels from inside car. Face panels with stainless steel.
- .6 Floor finish: To be selected by Consultant.
- .7 Ceiling: stainless steel as provided by elevator manufacturer.
- .8 Include lighting providing a light intensity of 215 lx measured 0.75 m above floor. Totally enclose and conceal wiring and fixtures from view within car.

- .9 Ventilate by an exhaust air handling unit through roof and through concealed perforations at base. Limit total fan noise to 55 dB on "A" scale of General Radio Sound Level meter type 1551A from reading 1000 mm above floor with fan on high speed.
- .10 Operating panel and face plate: stainless steel with illuminating call buttons.
- .11 Indicator panel within car panel.
- .12 Pad hooks: Stainless steel, permanently mounted at 2100 mm.
- .13 Wall mats: one set canvas covered, padded with cotton wadding fill material and sewn.
- .14 Furnish stainless steel license holders integral with return panel in each elevator car or control room to suit certificate issued by enforcing authority. Design holder with hidden or tamper proof fastening.
- .15 Provide recessed mounted, hands-free, emergency telephone, with automatic dialing feature for dedicated line. Program to suit building manager's requirement. Provide vandal resistant mounting to prevent unit removal from cabinet.

2.17 **FINISHING**

- .1 Structural metal surfaces: clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- .2 Machine components: clean and degrease; prime one coat, two coats enamel.
- .3 Field welds: chip and clean away oxidation and residue; wire brush weld; prime two coats.
- .4 Galvanized surfaces: clean with neutralizing solvent; prime one coat.
- .5 Wood surfaces not exposed to public view: one coat primer; two coats enamel.
- .6 Baked enamel on steel: clean degrease metal surface, one coat of zinc oxide primer sprayed and baked; two coats of semi-gloss enamel sprayed and baked; color as later selected by Consultant.

2.18 **BARRIER FREE DESIGN**

- .1 Comply with CSA B651.
- .2 42 mm dia. stainless steel handrails as indicated on drawings with ends returned close to panels and removable from inside car.
- .3 Sound audible soft-toned signal in car when car is passing or stopping at floor.

2.19 **EMERGENCY LIGHTING**

- .1 Include emergency lighting in each car as follows:
 - .1 Battery operated emergency lighting equipment, to CSA C22.2No.141, to provide general illumination and 10 lx minimum illumination in car at operating panels and telephone cabinet for 4 h minimum.
 - .2 Key operated switch for manual testing of unit from within car.
 - .3 Battery unit of sufficient strength to support 100 kg person without causing malfunction or damage.
 - .4 Means to contain leakage or spillage of electrolyte.

3 Execution

3.1 **EXAMINATION**

- .1 Verify that hoistway and pit are ready for equipment installation.
- .2 Verify shaft and openings are of correct size and within tolerances.
- .3 Confirm electrical power is available and of correct characteristics.
- .4 Report defects in writing to Consultant.
- .5 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install equipment in accordance with the Contract Documents, reviewed shop drawings, and in accordance with ASME A17.1/CSA B44, local codes and regulations. Position components so as to allow for future replacement or repair work to be undertaken, without having to dismantle or relocate other equipment.
- .2 Connect to electrical services as provided.
- .3 Provide wiring and conduit from electrical disconnects to car controller. Coordinate location of controller and electrical connection routing.
- .4 Provide suitable rail bracket fasteners and make secure attachments to hoistway construction.
- .5 Provide inserts for placement in concrete form work or self drilling expansion shell bolt anchors that will perform to four times rated pull-out load.
- .6 Set entrance frames in proper alignment with car platform. Fasten frames to available wall and floor supports.

- .7 Exposed Work within car enclosure and hall landing entrances shall be fabricated in true planes. Metal and wood sections shall be installed flat, be securely fastened and aligned so as to be straight and true. They shall be free of visible imperfections. Joints shall be accurately fitted, aligned and installed in same plane.
- .8 Install entrances so frames are plumb within maximum variation of 3 mm, measured between entrance landing sill and header, top to bottom.
- .9 Install hoistway door sills, frames and headers in hoistway walls. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.
- .10 Balance car.

3.3 WIRING

- .1 Install wiring in accordance with reviewed shop drawings. Tie wrap conductors.
- .2 Provide wiring to connect all parts of the elevator equipment including interconnecting wiring running between controller and elevator hoistway.
- .3 Wiring to be stranded or solid, to suit manufacturer's specific requirements. Wiring shall be provided with flame proof and moisture resisting outer cover.
- .4 Do not parallel conductors to increase current carrying capacity unless individually fused.
- .5 Wrap spare conductors together and labeled with their ends insulated.
- .6 Solder or fasten wiring connections to terminal strips or studs using approved mechanical fasteners.
- .7 Provide wiring harness where multiplicity of conductors are terminated at remote panel terminal strips.
- .8 Clearly identify controller components with designations corresponding to those used on electrical circuit drawings.
- .9 Provide insulated bushings around wiring openings where traveling cable and other multi conductor cables are run through openings in car enclosure.
- .10 Wiring connections to door detectors shall be protected from chaffing and splitting.
- .11 Where liquid tight conduit is used, provide conduit supports and fastenings at intervals of not more than 1500 mm.
- .12 Use proper anti shorts in all conduit connections.
- .13 Provide hoistway troughing and conduit.

- .14 Run hoistway wiring within conduit or troughing.
- .15 Provide ETT type flexible traveling cable, complete with flame resistant and moisture proof outer cover. Provide traveling cables of identical size and diameter and ensure each cable's loop has a similar hanging radius.
- .16 In all hoistway wiring risers, remote panel conduits and traveling cables runs provide a minimum of 10% spare conductors. Identify, tie wrap and isolate ends of all spare conductors.

3.4 **FIELD TESTING**

- .1 During installation, Consultant may carry out periodic Site inspections to gauge progress of the work and assess monthly invoices.
- .2 Provide full co-operate with Consultant to allow unrestricted access of the installation, hoistway, pit and car platform.
- .3 Perform all tests and inspections as required under ASME A17.1/CSA B44 and Authorities having Jurisdiction.
- .4 Include all costs of Provincial registration, design submission and acceptance inspection fees.
- .5 Coordinate and schedule with TSSA acceptance inspections.
- .6 Performance and operation or commissioning inspections shall be carried out by the Owner's designated representatives and shall be scheduled to take place before TSSA acceptance inspection.
- .7 During commissioning inspections, supply sufficient test weights to demonstrate performances under full load and no load conditions.

3.5 **EQUIPMENT PERFORMANCE AND ADJUSTMENT SETTINGS**

- .1 Adjust elevator to attain the following performance criteria:
 - .1 Car movement on guide rails: smooth movement, with no perceptible lateral or oscillating movement or vibration.
 - .2 Car speed variation: maximum 5% in lifting rated load.
 - .3 Car speed variation: maximum 10% in UP or DOWN speed, empty to full rated load.
 - .4 No noticeable shift in acceleration or deceleration rates.
 - .5 Car leveling accuracy shall be maintained at +/- 6 mm, under all load conditions.
 - .6 Guide rail alignment: plumb and parallel to each other within 3 mm.
- .2 Adjust door opening and closing times to suit handicapped users in accordance with Consultants instructions.

- .3 Adjust automatic floor levelling feature at each floor.

3.6 CLEANING

- .1 Remove protective coverings from finished surfaces and components.
- .2 Clean surfaces and components ready for inspection.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-21, Canadian Electrical Code, Part 1 (26th Edition), Safety Standard for Electrical Installations.
 - .2 Ontario Electrical Safety Code, 29th Edition, 2024.
 - .3 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for distribution equipment, lighting, fire alarm equipment, emergency lighting and exit signs, wiring devices, lighting controls, natural gas generator and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams under plexiglass in glazed frames and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.
- .5 Shop drawings:
 - .1 Submit shop drawings.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit digital copies of drawings and product data.
- .6 If changes are required, notify Consultant of these changes before they are made.
- .6 Certificates:
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.
- .7 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS_

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for electrical equipment for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

-
- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect electrical equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Develop Construction Waste Management Plan related to Work of this Section.
 - .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 60 00 - Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction and inspection authorities .
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet , black face, white core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Owner's Representative and Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.

- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	

Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light gray to EEMAC-ZY-1.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe , sized for free passage of conduit, and protruding 50 mm.

- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1000 mm.
 - .2 Wall receptacles:
 - .1 General: 400 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 400 mm.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1150 mm.
 - .7 Fire alarm horns and speakers: as per CAN/ULC-S524.
 - .8 Television outlets: as noted on drawings.
 - .9 Door bell pushbuttons: 1000 mm.
 - .10 Wall mounted visual signal devices: entire lens not less than 2000mm and not more than 2400mm as per CAN/ULC-S524-19.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES AND ARC FLASH STUDY

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

- .2 Contractor is to provide a complete arc flash, short circuit, and coordination study for the new distribution equipment being supplied. Contractor shall submit the arc flash, short circuit and coordination study prior to submission of distribution equipment shop drawings. Shop drawings for distribution equipment must include fully coordinated breakers with fully adjustable LSI trip units as per the coordination study. The company performing the study shall have at least five years experience in such studies as Brosz and Associates. Contractor shall install arc flash labels on equipment. Study to be carried out as per CSA Z462 - Workplace Electrical Safety Standard.
- .3 Include in cost of arc flash, short circuit and coordination study for two revisions based upon engineer review or project changes.

3.8 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Owner's representative and Consultant.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in

handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 SYSTEM STARTUP

- .1 Instruct Owner's Representative Consultant and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors as noted on drawings: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE or RWU90 XLPE, Non Jacketted.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat interlocking galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two

- hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at m centers required by code and commended by manufacturer.
- .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight, approved for TECK cable.

2.3 ARMoured CABLES_

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Type: ACWU90 PVC flame retardant jacket over thermoplastic armour and compliant to applicable Building Code classification for this project wet locations.
- .5 Connectors: anti short connectors.

2.4 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket.
- .2 Type: low energy 300 V control cable: solid stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: PVC.
 - .2 Shielding: tape coated with paramagnetic material.
 - .3 Overall covering: PVC jackets.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.
- .2 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.
- .3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .4 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .5 Conductor length for parallel feeders to be identical.
- .6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .7 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .9 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 In underground ducts in accordance with Section 33 71 73.02.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable concealed where possible, securely supported by straps and hangers.

3.5 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.6 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit and cable trays.
- .2 Ground control cable shield.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 – Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as indicated as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 19 mm diameter by minimum 3 m long.
- .4 Plate electrodes: copper, surface area 0.2 m², minimum 1.6 mm thick.
- .5 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .6 Insulated grounding conductors: green, copper conductors, size as indicated.
- .7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative Consultant.

3.2 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both one ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point street side of water pipe. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end and load end.

3.3 ELECTRODES

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.

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- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
 - .4 Install rod or plate electrodes and make grounding connections as indicated.
 - .5 Bond separate, multiple electrodes together.
 - .6 Use size 4/0 AWG copper conductors for connections to electrodes.
 - .7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of primary 600V V system, secondary 120/208 V system.

3.5 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.6 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.
- .2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.7 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
 - .2 Sound, fire alarm, security systems, intercommunication systems as indicated.

3.8 FIELD QUALITY CONTROL

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- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction over installation.
 - .3 Perform tests before energizing electrical system.
 - .4 Disconnect ground fault indicator during tests.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended or set in poured concrete walls and ceilings.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed

under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Owner's Representative.
- .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Secure equipment to hollow solid masonry, tile and plaster surfaces with nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 1m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or

cable.

- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trades and approval of Owner's Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-21, Canadian Electrical Code, Part 1, 26th Edition.
- .2 Ontario Electrical Safety Code, 29th Edition 2024.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.

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- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
 - .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
 - .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
 - .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 73 mm for receptacles and communication outlets.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.7 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2008), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-17, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2017), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.6-M1984(R2016), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-15, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with expanded ends.
- .4 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, steel and liquid-tight flexible metal.
- .6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than NPS 2 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

- .3 Watertight connectors and couplings for EMT.
- .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.
- .3 Use rigid galvanized steel threaded conduit except where specified otherwise.
- .4 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.
- .5 Use rigid pvc conduit underground and in corrosive areas.
- .6 Use flexible metal conduit for connection to motors in dry areas.
- .7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

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- .8 Minimum conduit size for lighting and power circuits: 19 mm.
 - .9 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
 - .10 Mechanically bend steel conduit over 19 mm diameter.
 - .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
 - .12 Install fish cord in empty conduits.
 - .13 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.
 - .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete surface type box.
 - .14 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
 - .15 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel.
 - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
 - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.
 - .1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA International
 - .1 CAN/CSA-Z809-08, Sustainable Forest Management.
- .2 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .3 Insulated Cable Engineers Association, Inc. (ICEA)
- .4 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2010-2014 Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for cables and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect cables from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of

pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 CABLE PROTECTION

- .1 38 x 140 mm planks pressure treated with clear coloured, or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

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- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
 - .7 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

- .1 Mark cable every 150 m along cable duct runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
 - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
 - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
 - .3 Leakage Current Testing:
 - .1 Raise voltage in steps from zero to maximum values as specified by ICEA manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by ICEA manufacturer.
 - .3 Record leakage current at each step.
- .7 Provide Owner's Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for low voltage control system designed to provide remote switching of lighting loads by use of:
 - .1 Low voltage momentary contact switches.
 - .2 Occupancy Sensors.
 - .3 Daylight Sensors.
 - .4 Room Controllers.
 - .5 Power Packs
 - .6 Emergency Lighting Control Units.

1.2 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 UL 924 - Standard for Emergency Lighting and Power Equipment

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC content.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Closeout Submittals:
 - .1 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.
- .4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Test reports:
 - .1 Submit certified test reports indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical

properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions.

.4 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety. - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 60 00 - Product Requirements.

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

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Control system: by one manufacturer and assembled from compatible components.

2.2 REMOTE CONTROL SWITCHES

.1 Single pole, double throw, momentary contact, heavy duty, rated 20A, 25 V, double push-button action with pilot lights.

2.3 LOW VOLTAGE RELAYS

.1 Electrically operated by momentary impulse, mechanically latched until activated.

.2 Two coil solenoid type with one coil to close relay contacts and one coil to open relay contacts.

.3 Operating voltage: 24 V, AC rectified AC.

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- .4 Load contacts: 20 A, 120 or 347 V, AC as required.
 - .5 Auxiliary contacts for pilot light.
 - .6 Coloured pre-stripped leads.

2.4 CONTROL TRANSFORMER

- .1 Low voltage power Class 2, input 120 or 347 V, AC, 60 Hz, output 35 VA at 24 V.

2.5 RECTIFIER

- .1 Selenium type: 24 V, AC, 60 Hz input, 0.36 A continuous duty output.
- .2 Silicon type: 24 V, AC, 60 Hz input, 7.5 A continuous duty 20 A intermittent duty output.

2.6 MANUAL CONTROL

- .1 Locate individual remote control switches as indicated.

2.7 ON/OFF/0-10V DIMMING ENHANCED ROOM CONTROLLER

- .1 Dual voltage (120/277 VAC, 60 Hz) capable, 60 Hz. 120/277 volt models rated for 20A total load.
- .2 Built in real time current monitoring.
- .3 One, two or three relays configurations.
- .4 Smart 250 mA switching power supply.
- .5 Four RJ-45 DLM local network ports. Provide integral strain relief.
- .6 One dimming output per relay.
 - .1 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting.

2.8 DUAL TECHNOLOGY CEILING MOUNT OCCUPANCY SENSOR

- .1 Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
- .2 Digital calibration and pushbutton configuration for the following variables:

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- .1 Sensitivity, 0-100 percent in 1 minute increments. .2 increments. Time delay, 0-30 minutes in 1 minute
 - .2 Test mode, five second time delay.
 - .3 Detection technology, PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - .4 Walk-through mode.
- .3 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
- .4 Programmable control functionality including:
 - .1 specific loads within a local network. Each sensor may be programmed to control
 - .2 of 16 user-definable lighting scenes. Sensor shall be capable of activating one
 - .3 manual-on loads. Load will retrigger Adjustable retrigger time period for (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
 - .4 On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies.
 - .5 Ultrasonic and Passive Infrared.
 - .6 Ultrasonic or Passive Infrared.
 - .7 Ultrasonic only.
 - .8 Passive Infrared only.
 - .9 Settings for passive infrared and independently configurable sensitivity (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
- .5 One or two RJ-45 port(s) for connection to DLM local network.
- .6 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
- .7 Device Status LEDs, which may be disabled for selected applications, including:
 - .1 PIR detection.
 - .2 Ultrasonic detection.
 - .3 Configuration mode.
 - .4 Load binding.
- .8 Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
- .9 Manual override of controlled loads.
- .10 All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.
- .11 BACnet object information shall be available for the following objects:
 - .1 Detection state.
 - .2 Occupancy sensor time display.

- .3 Occupancy sensor sensitivity, PIR and ultrasonic.
- .12 potentiometers for field settings. Units shall not have any dip switches or
- .13 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

2.9 DIGITAL WALL SWITCHES

- .1 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
- .2 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
- .3 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
- .4 Configuration LED on each switch that blinks to indicate data transmission.
- .5 Load/Scene Status LED on each switch button with the following characteristics:
 - .1 Bi-level LED.
 - .2 Dim locator level indicates power to switch.
 - .3 Bright status level indicates that load or scene is active.
 - .4 Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
- .6 Programmable control functionality including:
 - .1 Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority.
 - .2 Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
- .7 All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.
- .8 BACnet object information shall be available for the following objects:
 - .1 Button state.
 - .2 Switch lock control.
 - .3 Switch lock status.
- .9 Two RJ-45 ports for connection to DLM local network.
- .10 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.

- .11 Load and Scene button function may be reconfigured for individual buttons from Load to Scene, and vice versa.
 - .1 Individual button function may be configured to Toggle, On only or Off only.
 - .2 Individual scenes may be locked to prevent unauthorized change.
 - .3 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
 - .4 Ramp rate may be adjusted for each dimmer switch.
 - .5 Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.

2.10 DIGITAL DAYLIGHT SENSORS

- .1 Digital daylighting sensors shall work with load controllers and relay panels to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to the controller of panel. Daylighting sensors shall be interchangeable without the need for rewiring.
 - .1 Closed loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones.
 - .2 Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones
 - .3 Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone.
- .2 Digital daylighting sensors shall include the following features:
- .3 Sensor's internal photodiode shall only measure light waves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. Photodiode shall not measure energy in either the ultraviolet or infrared spectrums. Photocell shall have a sensitivity of less than 5 percent for any wavelengths less than 400 nanometers or greater than 700 nanometers.
- .4 Sensor light level range shall be from 1-6,553 foot-candles (fc).
- .5 Capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of load controller(s) and load binding to controller(s).
- .6 For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.
- .7 For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.

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- .8 Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
 - .9 Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.
 - .10 Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.
 - .11 Configuration LED status light on device that blinks to indicate data transmission.
 - .12 Status LED indicates test mode, override mode and load binding.
 - .13 Recessed switch on device to turn controlled load(s) ON and OFF.
 - .14 BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
 - .1 Light level.
 - .2 Day and night setpoints.
 - .3 Off time delay.
 - .4 On and off setpoints.
 - .5 Up to three zone setpoints.
 - .6 Operating mode - on/off, bi-level, tri-level or dimming
 - .15 One RJ-45 port for connection to DLM local network.
 - .16 A choice of accessories to accommodate multiple mounting methods and building materials. Photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62 inch thick (LMLS-400, LMLS-500). Extended tube photosensors accommodate mounting materials from 0.62 to 1.25 inches thick. Mounting brackets are compatible with J boxes and wall mounting. Photosensor to be mounted on included bracket below skylight well.
 - .17 Any load or group of loads in the room can be assigned to a daylighting zone.
 - .18 Each load within a daylighting zone can be individually enabled or disabled for discrete control (load independence).
 - .19 All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.
 - .20 Open loop digital photosensors shall include the following additional features:
 - .1 An internal photodiode that measures light in a 60-degree angle (cutting off the unwanted light from the interior of the room).
 - .2 Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software.

For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

.3 Each of the three discrete daylight zones can include any non overlapping group of loads in the room.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Actuate control units in presence of Owner's Representative to demonstrate lighting circuits are controlled as designated.
- .3 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .4 Verification requirements include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

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- .5 Third Party Testing:
- .1 The Contractor is responsible to provide third party testing of the lighting system in accordance with ASHRAE Standard 90.1-2010, Section 9.4.4 Functional Testing. The party responsible for the functional testing shall not be directly involved in either the design or construction of the project and shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria.
- .2 Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's installation instructions.
- .3 When sensors, time switches, programmable schedule controls or photosensors are installed, the following procedures shall be performed:
- .1 Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance, lights turn off only after space is vacated. Where an auto-on mode has been selected, lights do not turn on unless the space is occupied.
- .2 Confirm that the time switches and programmable schedule controls are programmed correctly to turn the lights off.
- .3 Where daylight harvesting capability has been installed, confirm that photosensor controls reduce electric light levels based on the amount of usable daylight in the space as specified.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Include on drawings:
 - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

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- .2 Store and protect panelboards from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Develop Construction Waste Management Plan related to Work of this Section.
 - .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 and 600 V panelboards: bus and breakers rated for 22,000 A (symmetrical) interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Aluminum bus with neutral of same double ampere rating of mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked enamel as per colour schedule.
- .11 Isolated ground bus where indicated.
- .12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board where required.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Owner's Representative.
- .5 Lock-on devices for receptacles, fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.
- .5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

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- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
 - .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.
 - .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.
 - .4 Connect loads to circuits.
 - .5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

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- .4 Develop Construction Waste Management Plan related to Work of this Section.
 - .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

PART 2 - PRODUCTS

2.1 SWITCHES

- .1 20A, 120V, single pole three-way switches to: CSA C22.2 No. 55 and CSA C22.2 No. 111.
- .2 Manually-operated general purpose AV switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or malamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 White toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads and or heating loads.
- .4 Switches of one manufacturer throughout project.

2.1 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R and 5-20R 125 V, 15 A and 20A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 White urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 White urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.2 COVER PLATES

-
- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
 - .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
 - .3 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
 - .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
 - .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
 - .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.3 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle

is required in one location.

- .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
- .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide fuse performance data characteristics for each fuse type and size above 100 A. Performance data to include: average melting time-current characteristics.
- .3 Shop Drawings:
 - .1 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in storage cabinet moisture free location.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.

1.3 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Six spare fuses of each type and size installed up to and including 600 A.

PART 2 - PRODUCTS

2.1 FUSES - GENERAL

- .1 Fuse type references J1, R1, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

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- .1 Class J fuses.
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .2 Class R -R fuses.
 - .1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.

2.3 FUSE STORAGE CABINET

- .1 Fuse storage cabinet, manufactured from 2.0 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00 - Common Work Results for Electrical.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
 - .1 Install rejection clips for Class R fuses.
- .3 Ensure correct fuses fitted to assigned electrical circuit.
- .4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.
- .5 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Include time-current characteristic curves for breakers with ampacity of 200 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.
- .4 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
 - .1 Production certificate of origin must be submitted to Owner's Representative for approval.
 - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
 - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Owner's Representative. Unless complying with this requirement, Owner's Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
 - .4 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
 - .3 Contractor's name and address and person responsible for project.
 - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
 - .5 Name and address of building where circuit breakers will be installed:

-
.1	Project title: Westgate Lodge.
.2	List of circuit breakers: as shown on single line diagram.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers, Circuit breakers, and ground-fault circuit-interrupters: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Circuit breakers to have minimum 22 symmetrical rms interrupting capacity rating, or as indicated on drawings.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS (DESIGN B)

- .1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 SOLID STATE TRIP BREAKERS (DESIGN D)

- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time instantaneous tripping for phase ground fault short circuit protection.
- .2 Use where indicated on the drawings.

2.5 OPTIONAL FEATURES

- .1 Include:
 - .1 Shunt trip.
 - .2 On-off locking device.
 - .3 Handle mechanism.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Install circuit breakers as indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 PAYMENT

- .1 Payment for field testing of ground fault equipment performed by Contractor or equipment manufacturer in accordance with Section 01 29 00 - Payment Procedures: Testing Laboratory Services.

1.2 REFERENCE STANDARDS

- .1 CSA International
 - .1 CAN/CSA C22.2 No.144-M91(R2006), Ground Fault Circuit Interrupters.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA PG 2.2-1999(R2009), Application Guide for Ground Fault Protection Devices for Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings.
- .4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Consultant and certificate that system as installed meets criteria specified.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144 NEMA PG 2.2.
- .2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

- .1 Single or Two pole ground fault circuit interrupter for 15 A, 120 V, 1 phase circuit c/w test and reset facilities.

2.3 GROUND FAULT PROTECTOR UNIT

- .1 Self-contained with 15 A, 120 V circuit interrupter and duplex single receptacle complete with:
 - .1 Solid state ground sensing device.
 - .2 Facility for testing and reset.
 - .3 CSA Enclosure 1, flush mounted with stainless steel face plate.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for ground fault circuit interrupters installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Pass phase conductors including neutral through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and co-ordinate with Section 01 40 00 - Quality Requirements if required.
- .2 Arrange for field testing of ground fault equipment by independent testing laboratory ground fault equipment manufacturer Contractor before commissioning service.
- .3 Demonstrate simulated ground fault tests.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials

at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
 - .2 CSA C22.2 No.39-13, Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- .1 Fusible, Non-fusible, Horsepower rated disconnect switch in CSA enclosure 3R, to CAN/CSA-C22.2 No.4 size as indicated.
- .2 Provision for padlocking in off switch position by 3 locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.
- .5 Fuseholders: to CSA C22.2 No.39relocatable and suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No.14-10, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.
- .3 Include operating information required for start-up, synchronizing and shut-down of generating units.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

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- .2 Store and protect contactors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Develop Construction Waste Management Plan related to Work of this Section.
 - .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 CONTACTORS

- .1 Contactors: to CSA C22.2 No.14.
- .2 Mechanically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
- .3 Breaker or fused switch combination contactor as indicated.
- .4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .5 Mount in CSA NEMA Enclosure 3R unless otherwise indicated.
- .6 Include following options in cover:
 - .1 Red indicating lamp.
 - .2 Stop-Start pushbutton.
 - .3 Hand-Off-Auto selector switch.
 - .4 On-Off selector switch.
- .7 Control transformer: factory wired and installed in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION

- .1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Size 4 nameplate indicating name of load controlled as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install contactors and connect power wires and auxiliary control devices.

- .2 Identify contactors with nameplates or labels indicating panel and circuit number.
- .3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by contactor installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 International Electrotechnical Commission (IEC)
 - .1 IEC 947-4-1-2002, Part 4: Electromechanical contactors and motor-starters.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province Territory, Canada.
 - .2 Provide shop drawings for each type of starter to indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout and components.
 - .4 Enclosure types.
 - .5 Wiring diagram.
 - .6 Interconnection diagrams.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit operation and maintenance data for each type and style of motor starter for incorporation into maintenance manual.
- .3 Extra Materials:
 - .1 Provide listed spare parts for each different size and type of starter.
 - .1 3 contacts, stationary.
 - .2 3 contacts, movable.
 - .3 1 contacts, auxiliary.
 - .4 1 control transformers.
 - .5 1 operating coil.
 - .6 2 fuses.
 - .7 10% indicating lamp bulbs used.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 60 00 - Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Starters: to IEC 947-4 with AC4 utilization category.

2.2 MANUAL MOTOR STARTERS

- .1 Single or Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 One or Three overload heaters, manual reset, trip indicating handle.
- .2 Accessories:
 - .1 Toggle switch: heavy duty oil tight labelled as indicated.
 - .2 Indicating light: heavy duty oil tight type and colour as indicated.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

- .1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type.
 - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
 - .3 Wiring and schematic diagram inside starter enclosure in visible location.
 - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

- .1 Pushbuttons Selector switches: heavy duty oil tight labelled as indicated.
- .2 Indicating lights: heavy duty oil tight type and Colour as indicated.
- .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.4 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 ACCESSORIES

- .1 Pushbutton: heavy duty, oil tight as required.
- .2 Selector switches: heavy duty, oil tight as required.
- .3 Indicating lights: heavy duty, oil tight, type and colour as indicated.

2.6 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.7 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.
- .3 Magnetic starter designation label, white plate, black letters, size 3 engraved as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install starters and control devices in accordance with manufacturer's

instructions.

- .2 Install and wire, starters and controls as indicated.
- .3 Ensure correct fuses installed.
- .4 Confirm motor nameplate and adjust overload device to suit.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.
- .2 Operate switches and contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

1. This section includes the following items from a single supplier:
 1. Engine Generator Set.
 2. Related Accessories as specified
2. Related Requirements
 1. It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
 2. The design is based on Kohler model KG125 as supplied by Pritchard Power Systems; Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been omitted or have been taken exception to, and a complete description of all deviations.
 3. It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
 4. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 SUBMITTALS

1. Action Submittals
 1. Product Data
 1. The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
 2. Shop Drawings

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2. Informational Submittal
 1. Certificates
 2. Test and Evaluation Reports
 3. Manufacturer's Instruction
 4. Source Quality Control Submittals
 5. Field or Site Quality Control
 6. Manufacturer's Report
 7. Special Procedure Submittal
 8. Qualification Statement
 3. Closeout Submittal
 1. Operation And Maintenance Data
 2. Warranty Documentation
 3. Record Documentation
 4. Maintenance Material Submittals
 1. Provide one (1) copies of the following documents and manuals for the engine, the alternator, and the generator set:
 1. Operation Manuals
 2. Warranty Certificate
 3. Installation Manuals
 4. Wiring Diagrams
 5. Specification Sheets

1.3 QUALITY ASSURANCE

1. Regulatory Agency
 1. The generator set shall conform to the requirements of the following codes and standards:
 1. CSA C22.2, No. 14-M91 Industrial Control Equipment.
 2. CSA-282-19
 3. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
 4. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 5. IEC8528 part 4, Control Systems for Generator Sets.
 6. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
 7. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
 8. NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
 9. NFPA 99, Essential Electrical Systems for Health Care Facilities.
 10. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

2. Qualifications

1. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.

3. Manufacturers

1. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

1.4 FIELD OR SITE CONDITIONS

1. Ambient Conditions

1. Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.
 1. Ambient Temperature: 104 °F
 2. Altitude : 500 ft
 3. Relative Humidity: 95%

2. Existing Conditions

1.5 WARRANTY

1. Manufacturer's Warranty

1. The generator set shall include a standard warranty covering one (1) year or 2000 hours, whichever occurs first, to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.
2. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCTS

2.1 EQUIPMENT

1. Equipment

1. The generator set shall be a Kohler model KG125 with a 4S13X alternator. It shall provide 156.25 kVA and 125.00 kW when operating at 120/208 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby @40C rating while operating in an ambient condition of less than or equal to 104 °F and a maximum elevation of 500 ft above sea level. The standby rating shall be available for the duration of the outage.

2. Engine

1. The minimum 6.2-liter displacement engine shall deliver a minimum of 202 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
 1. Electronic isochronous governor capable of 1.0% steady-state frequency regulation
 2. 12-volt positive-engagement solenoid shift-starting motor
 3. 130-ampere automatic battery charging alternator with a solid-state voltage regulation and negative ground polarity
 4. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
 5. Dry-type replaceable air cleaner elements for normal applications
 6. The engine shall be turbocharged and fueled by Natural Gas
 7. Operating fuel pressure for natural gas shall be between 7.0 and 11.0 inches of H2O
 8. Natural gas fuel consumption at 100% load shall not exceed 1680 cubic feet per hour when operating in standby configuration
 9. The exhaust manifold shall be dry.
 10. Exhaust flow shall not exceed 1024 cubic feet per minute at rated kW.
 11. Exhaust temp shall not exceed 1256 F at rated kW.
 12. The engine shall have a minimum of 8 cylinders in a V configuration and be liquid-cooled
2. The engine shall be EPA certified from the factory
3. The generator must accept rated load in one-step.

3. Cooling System

1. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.

4. Standard Air Cleaner

1. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

5. Battery

1. Each genset requires a BCI group 24 battery which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine

cranking cycles. Each battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 650 amps and a minimum reserve capacity of 120 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery elements must be anchor-locked with full-frame grids and tight-packed commercial plates to resist the effects of vibration. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life.

2. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

6. Controller

1. Advanced Power Management 402 (APM402) Generator Set Controller
 1. The generator set controller shall be a microprocessor-based control system that will provide automatic starting, system monitoring, and protection.
 2. The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.
2. Codes and Standards
 1. The generator set controller shall meet CSA-282-19 Table 1 and NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
 2. The controller shall meet NFPA 99 and NEC requirements.
 3. The controller shall be UL 508 recognized.
3. Applicability
 1. The controller shall be a standard offering in the manufacturer's controller product line.
 2. The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
4. Controller Buttons, Display, and Components
 1. The generator set controller shall include the following features and functions:
 1. Master Control Push Buttons – the buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:
 1. Run Mode – when in Run mode the generator set shall start.
 2. Off/Reset Mode – when in Off/Reset mode, the generator set shall not accept any remote start commands and shall be capable of resetting all faults, allowing for the restarting of the generator set after a shutdown.
 3. Auto Mode – when in Auto mode, the generator set shall be ready to accept a signal from a remote device.
 2. Emergency Stop Switch – the latch type stop switch shall be red in color with a “mushroom” type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.
 3. Alarm Horn – the horn sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the Auto mode.

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4. Push Button/Rotary Selector Dial – the dial shall be used for selection of all menus and sub-menus. Rotating the dial moves through the menus, pushing the dial selects the menu and function/features in the menu.
 5. Display – the digital display shall be alphanumeric, with 2 lines of data and approximately 24 characters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall enter a sleep mode to reduce the demand on the battery when the generator set is not running, and the rotary dial is not in use for a period of time. The generator will wake up from sleep mode when the generator set starts, or the rotary dial is in use.
 6. Fault Light – the controller shall have an annunciator fault light that glows red for faults and yellow for warnings. The warning light will also illuminate when not in Auto.
 7. Alarm Silence/Lamp Test Button – when this button is held, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not Auto or has a fault.
 8. Mini-USB Connection – the controller shall have a mini-USB connection port for a PC connection that is accessible on the front of the control panel without having to open any electrical enclosure panels on the generator. This connection shall allow a certified technician to service the generator controller using a dedicated PC program. The program shall allow for servicing of generator set parameters, faults diagnostics and viewing of controller information. The program shall allow for uploading of software and firmware as well as downloading of parameter settings and the event log.
5. Controller Engine Control Features and Functions
 1. User-programmable time delay for engine start.
 2. User-programmable time delay engine cool down.
 3. Capability to start and run at user-adjustable idle speed during warm-up for a selectable time-period until engine reaches preprogrammed temperature.
 4. The idle function including engine cooldown at idle speed.
 5. Output with adjustable timer for an ether injection starting system.
 6. Programmable cyclic cranking that can adjust on time, off time, and number of cycles.
 6. Controller Alternator Control Features and Functions
 1. Patented High-speed RMS Digital Voltage Regulation – the system shall have integral microprocessor-based voltage regulator system that provides + 0.5% voltage regulation no-load to full load with three phase sensing. A separate voltage regulator is not acceptable. The digital voltage regulator shall be applicable to single- or three-phase systems. The system shall be prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum + 10% adjustable of nominal voltage.
 2. Alternator Thermal Overload Protection – the system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
 7. Other Control Features and Functions

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1. Event Logging – the controller keeps a record of up to 1,000 events with date and time locally for warning and shutdown faults. This event log can be downloaded onto a PC through the service program.
 8. Control Monitoring Requirements
 1. The generator controller shall display and monitor the following engine and alternator functions.
 1. The following generator set functions shall be monitored:
 1. All output voltages - single phase, three phase, line to line, and line to neutral
 2. All single phase and three phase currents
 3. Output frequency
 4. kVA total and per phase
 5. kW hours
 2. Engine parameters listed below shall be monitored (engine dependent):
 1. Engine Speed
 2. Oil Pressure
 3. Coolant Temperature
 4. Battery Voltage
 5. Runtime Hours
 6. Fuel Pressure or Level
 7. Fuel Consumption Rate
 3. Operational records shall be stored in the control beginning at system startup
 1. Total Run Time Hours
 2. Total Loaded Hours
 3. Total kW Hours
 4. Number of Starts
 4. For maintenance and service purposes, the controller shall store and display on demand the information:
 1. Generator Model
 2. Generator Serial Number
 3. Controller Serial Number
 9. Generator Set Warning, Shutdown Alarm and Status
 1. The generator set shall have alarms and status indication lamps that show Non-Automatic Status, Warning, and Shutdown conditions. The controller shall indicate with a warning lamp and/or alarm, and on the digital display screen any shutdown, warning, or engine fault condition that exists in the generator set system.
 2. Conditions, as a minimum, resulting in generator shutdown (engine dependent):
 1. AC Sensing Loss
 2. Alternator Protection
 3. ECM Address Conflict
 4. ECM Communications Loss
 5. ECM DTCs
 6. Emergence Stop
 7. Overspeed
 8. Underspeed
 9. High Coolant Temperature
 10. kW Overload

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11. Locked Rotor
 12. Loss of Fuel
 13. Low Coolant Level
 14. Low Engine Oil Level
 15. Low Fuel Level
 16. Low Oil Pressure
 17. No Coolant Temperature Signal
 18. No Oil Pressure Signal
 19. Overcrank
 20. Overfrequency
 21. Underfrequency
 22. Overvoltage
 23. Undervoltage
3. Conditions, as a minimum, resulting in generator warning (generator will continue to operate) (engine dependent):
 1. AC Sensing Loss (short period of time)
 2. Battery Charger Communication Loss
 3. Battery Charger Fault
 4. Battery Fault
 5. Critical High Fuel Level
 6. High Fuel Level
 7. Low Fuel Level or Pressure
 8. Fuel Tank Leak
 9. Ground Fault
 10. High Battery Voltage
 11. Low Battery Voltage
 12. Low Cranking Voltage
 13. High Coolant Temperature
 14. Low Coolant Temperature
 15. Low Engine Oil Level
 16. Low Oil Pressure
 17. Not in Auto
 18. Speed Sensor Fault
 19. ECM DTCs
10. Inputs and Outputs
 1. Standard Dedicated User Inputs – the controller shall have dedicated inputs for:
 1. Two-Wire Input
 1. Remote Engine Start
 2. Digital Input - Fixed
 1. Auxiliary Fault (Shutdown)
 2. Remote Emergency Stop
 3. Digital Input – Programmable
 1. 3 Dry Contact
 2. Standard Dedicated User Outputs – the controller shall have dedicated outputs for:
 1. Relay Driver Output - Programmable
 1. 1 Relay
 3. Optional Configurable User Inputs and Outputs
 1. User Configurable Inputs
 1. 2 Dry Contact Digital

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2. User Configurable Relay Outputs
 1. 5 NO/NC Relays
 11. Communications
 1. CAN
 1. If the generator set engine is equipped with an ECM, the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards.
 2. Modbus®
 1. Isolated for Modbus devices
 2. Supply a Modbus to Ethernet Converter that provides one RJ45 jack for standard Ethernet 10/100 connection, and a terminal block for RS-485 connection, and is powered by 12 VDC.
 7. Generator Overcurrent and Fault Protection
 1. The generator shall be provided with a factory installed; 100% rated line circuit breaker rated at 200.00 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.
 2. The generator shall be provided with a 2nd factory installed, 80% rated line circuit breaker, , rated at 200.00 amperes that is UL489 listed for load bank testing and shall be complete with shunt trip contacts.
 3. The circuit breaker(s) shall incorporate an electronic trip device with the following characteristics:
 1. Adjustable long-time delay
 2. Adjustable short time delay
 3. Instantaneous
 4. Load side lugs shall be provided from the factory. The line circuit breaker shall include auxiliary contacts, shunt trip, undervoltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections.
 5. The shunt trip device shall be connected to trip the load bank circuit breaker in case of actual power hydro failure during the load bank testing.
 6. Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.
 8. Alternator
 1. The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby @40C. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe

nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

2. The alternator shall have a maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
3. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
4. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 435 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

9. Vibration Isolation

1. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 ACCESSORIES

1. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.
2. The generator set shall be supplied with a common failure relay to provide means of signaling fault and/or shutdown conditions.
 1. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and over speed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
 2. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
 3. Once energized the relay shall remain latched until the system is reset by the main controller switch.
3. The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging both lead-acid and ni-cad type batteries, with the following features:
 1. Automatic 3-stage float to equalization charge
 2. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations
 3. Battery charging current Ammeter and battery voltage voltmeter with 5% full-scale accuracy
 4. LED lamp for power ON indication
 5. Current limited during engine cranking, short circuit, and reverse polarity conditions
 6. Temperature compensated for ambient temperatures for -40°C to 60°C

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7. Alarm circuit board featuring alarm contacts for low battery voltage, high battery voltage, and battery charger malfunction.
 8. UL 1012 Listed
 9. CSA Certified
 4. The generator set shall be furnished with rodent guards to prevent rodent intrusion and protect internal components.
 5. The generator set shall be provided with a run relay which shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)
 6. Remote annunciator panel – The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.
 7. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust and includes the flex exhaust tube and the mounting hardware.
 8. Supply Exhaust flexible connection loose.
 9. Supply a critical grade exhaust silencer, The orientation to be coordinated with installer to fit the site specifics. The muffler pressure drop and transmission loss performance curves including center frequency to be included in the submittal to review compliance with site noise requirements as well as back pressure allowance.
 10. The Generator has to ship with factory installed 3-way dry catalyst and the generator has to be EPA certified.

2.3 SOURCE QUALITY CONTROL

1. Non-Conforming Work
 1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
 1. Design Prototype Tests. Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
 1. Maximum power (kW)
 2. Maximum motor starting (kVA) at 35% instantaneous voltage dip.
 3. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
 4. Governor speed regulation under steady-state and transient conditions.
 5. Voltage regulation and generator transient response.
 6. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
 7. Three-phase short circuit tests.
 8. Alternator cooling air flow.

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9. Torsional analysis to verify that the generator set is free of harmful torsional stresses.
 10. Endurance testing.
 2. Final Production Tests. Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
 1. Single-step load pickup
 2. Safety shutdown device testing
 3. Rated Power @ 0.8 PF
 4. Maximum power
 5. Upon request, a witness test, or a certified test record sent prior to shipment.
 3. Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and load bank testing for 4hrs at unity power factor. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 1. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
 2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
 3. Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
 4. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No.5-09, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).
 - .2 CSA C22.2 No.178.1-2007, Automatic Transfer Switches.
 - .3 CAN/CSA C60044-1-07, Instrument Transformers.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 2-1996(R2009), Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for transfer switches and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings.
 - .1 Indicate on drawings:
 - .1 Make, model and type.
 - .2 Load classification:
 - .1 Tungsten lamp load: kW.
 - .2 Ballast lamp load: kW.
 - .3 Motor load: kW.
 - .4 Restricted use: resistance and general loads, 0.8 pf or higher kW.
 - .3 Single line diagram showing controls and relays.
 - .4 Description of equipment operation including:
 - .1 Automatic starting and transfer to standby unit and back to normal power.
 - .2 Test control.
 - .3 Manual control.
 - .4 Automatic shutdown.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for transfer switches for incorporation into manual.
- .3 Detailed instructions to permit effective operation, maintenance and repair.
- .4 Technical data:
 - .1 Schematic diagram of components, controls and relays.
 - .2 Illustrated parts lists with parts catalogue numbers.
 - .3 Certified copy of factory test results.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect transfer switches from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Automatic load transfer equipment to:
 - .1 Monitor voltage on phases of normal power supply.
 - .2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below preset adjustable limits for adjustable period of time.
 - .3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.
 - .4 Transfer load from standby unit to normal power supply when normal

power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.

.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

2.2 MATERIALS

- .1 Instrument transformers: to CAN/CSA C60044-1.
- .2 Contactors: to NEMA ICS2.
- .3 Nema 1 enclosure for sprinkler proof.
- .4 Automatic Transfer Switch shall be ASCO part number J07ATSA30600R5XC or equivalent.

2.3 CONTACTOR TYPE TRANSFER EQUIPMENT

- .1 Contact Type Transfer Equipment: to CSA C22.2 No.178.1.
- .2 Two-3 pole contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, solenoid operated, with CSA type 3R enclosure.
- .3 Rated:
 - .1 ATS-1, 208V, 60Hz, 600A. 3 pole, 3 wire, solid neutral.
- .4 Main contacts: silver surfaced, protected by arc disruption means.
- .5 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel without removal of switch panel or disconnection of drive linkages and power conductors.
- .6 Auxiliary contact: gold silver plated, to initiate emergency generator start-up on failure of normal power.
- .7 Fault withstand rating: 35 kA symmetrical for 3 cycles with maximum peak value of 35 kA.
- .8 Lever to operate switch manually when switch is isolated.
- .9 Neutral bar, solid rated: 600 A for ATS-1.
- .10 Overlapping neutral contacts on contactor type transfer equipment.

2.4 CONTROLS

- .1 Selector switch No. 1 - 3 position "System Test", "Auto", "Time delay override".

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- .1 Test position - Selecting System test will start the generator and transfer load to generator, test timer is to be programmable and when done will automatically return to normal and shut generator down.
 - .2 Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.
 - .3 Engine start position - engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.
 - .2 Selector switch No. 2 for engine control with off/auto/engine start positions.
 - .1 Engine Start will start generator but not transfer the load, AUTO switch to function normally, in OFF position generator start signal will not be sent to generator.
 - .3 Control transformers: dry type with 120 V secondary to isolate control circuits from:
 - .1 Normal power supply.
 - .2 Emergency power supply.
 - .4 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A minimum:
 - .1 Voltage sensing: 3 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.
 - .2 Time delay: normal power to standby, adjustable solid state, 0 - 60 minutes in 1 second increments.
 - .3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 0 to 6 s delay.
 - .4 Time delay on retransfer from standby to normal power, adjustable 0 to 60 min in 1 second increments.
 - .5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 0 to 60 minutes in 1 second increments.
 - .6 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.
 - .5 Solid state electronic in-phase monitor.

2.5 ACCESSORIES

- .1 Ensure pilot lights indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel remote.
- .2 Plant exerciser: 168 hours timer to start standby unit once each week for selected interval but does not transfer load from normal supply transfers load to emergency supply and retransfers to normal supply on standby unit shutdown. Timer adjustable 0-168 hours in 15 minute intervals.
- .3 Auxiliary relay to provide 2 N.O. and 2 N.C. contacts for remote alarms.

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Control panel:
 - .1 For selector switch and manual switch: size 4 nameplates.
 - .2 For meters, indicating lights, minor controls: use size 2 nameplates.
 - .3 Nameplates to include: Identifier Tag, Amperage and Load Fed.

2.7 SOURCE QUALITY CONTROL

- .1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Owner's Representative.
- .2 Notify Owner's Representative 5 days minimum in advance of date of factory test.
- .3 Tests:
 - .1 Operate equipment both mechanically and electrically to ensure proper performance.
 - .2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.
 - .3 Check voltage sensing and time delay relay settings.
 - .4 Check:
 - .1 Automatic starting and transfer of load on failure of normal power.
 - .2 Retransfer of load when normal power supply resumed.
 - .3 Automatic shutdown.
 - .4 In-phase monitor operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for transfer switches installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Locate, install and connect transfer equipment as indicated.
- .2 Check relays and solid state monitors and adjust as required to ensure correct operation.
- .3 Install and connect battery and remote alarms.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Energize transfer equipment from normal power supply.
- .3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.
- .4 Set selector switch in "Manual" position and check to ensure proper performance.
- .5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.
- .6 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.
- .7 Repeat, at 1 hour intervals, four times, complete test with selector switch in each position, for each test.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .2 ASTM International Inc.
 - .1 ASTM F 1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3 CSA Group (CSA)
- .4 ICES-005-07, Radio Frequency Lighting Devices.
- .5 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval review by Consultant.
 - .3 Photometric data to include: VCP Table where applicable spacing criterion.
- .3 Samples:
 - .1 Provide samples as indicated. Install sample fixtures, design in mock-up ceiling. Include cost of mock-up in project price. Locate mock-up on site.
- .4 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 QUALITY ASSURANCE

- .1 Provide mock-ups in accordance with Section 01 45 00 - Quality Control.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts as per local regulations.

PART 2 - PRODUCTS

2.1 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation. See luminaire schedule.

2.2 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.3 LUMINAIRES

- .1 As indicated in luminaire schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling or support luminaires from ceiling grid in accordance with local inspection requirements.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect emergency lighting from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of

pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00 - Cleaning and Waste Management.

1.5 WARRANTY

- .1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, AC.
- .3 Output voltage: 6 V DC.
- .4 Operating time: 120 minutes.
- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: tungsten quartz halogen LED, 5 W, minimum 466 lumen minimum output.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: white.
- .13 Auxiliary equipment:
 - .1 Test switch.
 - .2 AC input and DC output terminal blocks inside cabinet.
 - .3 Shelf and Bracket.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V), sized in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for emergency lighting installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Owner's Representative.
 - .2 Inform Owner's Representative 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 Owner's Representative.

3.2 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

-
- .1 Protect installed products and components from damage during construction.
 - .2 Repair damage to adjacent materials caused by emergency lighting installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.2 No.141-15, Emergency Lighting Equipment.
 - .2 CSA C860-11(R2016), Performance of Internally-Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2015, Life Safety Code.
- .3 International Organization for Standardization (ISO)
 - .1 ISO 3864-1 2011, Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings.
 - .2 ISO 7010 2011, Safety colours and safety signs - Registered safety signs.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 SELF-POWERED UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cold rolled steel minimum 1.0 mm thick, satin aluminum enamel finish cast anodized extruded aluminum housing, brush aluminum finish.
- .3 Face and back plates: cast aluminum alloy die formed cold rolled steel Lexan

extruded aluminum.

- .4 Lamps: LED less than 2.5W, 120 V, 1000, 100,000 hours.
- .5 Graphics: Green pictogram and white graphical symbol and directional arrows to ISO3864-1. Dimensions to ISO 7010.
- .6 Face plate to remain captive for relamping.
- .7 Supply voltage: 120 V, ac.
- .8 Operating time: 120 minimum.
- .9 Recharge time: 12 hours
- .10 Battery: sealed, maintenance free.
- .11 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.
- .12 Solid state transfer circuit.
- .13 Signal lights: solid state, for 'AC Power ON' and 'High Charge' condition.
- .14 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit.
 - .1 Removable or hinged front panel for easy access to batteries.
- .15 Cabinet: finish: white.
- .16 Auxiliary equipment:
 - .1 Test switch.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.

-
- .3 Lock exit light circuit breaker in on position.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .2 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)
 - .1 Fire Protection Standard-10.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-06, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S526-07, Visible Signal Devices for Fire Alarm Systems, Including Accessories.
 - .3 CAN/ULC-S527-99, Standard for Control Units for Fire Alarm Systems.
 - .4 CAN/ULC-S528-05, Manual Stations for Fire Alarm Systems, Including Accessories.
 - .5 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
 - .6 CAN/ULC-S530-91(R1999), Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S531-02, Standard for Smoke Alarms.
 - .8 CAN/ULC-S537-04, Standard for the Verification of Fire Alarm Systems.
 - .9 CAN/ULC-S1001-11-REV2, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
 - .10 CAN/ULC-S561-2022, Standard for Installation and Services for Fire Signal Receiving Centres and Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for multiplex fire alarm system and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province Territory, Canada.
 - .2 Indicate on shop drawings:
 - .1 Detail assembly and internal wiring diagrams for control units. Consoles Auxiliary cabinets.
 - .2 Overall system riser wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details for devices.
 - .4 Details and performance specifications for control, annunciation

and peripherals with item by item cross reference to specification for compliance.

.5 Step-by-step operating sequence, cross referenced to logic flow diagram.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan Waste Reduction Workplan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for fire alarm system for incorporation into manual.

.3 Include:

.1 Instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data - illustrated parts lists with parts catalogue numbers.

.3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

.4 List of recommended spare parts for system.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of

pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- .1 Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.
- .2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general two-stage alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signaling to monitoring agency fire department.
- .3 Zoned, non-coded single stage .
- .4 Modular in design to allow for future expansion.
- .5 Operation of system shall not require personnel with special computer skills.
- .6 System to include:
 - .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signaling.
 - .2 Data Gathering Panels/Transponders with stand-alone capabilities.
 - .3 Power supplies.
 - .4 Initiating/input circuits.
 - .5 Output circuits.
 - .6 Auxiliary circuits.
 - .7 Wiring.
 - .8 Manual and automatic initiating devices.
 - .9 Audible and visual signaling devices.
 - .10 End-of-line resistors.
 - .11 Local and Remote annunciators displays.
 - .12 Printer Event log memory chip.
 - .13 Historic event recorder.
 - .14 Y2K compliancy.
- .7 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .8 Power supply: to CAN/ULC-S524.
- .9 Audible signal devices: to CAN/ULC-S524.
- .10 Visual signal devices: to CAN/ULC-S526.

- .11 Control unit: to CAN/ULC-S527.
- .12 Manual pull stations: to CAN/ULC-S528.
- .13 Thermal detectors: to CAN/ULC-S530.
- .14 Smoke detectors: to CAN/ULC-S529.
- .15 Smoke alarms: to CAN/ULC-S531.
- .16 Regulatory Requirements:
 - .1 System components: listed by ULC and comply with applicable provisions of OBC Provincial Building Code, and meet requirements of local authority having jurisdiction.

2.2 SYSTEM OPERATION: SINGLE STAGE - SIGNALS ONLY

- .1 Actuation of any alarm initiating device to:
 - .1 Cause electronic latch to lock-in alarm state at central control unit and data gathering panel/transponder.
 - .2 Indicate zone of alarm at central control unit and remote annunciator display.
 - .3 Cause audible signaling devices to sound continuously throughout building and at central control unit.
 - .4 Transmit signal to fire department via master fire alarm box central station.
 - .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
 - .6 Cause fire doors and smoke control doors, if normally held open, to close automatically.
 - .7 Cause elevators to return to floor of egress, or to alternate floor, as required.
- .2 Acknowledging alarm: indicated at central control unit.
- .3 Ensure that it is possible to silence signals by "alarm silence" switch at control unit, after 60 seconds period of operation.
- .4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .5 Actuation of supervisory devices to:
 - .1 Cause electronic latch to lock-in supervisory state at central control unit and data gathering panel/transponder.
 - .2 Indicate respective supervisory zone at central control unit and at remote annunciator display.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.

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- .6 Resetting alarm supervisory device not to return system indications/functions back to normal until control unit has been reset.
 - .7 Trouble on system to:
 - .1 Indicate circuit in trouble at central control unit.
 - .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
 - .8 Trouble on system: suppressed during course of alarm.
 - .9 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 CONTROL PANEL

- .1 Central control unit (CCU).
 - .1 Suitable for DCLA communication style: to CAN/ULC-S524.
 - .2 Features specified are minimum requirements for microprocessor-based system with digital data control and digital multiplexing techniques for data transmission.
 - .3 Minimum capacity of 250 addressable monitoring and 250 addressable control/signal points. Points may be divided between 2 communication channels in distributed system, each channel operating independently of other. Faults on one communication channel not to affect operation of other channel.
 - .4 System to provide for priority reporting levels, with fire alarm points assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
 - .5 Integral power supply, battery charger and standby batteries.
 - .6 Basic life safety software: retained in non volatile Erasable Programmable Read-Only-Memory (EPROM). Extra memory chips: easily field-installed. Random-Access-Memory (RAM) chips in panel to facilitate password-protected field editing of simple software functions (i.e. zone labels, priorities) and changing of system operation software.
 - .7 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
 - .8 Communication between CCU and remote DGP's/TPR's to be supervised, DCLA. Should communications fail between CCU and remote units, audible and visual trouble to be indicated at CCU. Data communication to be binary DC, baseband, time-division multiplex, half-duplex. Each data channel: capable of communicating up to distance of 3,000 m.
 - .1 Communication between nodes in networked system to be supervised, DCLA. Should communications fail between any 2 nodes, other nodes on loop to continue to communicate with each other and programmed functions on communicating nodes to continue operating.
 - .9 Support up to 2 46 RS-232-C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.

- .10 Equipped with software routines to provide Event-Initiated-Programs (EIP); change is status of one or more monitor points, may be programmed to operate any or all of system's control points.
- .11 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .12 Software to operate variable sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.

2.4 POWER SUPPLIES

- .1 120 V, 60 Hz as primary source of power for system.
- .2 Voltage regulated, current limited distributed system power.
- .3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.
- .4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.
- .5 During normal operating conditions fault in battery charging circuit, short or open in battery leads to activate common trouble sequence and standby power trouble indicator.
- .6 Standby batteries: sealed, maintenance free.
- .7 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

2.5 INITIATING/INPUT CIRCUITS

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLA configuration to central control unit DGP's/transponders.
- .2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
- .4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB DCLA configuration to central control unit DGP's/transponders.
- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.6 ALARM OUTPUT CIRCUITS

- .1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit DGP's/transponders.
 - .1 Signal circuits' operation to follow system programming; capable of sounding horns continuously at 20 spm. Each signal circuit: rated at 2 A, 24 VDC; fuse-protected from overloading/overcurrent.
 - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.7 AUXILIARY CIRCUITS

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm and or supervisory trouble on system to cause operation of programmed auxiliary output circuits.
- .4 2 sets of separate contacts for elevator capture to main floor of egress and to alternate floor of egress.
- .5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .6 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system.
 - .1 Timing circuit: controlled by CCU.
- .7 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

2.8 WIRING

- .1 Twisted copper conductors: rated 120 300 600 V.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.
- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.9 MANUAL ALARM STATIONS

- .1 Addressable manual pull station.
 - .1 Pull lever, break glass rod, semi-flush wall mounted type, single action, single stage, electronics to communicate station's status to addressable

module/transponder over 2 wires and to supply power to station. Station address to be set on station in field.

2.10 AUTOMATIC ALARM INITIATING DEVICES

- .1 Heat detectors, fixed temperature, non- restorable, rated 57 88 degrees C.
- .2 Thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57 88 degrees C, rate of rise 8.3 degrees C per minute.
- .3 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57 88 degrees C, rate of rise 8.3 degrees C per minute.
 - .1 Electronics to communicate detector's status to addressable module/transponder.
 - .2 Detector address to be set on detector base head in field.
- .4 Smoke detector: ionization photo-electric type air duct type with sampling tubes with protective housing.
 - .1 Twistlock Plug-in type with fixed base.
 - .2 Wire-in base assembly with integral red alarm LED, and terminals for remote relay alarm LED.
- .5 Addressable smoke detector.
 - .1 Photo-electric type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector base head in field.
- .6 Addressable variable-sensitivity smoke detectors.
 - .1 Photo-electric type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector base head in field.
 - .4 Sensitivity settings: 3 7 settings, determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
 - .5 Ability to annunciate minimum of 2 levels of detector contamination automatically with trouble condition at control panel.

2.11 AUDIBLE SIGNAL DEVICES

- .1 Horns: 90 db, weatherproof mounting, 24 V dc.
- .2 Mini-horns: 90 db, surface flush mounting, red beige colour, 24 V dc.
- .3 Audible signal devices in sleeping rooms shall emit a low frequency signal as per sentence 3.2.4.18 (6) of the OBC. The low frequency signal shall be in the

range of 470 Hz to 570 Hz.

2.12 VISUAL ALARM SIGNAL DEVICES

- .1 Strobe type: flashing , , 24 V dc.
- .2 Designed for surface mounting on ceiling or walls as indicated.

2.13 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signaling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.14 REMOTE ANNUNCIATORS

- .1 LED remote alphanumeric type, with designation cards to indicate zones.
- .2 Display:
 - .1 Alarms and troubles for alarm initiating circuits.
 - .2 Supervisory alarms and troubles common supervisory alarm for supervisory initiating circuits.
 - .3 Common system trouble.
- .3 Trouble buzzer:
 - .1 Acknowledging trouble at main panel to silence trouble buzzers in system.
- .4 Supervised, with LED test button and alarm trouble acknowledge button.
- .5 Minimum wiring configuration with main panel and other remote annunciators.

2.15 GRAPHIC DISPLAY

- .1 Passive type.

2.16 AS-BUILT RISER DIAGRAM

- .1 Fire alarm system riser diagram: in glazed frame on black lamincoid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm.

2.17 ANCILLARY DEVICES

- .1 Remote relay unit to initiate fan shutdown.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for fire alarm installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524 and TB Fire Protection Standard.
- .2 Install central control unit and connect to ac power supply, ac dc standby power.
- .3 Install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Mount detectors more than 1 m from air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .5 Connect alarm circuits to main control panel.
- .6 Install signal bells chimes horns and visual signal devices and connect to signaling circuits.
- .7 Connect signaling circuits to main control panel.
- .8 Install end-of-line devices at end of alarm and signaling circuits.
- .9 Install remote annunciator panels and connect to annunciator circuit wiring.
- .10 Install door releasing devices.
- .11 Install remote relay units to control fan shut down.
- .12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .13 Room detection system.
 - .1 Install detectors. Make necessary connections between room detection

-
- panel and main fire alarm panel.
 - .2 Locate and install audible signals visual alarms.
 - .3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.
 - .14 Connect fire suppression systems to control panel.
 - .15 Splices are not permitted.
 - .16 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
 - .17 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
 - .18 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system transmit alarm to control panel and actuate first stage alarm general alarm ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of systems.
 - .4 Addressable circuits system style DCLA:
 - .1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .5 Addressable circuits system style DCLB:
 - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLB addressable links for capability

of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

- .3 Provide final PROM program re-burn for system Consultant incorporating program changes made during construction.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Place materials defined as hazardous or toxic waste in designated containers.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by fire alarm system installation.

3.6 CLOSEOUT ACTIVITIES

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.8 INTEGRATED SYSTEMS TESTING

- .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" to verify that the systems have been properly integrated. Testing shall be completed by a Professional Engineer Licensed in the province of Ontario and certified by ULC for completing this testing. The electrical contractor shall include the cost of the engineer and the cost for coordinating the various trades that will be required for this testing including the fire protection contractor, elevator contractor and mechanical

contractor. Electrical contractor shall coordinate with the S1001 engineer to determine which trades are required on site and coordinate also with the general contractor to include the cost for these trades to participate in this testing. An integrated systems testing plan shall be submitted for review and approval.

END OF SECTION

1 General

1.1 GENERAL REQUIREMENTS

- .1 Division 1, General Requirements, shall apply as if repeated here.

1.2 DESCRIPTION

- .1 The Work described in this Section includes the supply of all labour, materials, tools, services and incidentals to install Work as detailed and where shown on Drawings.

1.3 QUALITY ASSURANCE

- .1 Workmanship: Carry out compaction tests on compacted fill to ASTM D698 for Standard Proctor Dry Density on the basis of 1 test for every 50 square metres in general fill area and 1 test in every 5 m in trenches. Pay all testing costs as included in the testing allowance.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Stockpile existing top soil or fill materials in locations designated by the Owner.

1.5 SITE CONDITIONS

- .1 Cultural heritage resources: If Cultural Heritage Resources (such as archaeological sites, artifacts, building and structural remains, and/or human burials) are encountered during performance of Work, contact Consultant immediately and suspend Work in immediate area until assessment has been completed by Ministry of Culture, Tourism and Recreation.

1.6 WARRANTY

- .1 Submit standard warranty for granular work in accordance with the Conditions of the Contract for one (1) year and covering the following:
- .1 Repair of any granular base showing defects due to materials or workmanship from date of take-over.

2 Products

2.1 MATERIALS

- .1 General fill material: clean, free from debris organic matter and other deleterious material.
- .2 Granular fill material: imported granular fill, type as called for on drawings and conforming to OPSS 1004 and OPSS 1010 as applicable.
- .3 Granular sub-base and base: Granular A and B, conforming to OPSS 1010. Existing granular base may be reused if not contaminated and it meets the approval of the Consultant.

3 Execution

3.1 SHORING AND BRACING

- .1 Shore and brace all excavation sufficiently to prevent caving in and to support existing structures, road or services.
- .2 Ensure shoring is in accordance with local municipal and provincial regulations and obtain all necessary permits.
- .3 Erect warning signs and protective barriers in accordance with local municipal and provincial regulations and/or as required by the Consultant.
- .4 Make good any damage and be liable for any injury resulting from inadequate shoring, bracing or protective barriers and warning signs.

3.2 SITE DEMOLITION, SITE CLEARING AND REMOVALS

- .1 Clear the site of all rubbish, rocks, boulders, tree stumps - noted and not noted, and all other debris. Remove and dispose of debris off site. In areas that are to be lowered or have the grade raised more than 100 mm, remove all shrub growth.
- .2 Cut down dead trees and trees to be removed. Remove stumps to a depth of 300 mm below proposed finished grade. Remove and dispose of all wood and chips off site, fill hole with topsoil, and place new sod.
- .3 Excavate to remove all existing paving where shown on the drawings and dispose of material off the site.
- .4 Remove material without damaging adjacent pavements to remain. Make clean, sharp saw cut before starting removal work. Be responsible for making good damaged surfaces.
- .5 Remove other structures, materials and surfaces as indicated on drawings.
- .6 Trees to be relocated shall be done so by an approved large tree mover.
- .7 Temporarily remove existing fences as required to facilitate new construction work. Re-install at the completion of construction to as new condition. The site will be maintained in a safe condition at all times to the satisfaction of the Consultant. Erect Barriers and Warning signs as required.

3.3 STRIPPING AND GRADING

- .1 Where necessary strip topsoil and stockpile as directed.
- .2 Cut back areas that are to be lowered to the grades shown on the drawings, allowing for the replacement of topsoil. Obtain the written approval of the Owner before using excavated material as fill. Prior to placing fill material scarify the existing grade to a minimum depth of 75 mm.
- .3 Where existing grade is to be raised, supply and place fill material approved by the Owner in progressive 225 mm lifts (loose material depth). Compact each lift to 98% Standard Proctor Dry Density before placing subsequent layers..

- .4 Provide grade parallel to finished grade, allowing for the placing of the specified surface material and base and to a tolerance of plus or minus 50 mm and compacted to 98% Standard Proctor Dry Density under areas to be paved and 85% Standard Proctor Dry Density under areas to be sodded or planted.

3.4 SITE EXCAVATION

- .1 Stake out the locations of all items requiring excavation and obtain the approval of the Owner before commencing work.
- .2 Dispose of excavated material off site unless it is approved for use a fill material or backfilling material by the Owner.
- .3 Grade around excavations to prevent surface water runoff into excavated area. Erect barriers and warning signs as required by the Consultant.
- .4 Should bottoms of excavation be damaged by weather or should softening occur, remove softened material and replace with approved granular fill material at no extra cost.
- .5 Excavate to the elevations and dimensions indicated or required for construction work. All depths detailed are shown depth after compaction.
- .6 Obtain the approval of the Owner of all excavations before proceeding with construction activities.
- .7 Fill extra excavations with concrete or as directed.
- .8 Correct unauthorised excavations at no extra cost.
- .9 Do not disturb soil within the branch spread of tree or shrubs that are to remain. If excavating through roots, excavate by hand and cut all roots with a sharp hand saw or chain saw. Seal cuts with approved tree wound dressing. Where excavation results in the loss of more than 20% of the root system of any tree, have the plant material top pruned by a qualified arboriculturalist to compensate for root loss. Pay all costs incurred.
- .10 Excavate post holes with a power auger or hand auger as required, to the depth and diameter indicated. Ensure adequate allowance is provided in the bid for hand digging of holes as no extra to the contract will be allowed.
- .11 Shape the bottom of excavations for area that include subsurface drainage to drain to the catch basin at 2% minimum slope.

3.5 BACKFILLING

- .1 Do not commence backfilling until work has been approved by the Owner.
- .2 Ensure areas to be backfilled are free of debris, snow, ice, water or frozen ground.
- .3 Place specified fill materials in continuous horizontal layers not exceeding 225 mm loose depth and compact to 98% Standard Proctor Dry Density.
- .4 Backfill simultaneously on both sides of landscape walls to equalize soil pressure.

- .5 Make good any settlement or subsequent damage to adjacent structures or to other work under this contract caused by improper or inadequate compaction.

3.6 PLANTING PIT EXCAVATION

- .1 Excavate planting pits and beds to the following depths unless specified otherwise on the drawings:
 - .1 Deciduous and Coniferous Trees: 900 mm minimum and 150 mm greater than the depth of the rootball and 150 mm on all sides, greater than the rootball diameter.
 - .2 Shrubs and evergreens: the greater of either 600 mm minimum planting bed depth or 150 mm greater than the depth of the rootball.
 - .3 Ground cover and perennials: 300 mm minimum planting bed depth.

3.7 GRANULAR BASE MATERIALS

- .1 Granular base shall not be placed until the finished sub- base surface is inspected and approved by the Consultant.
- .2 Placing of granular material:
 - .1 Material shall be placed only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.
 - .2 Material shall be placed using methods which do not lead to segregation or degradation of aggregate.
 - .3 Material shall be placed in uniform layers not exceeding 200mm when compacted or to such other depth as approved by the Consultant.
 - .4 Each layer shall be shaped to a smooth contour and compacted to the specified density before the succeeding layer is placed.
 - .5 Any portion of a layer in which material becomes segregated during spreading shall be removed and replaced.
- .3 Granular material:
 - .1 All granular material specified to be used in this section shall comply and be laid in accordance with the requirements of OPSS standards.
 - .2 Granular A and Granular B shall be placed and shaped to proper grade and contour, and compacted in 100 mm layers to 98 % Standard Proctor dry density.
 - .3 After the required thickness has been attained, the surface shall be shaped and compacted by additional rolling as necessary to produce the required contour of the surface. The tolerance in cross sections or longitudinal profile shall not be more than plus or minus 10 mm.
 - .4 After the required thickness has been attained, the surface shall be shaped and compacted by additional rolling as necessary to produce the required contour of the surface. The tolerance in cross sections or longitudinal profile shall not be more than plus or minus 10 mm.

- .5 The material shall be sprinkled with water during rolling, tamping and blading when and if directed by the Consultant either to aid compaction or to reduce dust nuisance or both.
- .4 Compaction of granular base materials:
 - .1 The density shall not be less than 98% Standard Proctor dry density.
 - .2 The Contractor shall shape and roll alternately to obtain a smooth, even and uniformly compacted base.
 - .3 The Contractor shall apply water as necessary during compacting to obtain the specified density and if material is excessively moist, aerate by scarifying with suitable equipment until the moisture content is corrected.
 - .4 In areas not accessible to rolling equipment, the Contractor shall compact to specified density with approved mechanical tampers.
- .5 Tolerances:
 - .1 Finished base surface shall be within 10mm of established grade but not uniformly high or low.
 - .2 Surface irregularities shall be corrected by loosening and adding or removing material until surface is within specified tolerance.
- .6 Finished base shall be maintained in a condition conforming to this section until the succeeding material is applied or until acceptance.

3.8 INSPECTION AND TESTING

- .1 Coordinate compaction testing for all granular bases. Suspend construction at direction of Consultant until results are available. Should any testing results be sub-standard and not in accordance with specifications, correct all deficiencies and re-test areas corrected at Contractor's expense.
- .2 All testing shall be conducted by a qualified and reputable geo-technical engineering firm. Testing shall be paid by the testing allowance.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, products, equipment, and services necessary for the supply, placement, grading, and compaction of Granular Sub-Base in accordance with the Contract Documents.

1.2 REFERENCES

- .1 Contract Drawings
- .2 Special Provisions – Revisions to Standard Specifications – Revision to OPSS.MUNI 102
- .3 Special Provisions – Revisions to Standard Specifications – Revision to OPSS.MUNI 314
- .4 Special Provisions – Revisions to Standard Specifications – Revision to OPSS.MUNI 1010
- .5 OPSS.MUNI 102, 314, 506, 1001, and 1010 (including Appendices 1010-D and 1010-E)
- .6 OPSD 200.010

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's product data in accordance with Section 01 10 10 where applicable, including physical properties and installation recommendations for granular materials if required by the Engineer.
- .2 Certificates:
 - .1 Submit material certification confirming compliance with OPSS-314 and OPSS-1010 requirements.

1.4 QUALITY ASSURANCE

- .1 Installer qualifications: Perform work using personnel experienced in granular placement and compaction in accordance with OPSS requirements.
- .2 Granular materials shall meet the gradation, physical property, and quality requirements of OPSS-314 and OPSS-1010.
- .3 All granular materials shall be compacted to 100% Standard Proctor Maximum Dry Density.

1.5 SITE CONDITIONS

- .1 Ensure subgrade is approved by the Engineer prior to placement of granular materials.
- .2 Do not place granular materials during unsuitable weather conditions that prevent proper compaction or moisture control.
- .3 Water required for dust control and compaction shall be supplied by the Contractor and is included in the unit price in accordance with OPSS.MUNI 506.
- .4 Contractor shall not be entitled to payments for delays or downtime while awaiting geotechnical testing results.
- .5 Contractor shall handle, transport, and place spoils generated from extra-depth excavation in a location designated by the Engineer and leave the area in acceptable condition.

2 Products

2.1 MATERIALS

- .1 Granular materials shall conform to OPSS-314 and OPSS-1010.
- .2 Granular material for this site shall be Granular 'A' and Granular 'B' Type I.**
- .3 Contractor shall add stone or adjust gradation as necessary to meet specification requirements at no additional cost to the Owner.
- .4 All materials shall be free of organic matter, debris, or other deleterious substances.

2.2 OPSS.MUNI 1010- ADDITIONAL REQUIREMENTS

Revisions to Subsection 1010.08.01

- .1 Stockpile samples shall be tested by the Contract Administrator or their designated agent at least seven days prior to expected delivery of materials to the site.
- .2 If stockpile samples fail required tests, two additional samples shall be taken from the same stockpile. Both samples must pass before the material may be used.
- .3 Any further testing beyond this shall be at the Contractor's expense.
- .4 The Contractor shall only supply granular materials from pre-approved sources and stockpiles.
- .5 Unapproved materials delivered to the site shall be immediately removed at the Contractor's expense.
- .6 Passing initial stockpile tests does not constitute final acceptance. Final acceptance is based solely on testing of delivered materials.
- .7 If backfill material is not virgin material from a license aggregate pit or quarry, it must be assessed and managed in accordance with O.Reg. 406/19.

Revisions to Subsection 1010.08.03 – Duplicate Samples

- .1 Both duplicate samples shall be given to the Contract Administrator.
- .2 One sample shall be used for QA testing.
- .3 The second sample shall be reserved for referee testing if invoked under Subsection 1010.08.06.

Revisions to table 1 of OPSS.MUNI 1010

- .1 Note 3 is deleted and replaced with the following:
 - .1 Granular A, B Type I (Modified), B Type III, or M shall not contain any crushed glass or ceramic material.
 - .2 Granular A, B Type I (Modified), B Type II, B Type III, M, O, S, and SSM shall not contain any deleterious material (wood, clay, brick, clay tile, gypsum, gypsum wall board, plaster).

Revisions to Appendix 1010-D – Aggregate Test Data Form

- .1 Note 3 is deleted and replaced with the following:
 - .1 Granular A, B Type I (Modified), B Type III, or M shall not contain any crushed glass or ceramic material.
 - .2 Granular A, B Type I (Modified), B Type II, B Type III, M, O, S, and SSM shall not contain any deleterious material (wood, clay brick, clay tile, gypsum, gypsum wall board, plaster).

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of subgrade and previously installed work upon which this Section depends. Report defects to the Engineer.
- .2 Commencement of granular placement shall constitute acceptance of existing conditions.
- .3 Ensure subgrade is at proper elevation and cross-fall prior to placement of granular materials.

3.2 **PREPARATION**

- .1 Prepare subgrade in accordance with OPSS.MUNI 206 and as directed by the Engineer.
- .2 Ensure subgrade is uniformly compacted and proof-rolled prior to granular placement.

3.3 **INSTALLATION**

- .1 Place granular sub-base materials to the lines, grades, and cross sections shown on the Contract Drawings.
- .2 Spread granular materials in uniform layers not exceeding the maximum loose thickness permitted by OPSS-314.
- .3 Compact each layer to 100% Standard Proctor Density.
- .4 Add water as required for compaction and dust control; cost included in unit price.
- .5 Contractor shall perform all grading required to meet QA grade checks at no additional cost to the Owner.
- .6 Contractor shall not be entitled to additional payment for replacement of failed or non-conforming granular material.

3.4

CLEAN-UP

- .1 Clean, repair, or replace surfaces soiled or damaged in connection with the work of this Section as directed by the Engineer.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Remove surplus granular material and leave the site in a condition acceptable to the Engineer.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, products, equipment, and services necessary for the supply, placement, testing, and quality control of hot mix asphalt in accordance with the Contract Documents.

- .2 **BASE ASPHALT WILL BE PLACED IN THE YEAR 2026, SURFACE ASPHALT WILL BE PLACED IN THE YEAR 2028.**

1.2 REFERENCES

- .1 Contract Documents
.2 OPSS 1101
.3 OPSS 1150
.4 OPSS 310
.5 OPSS.MUNI 102

1.3 SUBMITTALS

- .1 Product Test Reports:
.1 Submit manufacturer's product data and test reports in accordance with Section 01 10 10 for each Product indicating:
.1 Submit AASHTO PP6 test reports for PGAC at least three weeks prior to paving.
.2 Submit modified asphalt cement test reports (if applicable) at least three weeks prior to paving.
.3 Submit 5 point Marshall mix designs for each asphalt mix at least three weeks prior to paving.
.2 Certificates:
.1 Submit certification of PGAC source from an MTO-designated supplier.
.2 Submit technical letter confirming compatibility of PGAC or modified asphalt cement with any liquid anti-stripping additives.

1.4 QUALITY ASSURANCE

- .1 Provide PGAC QA samples for every 500 tonnes of hot mix (minimum 1L per grade).
.2 Daily performance testing from a CCIL-certified laboratory is required for all asphalt produced.
.3 Where QC and QA results vary, referee testing shall be initiated; costs shall be borne by the party whose results do not match the referee results.
.4 The Engineer may refuse asphalt from a supplier who fails to consistently meet specifications.
.5 Steel slag and blast furnace slag are not permitted.
.6 RAP permitted up to 15% in base (binder) asphalt only.

1.5 **SITE CONDITIONS**

- .1 Ensure asphalt is clean prior to placement of subsequent lifts; no additional payment will be made for cleaning and shall be part of the unit price.
- .2 The Contractor shall not pave on soaked/wet granular or road base. Wet is considered by excess moisture as determined by the Geotechnical Engineer. The Contractor is responsible to coordinate paving based on favourable weather conditions.

2 Products

2.1 **MATERIALS**

- .1 Hot mix asphalt shall conform to OPSS 310 and OPSS 1150.
- .2 Asphalt Cement Content shall be:
 - HL-3: 5.0% to 7.0%
 - HL-4: 5.0% to 7.0%
 - HL-8: 4.7% to 6.5%
- .3 Unit price shall include supply of asphalt cement
Performance Graded Asphalt Cement (PGAC)
- .4 PGAC shall comply with AASHTO MP1 and PP6 and the MTO Non-Standard Special Provision Amendment to OPSS 1101.
- .5 PGAC shall be homogenous, free of water and contamination, and shall not foam when heated.
- .6 PGAC shall be sourced from an MTO-designated supplier (DSM).
Modified Asphalt Cement
- .7 Where specified, modified asphalt cement requirements shall be provided by special provision.
- .8 Submit modified asphalt cement test reports three weeks prior to paving.
- .9 Provide technical letter confirming compatibility with liquid anti-stripping additives.
Asphalt Mix Design
- .10 Contractor is responsible for mix design, paving, and mix designation by a CCIL-certified laboratory.
- .11 Submit 5 point Marshall mix design for each asphalt type three weeks prior to paving.
- .12 Daily CCIL-certified performance tests required:
 - 1. Extraction tests (corrected for fines loss)
 - 2. Marshall Stability
 - 3. Flow
 - 4. Air Voids (S.D.)
 - 5. Voids in mineral aggregate
 - 6. Gradation analysis
- .13 Minimum asphalt cement content for surface mixes: 5.0%.
- .14 Minimum Marshall Stability for HL-3 and HL-1: 10,500 N at 60°C.
- .15 Deviation tolerances must comply with OPSS 1150.07.01-1150.07.04.
- .16 Field samples must be submitted within one day of placement.
- .17 Plant production shall stop immediately if results do not meet specifications.

Stripping Resistance

- .18 Mix design must address stripping resistance and include test results per MTO Laboratory Manual.
- .19 Applicable Tests:
 - 1. LS-283 – Resistance to Stripping (Immersion Marshall)
 - 2. LS-601 – Finer than 75µm Sieve by Washing

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends.
- .2 Confirm proposed asphalt mix is acceptable relative to geotechnical recommendations.
- .3 Ensure substrate is clean and prepared prior to paving.

3.2 **PREPARATION**

- .1 Apply tack coat to all abutting edges of existing pavement using a mechanical, pump driven heated spray wand, and between subsequent lifts, including between HL8 base asphalt and HL3 or HL4 surface asphalt, after cleaning HL8 base asphalt.
- .2 Hand placement of tack coat is not acceptable.
- .3 Clean roadway using mechanical sweeping equipment prior to placement of subsequent lifts, including between HL8 base asphalt and HL3 or HL4 surface asphalt.

3.3 **INSTALLATION**

- .1 **HL8 base asphalt is to be over-paved behind curb and shall be included in the unit rate for this item.**
- .2 Place asphalt using machines with a minimum spreader width of 3.5m.
- .3 Only track type spreaders may be used on granular base.
- .4 Ensure crown and crossfall match Contract Drawings; hand placing including in unit price.
- .5 Contractor shall place asphalt as required by the Engineer; no extra payment for staged or discontinuous paving operations.

Rolling and Compaction

- .6 Initial breakdown rolling: steel tandem or three wheeler roller, minimum 10 tonnes.
- .7 Intermediate rolling: pneumatic tired roller, minimum 18 tonnes, tire pressure 480-620 kPa.
- .8 Finish rolling: steel tandem roller, minimum 9 tonnes.
- .9 All tires shall be smooth and within 35 kPa of required pressure.
- .10 Vibratory rollers may be used for breakdown but do not replace the required finish roller.
- .11 The Contractor shall take preventative measures to prevent asphalt from falling into the structures by temporarily plugging lifting holes and removing after. Any asphalt found in maintenance holes or catch basins shall be cleaned at the expense of the Contractor.
- .12 Any asphalt packed onto lids or excess asphalt spoils left in gutters, shall be cleaned and removed offsite at the Contractor's expense.

3.4 **CLEAN-UP**

- .1 Clean, repair, or replace surfaces soiled or damaged during work of this Section.
- .2 Replace finishes or materials that cannot be restored to the satisfaction of the Engineer.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, materials, equipment, and services necessary for the construction of concrete curb and gutter, including curb terminations, sidewalk keys, granular base, and all associated work in accordance with the Contract Documents.

- .2 **CONCRETE WORKS ARE ANTICIPATED TO COMMENCE IN THE YEAR 2028.**

1.2 REFERENCES

- .1 Contract Drawings
.2 OPSS.MUNI 353 – Concrete Curb and Gutter
.3 OPSS.MUNI 1350 – Concrete – Materials and Production
.4 OPSD 350.010 – Concrete Curb and Gutter, General
.5 OPSD 600.040 – Concrete Curb and Gutter, Urban
.6 OPSD 608.010 – Curb Termination at Entrances
.7 Town of Cobourg Engineering Design Criteria

1.3 SUBMITTALS

- .1 Product data:
.1 Submit manufacturer's Product data in accordance with Section 01 10 10 for all materials used in curb and gutter construction:
.1 Installation details, physical properties and detailed application and installation instructions, marked as applicable to the work.
.2 Certificates:
.1 Submit manufacturer's certification stating compliance with criteria specified and confirming product compatibility.

1.4 QUALITY ASSURANCE

- .1 Installer's qualifications: Perform work of this Section using personnel experienced in municipal curb and gutter construction.

1.5 SITE CONDITIONS

- .1 Do not place concrete during unsuitable weather conditions, including freezing temperatures, excessive precipitation, or conditions that prevent proper finishing and curing.
.2 Maintain substrate and ambient temperatures in accordance with OPSS.MUNI 1350 and manufacturer's recommendations.
.3 Ensure surfaces receiving curb and gutter are properly prepared, stable, and free of frost, standing water, or debris.

2 Products

2.1 **MATERIALS**

- .1 Concrete for curb and gutter shall meet the following requirements:
Class of Concrete – 32 MPa at 28 days.
Maximum Slump – 60mm ± 20mm
Air Content 7.0% ± 1.5%
- .2 Granular Base:
Granular A as required to achieve proper grade, support, and compaction beneath curb and gutter
- .3 Sidewalk Key:
Provide sidewalk key where sidewalk is constructed adjacent to proposed curb and gutter
- .4 Curb Termination Components:
Materials required to construct curb terminations in accordance with OPSD 608.010 and OPSD 350.010

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of subgrade, granular base, and adjacent work upon which this Section depends. Report defects to the Engineer.
- .2 Commencement of work indicates acceptance of existing conditions.
- .3 Confirm curb alignment, grades, and elevations as shown on the Contract Drawings.

3.2 **PREPARATION**

- .1 Prepare subgrade and granular base to required lines and grades.
- .2 Place, roll, and compact Granular A as required to the satisfaction of the Engineer.
- .3 Ensure formwork is secure, true to line and grade, and capable of producing required curb geometry.

3.3 **INSTALLATION**

- .1 Construct curb terminations in accordance with OPSD 608.010 and OPSD 350.010 at entrances.
- .2 Install full-depth curb and gutter through roadway in accordance with OPSD 600.040 unless otherwise noted.
- .3 Provide sidewalk key where sidewalk is adjacent to curb and gutter.
- .4 Drop curb flush to gutter at all sidewalk ramps in accordance with the “super elevated” section of OPSD 600.040 and OPSD 310.030.
- .5 Do not use the 30mm lip shown on the tangent section for sidewalk ramps.
- .6 The 30mm lip shall be used at entrances only.
- .7 Place concrete in accordance with OPSS.MUNI 353 and OPSS.MUNI 1350.
- .8 Finish curb and gutter to required cross section, ensuring brushed, uniform surfaces free of honeycombing, segregation, or defects.

- .9 Cure concrete in accordance with OPSS.MUNI 353.
- .10 Backfill only after concrete has achieved sufficient strength and curing.
- .11 Construct monolithic curb returns at new site entrance on John Street as per Town of Cobourg Design Guidelines – including removing existing curb and restoring in kind or better to properly tie in monolithic curb returns at the entrance.
- .12 Existing curb to be removed and replaced through entrance and shall be included in the unit rate for this item. Curb shall conform to the Town of Cobourg Design Guidelines and standards.
- .13 Should the curb not require removal if deemed satisfactory by the Engineer, a curb cut may be done and shall be factored into the unit rate provided.
- .14 Concrete spoils shall not be re-used under any circumstances and must be discarded off-site.
- .15 Protect concrete during curing and subsequent construction activities. Concrete surfaces marred by the public, traffic from the Contractor/Sub-Contractor forces, or animals shall be replaced by the Contractor at their own cost.
- .16 Asphalt saw-cutting, removal, and asphalt infill post curb installation shall be included within the unit rate for this item.

3.4 CLEAN-UP

- .1 Clean, repair, or replace surfaces soiled or damaged during the Work as directed by the Engineer.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Replace materials or finishes that cannot be restored to the satisfaction of the Engineer.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, materials, equipment, and services necessary for the construction of concrete sidewalks, sidewalk ramps, expansion joints, isolation joints, and associated work in accordance with the Contract Documents.

- .2 **CONCRETE WORKS ARE ANTICIPATED TO COMMENCE IN THE YEAR 2028.**

1.2 REFERENCES

- .1 Contract Drawings
- .2 OPSS.MUNI 351- Concrete Sidewalk
- .3 Revisions to Standard Specifications – Revision to OPSS.MUNI 351
- .4 OPSS.MUNI 1350 – Concrete – Materials and Production
- .5 OPSD 310.010 – Concrete Sidewalk Ramps at Intersections
- .6 OPSD 310.020 – Concrete Sidewalk, Boulevard Section
- .7 OPSD 310.030 – Concrete Sidewalk, Residential
- .8 OPSD 310.031 – Concrete Sidewalk, Industrial/Commercial
- .9 OPSD 310.033 – Concrete Sidewalk, Special Details
- .10 OPSD 310.040 – Isolation of Utility Appurtenances
- .11 OPSD 310.050 – Sidewalk at Entrances
- .12 OPSD 310.039 – Cast Iron Tactile Walking Surface Indicators (TWSIs)
- .13 Town of Cobourg Engineering Design Criteria

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's product data in accordance with Section 01 10 10 for all materials used in sidewalk construction, including:
 - .1 Installation details, physical properties, and application instructions marked as applicable to the work, including submission of concrete mix design prior to pouring.
 - .2 Submit manufacturer's installation instructions for tactile walking surface indicators.
- .2 Certificates:
 - .1 Submit manufacturer's certification stating compliance with specified criteria and confirming product compatibility.

1.4 QUALITY ASSURANCE

- .1 Installer shall have experience in municipal concrete sidewalk construction.
- .2 Concrete supplier shall be certified and capable of providing batch tickets.
- .3 All concrete shall be tested for slump, air, temperature, and strength as required by OPSS.MUNI 1350.

- .4 Sidewalk grades, slopes, and alignment shall meet design tolerances.
- .5 Defective or non-conforming concrete shall be removed and replaced at no cost to the Owner.

1.5 SITE CONDITIONS

- .1 Do not place concrete during unsuitable weather conditions, including freezing temperatures, excessive precipitation, or conditions that prevent proper finishing and curing.
- .2 Maintain substrate and ambient temperatures in accordance with OPSS.MUNI 1350 and manufacturer's recommendations.
- .3 Ensure subgrade and granular base are properly prepared, stable, and free of frost, standing water, or debris.

2 Products

2.1 MATERIALS

- .1 Concrete for sidewalks shall meet the following requirements:
Class of Concrete: 32 MPa at 28 days
Maximum Slump: 60mm $\pm$ 20mm
Air Content: 7% $\pm$ 1.5%
- .2 Expansion Joint Material: Preformed joint filler meeting OPSS.MUNI 1308 or as approved by the Contract Administrator.
- .3 Isolation Joint Material: Material suitable for isolating sidewalk from utility poles, hydrants, maintenance holes, and other appurtenances in accordance with OPSD 310.040.
- .4 Granular Base: Granular A as required to achieve proper grade, support, and compaction beneath sidewalk.
- .5 Tactile Plates: Cast Iron and conforming to OPSD 310.039. Tactile Plates shall be compatible with sidewalk ramp geometry shown on the Contract Drawings.

3 Execution

3.1 EXAMINATION

- .1 Verify condition of subgrade, granular base, and adjacent work upon which this Section depends. Report defects to the Contract Administrator.
- .2 Commencement of work indicates acceptance of existing conditions.
- .3 Confirm sidewalk alignment, grades, and elevations as shown on the Contract Drawings.

3.2 PREPARATION

- .1 Prepare subgrade and granular base to required lines and grades.
- .2 Compact granular base to required density.
- .3 Ensure formwork is secure, true to line and grade, and capable of producing required sidewalk geometry.

3.3 INSTALLATION

- .1 Place expansion joints at intervals not exceeding 6.0m, unless otherwise specified by the local municipality.
- .2 Provide expansion joints where sidewalk abuts:
 - Other Concrete Structures
 - Walks
 - Curbs
 - Utility Poles
 - Hydrants
 - Maintenance Holes
 - Any other location specified by the Contract Administrator
- .3 Isolate utility poles, hydrants, maintenance holes, and other utility structures and appurtenances in accordance with OPSD 310.040.
- .4 Construct sidewalk ramps at intersections in accordance with OPSD 310.010.
- .5 Construct sidewalk ramps wherever required by the Contract Drawings or as directed by the Contract Administrator.
- .6 Place concrete in accordance with OPSS.MUNI 351 and OPSS.MUNI 1350.
- .7 Finish sidewalk to required cross section, ensuring brushed, uniform surfaces free of defects.
- .8 Tool edges and surfaces where required by the Contract Documents.
- .9 For concrete sidewalk through the driveway entrance, concrete sidewalk must be 200mm thick throughout the whole length of the entrance as well as 2.0m beyond the back of curb on each side of the entrance, as per OPSD 310.010 and OPSD 310.050.
 - Existing sidewalk to be removed and replaced as per limits shown on SG-1 and shall be included within the unit rate for this item.
- .10 Concrete spoils may not be re-used under any circumstances and must be cleaned up and discarded off-site.
- .11 Joint Finishing Requirements (Special Provision – OPSS.MUNI 351)
 - All joints shall receive a broom finish.
 - All dummy joints and contraction joints shall be saw cut.
 - Rounded edge tooling is not permitted.
 - Cure concrete in accordance with OPSS.MUNI 351.
 - Backfill only after concrete has achieved sufficient strength and curing.
- .12 Tactile Walking Surface Indicators:
 - Install tactile walking surface indicators (TWSIs) at all sidewalk ramps where shown on the Contract Drawings or as directed by the Contract Administrator.
- .13 Tactile plates shall be installed in accordance with OPSD 310.039, including:
 - Placement location and orientation
 - Embedment depth
 - Fastening method
 - Surface alignment and slope tolerances
- .14 Ensure tactile plates are fully seated, flush, and free of rocking or movement.
- .15 Protect concrete and tactile plates during curing and subsequent construction activities. Concrete surfaces marred by the public, traffic from the Contractor/Sub-Contractor forces, or animals shall be replaced by the Contractor at their own cost.

Concrete Garbage Pad

- .1 Concrete garbage pad shall be reinforced and poured to limits as specified on Contract Drawings.
- The course aggregate for concrete pavement and base shall have a combined gradation of nominal maximum size 275mm and 19.0mm aggregate, and shall be according to OPSS 1002.
 - Concrete shall be according to OPSS 1350, with a minimum 28-day compressive strength of 32MPa, class C-2 exposure.
 - Maximum slag content shall be 25%.
 - Tie bars shall be according to OPSS 1440 and 1442.
 - Expansion joint filler shall be according to OPSS 1308.
 - Joint sealant material shall be according to OPSS 369.
 - Finishing of concrete surface shall take place while the concrete is sufficiently plastic to achieve the desired grades, elevations; and texture, according to CSA A23.1.
 - Supply and place welded wire mesh reinforcement (150mm x 150mm weave MW 18.7).
 - The unit price shall include all necessary saw cutting of the existing asphalt. Saw cut must be in a neat manner.
 - For removal, the Contractor shall include saw cutting and restoration of the disturbed asphalt. If asphalt is removed, it shall be 300mm wide.
 - The unit rate for this item shall include all removal and disposal of asphalt required to install the concrete works, as well as all restorations to the pavement surface required to leave a smooth finish.

3.4 CLEAN-UP

- .1 Clean, repair, or replace surfaces soiled or damaged during the Work as directed by the Contract Administrator.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Replace materials or finishes that cannot be restored to the satisfaction of the Contract Administrator.

END OF SECTION

Part 1 General

1.1 Description

- .1 This Section specifies the work requirements for supply and installation of standard precast unit paving.

1.2 Reference standards

- .1 American Society for Testing and Materials International, (ASTM), latest edition:
 - .1 ASTM C979, Standard Specification for Pigments for Integrally Coloured Concrete
 - .2 ASTM C 1372, Standard Specification for Segmental Retaining Wall
- .2 Canadian Standards Association (CSA)/CSA International
 - .1 CSA A231.2, Precast Concrete Pavers
 - .2 CSA A231.1, Precast concrete paving slabs
 - .3 CSA A283, Qualification code for concrete testing laboratories
 - .4 CSA A23.1, Concrete: Components and workmanship

1.3 Definitions

- .1 Definitions of the referenced ASTM and CSA sections are invoked and apply to this section.

1.4 Quality control

- .1 Installer: company or person specializing in precast concrete paver installations with 5 years documented experience.
 - .1 Paving Installation Contractor:
 - .1 Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical

1.5 Submittals

- .1 Submit samples in accordance with Section 01 40 00 – Quality Requirements and 01 33 00 Submittal Procedures.
- .2 Submit samples of the following:
 - .1 Concrete Pavers:

- .1 Samples for review: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
 - .1 Submit three (3) full size samples of unit paver, demonstrating full range of colour variation to Consultant.
- .2 Accepted samples become the standard of acceptance for the product produced.
- .3 Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
- .4 Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
- .2 Polymeric Joint Sand:
 - .1 Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.
 - .2 Samples for Review: Provide three representative samples in containers of Polymeric Joint Sand material, cured and dried, for color selection.
- .3 Base and Subbase Aggregate:
 - .1 Test results from an independent testing laboratory for sieve analysis per ASTM C 136.
- .3 Submit schedule of paving to Consultant for review prior to installation.

1.6 Requirements

- .1 Source Limitations:
 - .1 Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
 - .2 Obtain Polymeric Joint Sand from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
- .2 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 40 00 - Quality Requirements.
 - .2 Install 1.8 x 1.8 m area mock-up. Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .2 To determine surcharge of bedding layer, joint sizes, lines, laying patterns, colours and texture.
 - .3 Locate where directed.
 - .4 Allow 48 hours for inspection of mock-up before proceeding with work.
 - .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
 - .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.7 Delivery, storage & handling

- .1 In accordance with Conditions of the Contract and Division 1 Product Requirement Section.
- .2 Deliver Concrete Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
 - .1 Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
 - .2 Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 - .3 Unload pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.
- .3 Store and protect materials free from mud, dirt and other foreign materials.
- .4 Store Polymeric Joint Sand on elevated platforms, under a cover and/or in a dry location.

1.8 Project/site conditions

- .1 Environmental Requirements:
 - .1 Install Concrete Pavers only on unfrozen Base or Subbase Aggregate materials.
 - .2 Install Base or Subbase Aggregates only over unfrozen subgrade.
 - .3 Install Concrete Pavers when no heavy rain or snowfall are forecast within 24 hour
 - .4 Weather Limitations for Polymeric Jointing Sand: Install Polymeric Joint Sand only when ambient temperature is above 40°F (5°C), under dry conditions with no rain forecast for 24 hours and when surface of pavement is completely dry.

Part 2 Products

2.1 Concrete pavers

- .1 Basis-of-Design Product: the concrete paver shapes are based on:
 - .1 Style: Promenade
 - .2 As manufactured by: Unilock
 - .3 Or approved equal
- .2 Product Requirements:
 - .1 Boulevard 300 Paver
 - .1 Color/Finish: Granite
 - .2 Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 inch for length and width. Maximum height tolerance of plus or minus 1/8 inch.
 - .3 Unit sizes:
 - .1 200mm x 600mm x 100mm

- .3 Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
 - .1 Average compressive strength with 7,200 psi (50 MPa).
- .4 De-icing salts freeze-thaw durability:
 - .1 225 g/m² after 28 cycles
 - .2 500 g/m² after 49 cycles
- .5 Dimension tolerance:
 - .1 Length: -1.0 mm to +2.0 mm
 - .2 Width: -1.0 mm to +2.0 mm
 - .3 Height: ±3.0 mm
- .6 Accept only pigments in concrete pavers conforming to ASTM C 979. Note: ACI Report No. 212.3R provides guidance on the use of pigments.
- .7 Maximum allowable breakage of product is 5%.
- .8 Colour variations to homogenous pattern acceptable to Consultant.
- .9 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels.

2.2 Joint sand

- .1 Provide clean, dry, free-flowing natural sand for filling joints between precast concrete paving units.
- .2 Jointing sand shall conform to ASTM C144, except as modified herein.
- .3 Sand shall be:
 - .1 Washed and screened.
 - .2 Free of clay, shale, organic matter, salts, and deleterious materials.
 - .3 Non-staining to adjacent paving materials.
 - .4 Uniformly graded to permit complete filling of joints.
 - .5 Colour: Natural buff or grey.
 - .6 Gradation:

.4	Sieve Size	.5	Percent Passing
.6	2.36 mm	.7	100
.8	1.18 mm	.9	90 to 100
.10	600 µm	.11	60 to 90

.4	Sieve Size	.5	Percent Passing
.12	300 µm	.13	30 to 60
.14	150 µm	.15	10 to 30

2.3 Non-permable setting bed sand

.1 Provide Setting Bed Sand as follows:

- .1 Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
- .2 Do not use limestone screenings, stone dust, or sand material that does not conform to conform to the grading requirements of ASTM C 33.
- .3 Do not use mason sand or sand conforming to ASTM C 144.
- .4 Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.
- .5 Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 2 below:

TABLE 2 – SETTING BED SAND GRADATION REQUIREMENTS FOR SETTING BED SAND (NON-PERMEABLE)

ASTM C 33	
Sieve Size	Percent Passing
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075)	0 to 1

2.4 Non-permable base aggregate

- .1 Provide Base Aggregate materials in conformance with Civil Drawings.

2.5 Edge restraint

- .1 Concrete Edge Restraint (curbs, building walls, or retaining walls) as indicated on Landscape Drawings.

2.6 Cleaning compound

- .1 Clear, organic solvent designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.

Part 3 Execution

3.1 General

- .1 Confirm that surfaces on which unit pavers are to be placed are free of frost, water, and debris before placing unit pavers.
- .2 Verify all concrete curb and retaining wall work is complete prior installing precast concrete unit paving.

3.2 Examination

- .1 Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Concrete Pavers.
- .2 Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
- .3 Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
- .4 Verify that Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
- .5 Provide written density test results for soil subgrade, Base and Subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
- .6 Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.
- .7 Proceed with installation only after unsatisfactory conditions have been corrected.
- .8 Beginning of bedding sand and paver installation signifies acceptance of base and edge restraints.

3.3 Preparation

- .1 Verify that the subgrade soil is free from standing water.
- .2 Stockpile Setting Bed Sand, Joint Sand, Base and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- .3 Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Geotextile and Subbase Aggregate materials.

- .4 Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Joint, Setting Bed, Base and Subbase Aggregate materials contaminated with sediment with clean materials.
- .5 Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Subbase Aggregate construction.
- .6 Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.
- .7 Compact soil subgrade uniformly to at least 98 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D 1557 for vehicular areas. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.
- .8 Backfill all service trenches within the pavement area to the sub-grade level with approved material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D 698.
- .9 Trim the subgrade to within 0 to ½ in. (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.
- .10 Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.
- .11 Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected and approved by the Architect/Engineer.

3.4 Installation

- .1 Edge restraints
 - .1 Provide edge restraints as indicated.
 - .1 Provide concrete edge restraint along the perimeter of all paving as specified in Landscape Drawings. Install the face of the concrete edge restraint, where it abuts pavers vertical down to the subbase.
- .2 Base and subbase aggregate
 - .1 Provide the Subbase Aggregate in uniform lifts not exceeding 6 in., (150 mm) loose thickness and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.
 - .2 Compact the Subbase Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
 - .3 Tolerance: Do not exceed the specified surface grade of the compacted Subbase Aggregate material more than ±3/4 in. (20 mm) over a 10 ft. (3 m) long straightedge laid in any direction.

- .4 Provide the Base Aggregate material in uniform lifts not exceeding 6 in. (150 mm) over the compacted Subbase Aggregate (or Subgrade) material and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.
- .5 Compact the Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
- .6 Tolerance: Do not exceed the specified surface grade of the compacted Base Aggregate material more than $\pm 3/8$ in. (10 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
- .7 Compact and grade the upper surface of the base sufficiently to prevent infiltration of the bedding sand into the base both during construction and throughout its service life. Blend segregated areas of the granular base by the application of crushed fines that have been watered and compacted into the surface.
- .3 Setting bed sand
 - .1 Provide, spread and screed Setting Bed Sand evenly over the compacted Base Aggregate course.
 - .1 Protect screeded Setting Bed Sand from being disturbed by either pedestrian or vehicular traffic.
 - .2 Screed only the area which can be covered by pavers in one day.
 - .3 Do not use Setting Bed Sand material to fill depressions in the base surface.
 - .2 Keep moisture content constant and density loose and constant until Concrete Pavers are set and compacted.
 - .3 Screed Setting Bed Sand using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards. Maintain in a loose condition slightly ahead of the paving units and fully protect against incidental compaction following screeding. Loosen compacted sand by rain or screeded sand left overnight before further paving units are placed.
 - .4 Inspect the Setting Bed Sand course prior to commencing the placement of the Concrete Pavers. Acceptance of the Setting Bed Sand occurs with the initiation of Concrete Paver placement.
- .4 Concrete pavers
 - .1 Replace unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
 - .2 Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).
 - .3 Exercise care in handling face mix pavers to prevent surfaces from contacting backs or edges of other units.
 - .4 Provide Concrete Pavers using laying pattern as indicated in Landscape layout plan and detail drawings. Adjust laying pattern at pavement edges such that

- cutting of edge pavers is minimized. Where cutting is required, pavers are to be cut no smaller than one-quarter of a whole paver.
- .5 Use string lines or chalk lines on Permeable Setting Bed aggregate to hold all pattern lines true.
 - .6 Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
 - .7 Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
 - .8 When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
 - .9 Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
 - .10 Prevent joint (bond) lines from shifting more than $\pm 1/2$ in. (± 13 mm) over 50 ft. (15m) from string lines.
 - .11 Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
 - .12 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.
 - .13 Prevent all traffic on installed pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and Permeable Joint Aggregate material.
 - .14 Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
 - .1 After edge pavers are installed and there is a completed surface.
 - .2 Compact installed concrete pavers to within 6 feet (1,800 mm) of the laying face before ending each day's work. Cover pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Permeable Setting Bed Aggregate from becoming disturbed.
 - .15 Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
 - .16 Remove any cracked or structurally damaged pavers and replace with new units prior to installing Joint Sand material.

3.5 Joint filler

- .1 Polymeric Joint Sand
 - .1 After paving units are installed and compacted, spread jointing sand over surface and broom into joints until joints are completely filled.
 - .2 Compact paving units and refill joints as required until joints are completely filled to the bottom of chamfers.
 - .3 Remove excess sand from surface upon completion.
 - .4 Protect completed work from vehicular traffic until joint filling and final compaction are complete.

3.6 Field quality control

- .1 Verify final elevations for conformance to the drawings after sweeping the surface clean.
 - .1 Prevent final Concrete Paver finished grade elevations from deviating more than
 - .1 $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.
 - .2 Lippage: Paver-to-Paver Lippage:
 - .1 No greater than 3 mm (1/8 inch) difference in height between adjacent pavers.

3.7 Repairing, cleaning and sealing

- .1 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.
- .2 Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
 - .1 Clean Concrete Pavers in accordance with the manufacturer's written recommendations.

3.8 Protection

- .1 Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION

1.1 PART I - GENERAL

1.2 SCOPE OF WORK

Work described in this section includes materials, equipment, labor costs, including shipping of fence panels, posts, gates, and accessories.

1.3 REFERENCES

.1 ASTM STANDARDS: American Society for Testing and Materials

- .1 A121 - 19 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
- .2 A123 / A123M - 17 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .3 A153 / A153M - 16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- .4 A500 / A500M - 18 Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round Shapes.
- .5 A505 - 16 Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements
- .6 A513/A513M - 19 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
- .7 A641/A641M - 09a (2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- .8 A653/A653M - 19 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .9 A659/A659M - 18 Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled
- .10 A787/A787M - 15a Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing
- .11 A853 - 24 (2017) Standard Specification for Steel Wire, Carbon, for General Use
- .12 A1008 / A1008M - 18 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- .13 A1064 / A1064M - 18a Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- .14 B6 - 18 Standard Specification for Zinc
- .15 B22 - 14 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
- .16 B209 - 14 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- .17 B210 / B210M - 19a Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

- .18 B221 – 20 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .19 D2247 - 15 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- .20 D2794 - 93 (2014) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- .21 D3359 - 17 Standard Test Methods for Measuring Adhesion by Tape.
- .22 F626 - 14 (2019) Standard Specification for Fence Fittings
- .23 F900 - 11 (2017) Standard Specification for Industrial and Commercial Swing Gates.
- .24 F934 - 96 (2017) Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
- .25 F1043 - 18 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
- .26 F1184 - 16 Standard Specification for Industrial and Commercial Horizontal Slide Gates.
- .27 F2919 / F2919M - 12 (2018) Standard Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer Coated) with Variable Mesh Patterns or Meshes Greater than 6 in² [3871 mm²] in Panels
- .28 F2957 - 13(2019)e1 Standard Specification for Ornamental Aluminum Fence Systems

.2 CSA STANDARDS: Canadian Standards Association

- .1 A23.1:19/A23.2:19 Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
- .2 G164-18 Hot Galvanization of Irregularly Shaped Articles.

.3 CGSB STANDARDS: Canadian General Standards Board

- .1 CAN/CGSB-138.1-2019 Fabric for Chain Link Fence
- .2 CAN/CGSB-138.2-2019 Steel Framework for Chain Link Fence
- .3 CAN/CGSB-138.3-2019 Installation of Chain Link Fence
- .4 CAN/CGSB-138.4-2019 Gates for Chain Link Fence

1.4 SUBMITTALS

- .1 Product Data: Material descriptions, dimension of individual components and profiles, and finishes for the following:
 - .1 Fence, gate posts, brackets, rails and fittings.
 - .2 Gates and hardware
- .2 Shop Drawings: In accordance to Section 01 33 00 with digital PDF copies:
 - .1 Show locations of fence, each gate, posts, rails, and details of gate swing direction, or other operation, hardware, and accessories.
 - .2 Indicate materials, dimensions, sizes, weights, and finishes of components.

- .3 Include plans, elevations, sections, gate swing direction and other required installation and operational clearances, and details of post anchorage, attachment and bracing.
- .4 Installation recommendations and instructions by manufacturer describing all details for a typical fence and gate type.
- .5 Where fence is operating as a guard as defined by the Ontario Building Code (OBC), provide shop drawings that are stamped by a licensed, practicing structural engineer that certifies the fence design is in compliance with guard requirements within the OBC.
- .3 Installation recommendations and instructions by manufacturer describing all details for a typical fence and gates.
- .4 Verification Samples: For each finish product specified, two (2) samples, minimum size 6 in (150 mm) long, representing actual standard/optional color or color chips for custom color.
- .5 Qualification Data: For firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- .6 Maintenance Data: Material Safety Data Sheet available upon request.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: An experienced installer who has completed installations of fences and gates similar in material, design, and extent to those indicated for this project and whose work has resulted in construction with a record of successful in-service performance.
- .2 Source Limitations for Fences and Gates: Obtain each color, grade, finish, type, and variety of components for fences and gates from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.

1.6 PROJECT CONDITIONS

- .1 Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - .1 Notify local utility making services before beginning work.
 - .2 Unless otherwise indicated in the general provisions of the contract, notify the Architect no less than two (2) days in advance of proposed utility interruptions.
 - .3 Do not proceed with utility interruptions without Architect's written permission.
- .2 Field Measurements: Verify layout information for fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

Part 2 PRODUCT

2.1 MANUFACTURER

.1 OMEGA II FENCE SYSTEMS TM

A division of Metaltech - Omega Inc. 1735, St-Elzéar west

Laval (Quebec), Canada H7L 3N6

Tel: 800-836-6342 / 450-686-9600

Fax: 450-681-5318

Email: customerservice@omegatwo.com Web site: www.omegafence.com

.2 Acceptable Substitutions:

- .1 All substitution approval requests shall be accompanied by manufacturing drawings and specifications, and they shall meet all specifications for design, size, gauge of metal parts, and fabrication.

2.01 COATINGS

.3 Zinc Coating

- .1 Panels are coated with a minimum coating of 0.75 oz/ft² (530 g/m²) (hot-dip galvanizing) as per ASTM A123 Grade 75.
- .2 Square fence posts, swing gate frame and posts:
 - .1 Thickness of 11GA (0.120 in or 3.0 mm) or less: Zinc coated (pre-galvanized process) with a minimum of 0.9 oz/ft² (275 g/m²) as per ASTM A653 Grade 90.
 - .2 Thickness over 1/8 in (3.2 mm): Coated with a minimum of 2.3 oz/ft² (705 g/m²) zinc (hot-dip galvanizing) in conformity with ASTM A123 Grade 100.

.4 Polyester Coating:

- .1 Polyester coating to be minimum 4 mils applied by an electrostatic process. Coating shall cover all surfaces of the wire and post sections. Coating shall be capable of withstanding the following tests:
 - .1 Mechanical adhesion test as per ASTM D3359 - Method B.
 - .2 Shock resistance tests as per ASTM D2794.
 - .3 Salt spray testing with a minimum of 1 000 hours without red rust appearance, as per ASTM B117.
 - .4 Humidity resistance in a weather meter chamber as per ASTM D2247.
 - .5 Exposure to ultraviolet light with exposure of 1 000 hours using apparatus Type E and 63°C as per ASTM D1499.

.5 Polyester Surface Coating Colors:

- .1 Standard Gloss Black, RAL 9004 (30% Gloss)

2.2 MATERIALS

MODEL "OMEGA CLASSIC" FENCE AND ACCESSORIES

.1 Panel Height:

- .1 4-foot-high nominal panels: 46 in (1 168 mm).

- .2 Steel Fence Panels:
 - .1 91-23/32 in (2329 mm) wide, welded using 1/2 in (12.7 mm) vertical rod, welded with 1 in x 1/4 in thick (25.4 mm x 6.4 mm) horizontal flat to form mesh openings:
 - .1 Panel Nominal Height: 4 feet
 - .2 Square Dimensions C/C: 4-11/32 in x 4-11/32 in (110.3 mm x 110.3 mm)
 - .3 Rectangle Dimensions C/C: 4-11/32 in x 36-1/4 in (110.3 mm x 920.8 mm)
 - .2 Flats and rods are hot rolled and have a tensile strength of at least 46 000 psi (315 Mpa) in accordance with Q195.
 - .3 Both ends of the vertical wires of the panel shall extend 1 in (25.4 mm) from the last or the first horizontal wire to create a spiked top or bottom depending on installed position.
 - .4 Panel camber may not exceed 0.094 in (2.5 mm).
 - .5 **All ends of the vertical wires of the panel shall be cut flush prior to powder coat.**
 - .6 Panel camber may not exceed 0.094 in (2.5 mm).
- .3 Square Posts:
 - .1 Cold rolled 1008 grade steel to meet ASTM A500 and ASTM A787 and the following maximum horizontal loads, length as required for installation type:
 - .2 The length of the posts is minimum 48 inches (1219 mm) more than the actual height of the fence for installation in the ground
 - .3 Installation
 - .1 In ground, post length as required for extending to minimum 48 inches (1219 mm) below grade
 - .4 Post Size:
 - .1 3 in x 3 in (76.2 mm x 76.2 mm) 11 gauge (3.0 mm)
- .4 Post Brackets:
 - .1 L-Shaped Classic Bracket Kit: Includes the following: 1/4 in (6.3 mm) plate, nut and carriage bolt 5/16 in x 1-1/2 in (8.0 mm x 63.5 mm) all galvanized steel.
 - .2 Provide 8 brackets per panel.
- .5 Post caps:
 - .1 Aluminum alloy: For dimension post 3 in x 3 in (76.2 mm x 76.2 mm)
- .6 Polyester powder coating: (See article 2.01).
- .7 Gate Frames: Two (2) 1-1/2 in x 1-1/2 in (38.1 mm x 38.1 mm) horizontal tubes and two (2) 2 in x 2 in (50.8 x 50.8 mm) vertical tubes, all 16 gauge (1.6 mm) tubes, welded at intersections to create a rigid frame, in accordance with ASTM F900.

- .8 Gate Posts: Cold rolled from 1008 grade steel to meet ASTM A500 and ASTM A787. Posts are to include cap and SPF-W Kit for adjacent panel mounting. Length as required for installation type: Cold rolled 1008 grade steel to meet ASTM A500 and ASTM A787 and the following maximum horizontal loads, length as required for installation type:
 - .1 The length of the posts is minimum 48 inches (1219 mm) more than the actual height of the fence for installation in the ground
 - .2 Installation
 - .1 In ground, post length as required for extending to minimum 48 inches (1219 mm) below grade
 - .3 Post Size:
 - .1 3 in x 3 in (76.2 mm x 76.2 mm) 11 gauge (3.0 mm)
- .9 Gate Hardware:
 - .1 Standard Hardware: Hot-dip galvanized steel in conformity with ASTM F900, sized to assure proper gate operation. Non-moving parts shall be powder coated. a. Hinge: Structurally designed to support all gates without deformation during opening and closing.
 - .2 Latch: Clamp-on gravity system that is self latching. Includes the following: - Self-locking Device: With padlock eyes as an integral part of latch.
 - .3

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
- .2 Do not begin installation before final grading is completed, unless otherwise permitted by Contract Administrator.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 ft (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 IN-GROUND CONCRETE INSTALLATION

- .1 Install fencing on established boundary lines inside property line
- .2 Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
- .3 Post Setting: Set posts in concrete footing. Protect portion of posts above ground from concrete splatter. Place concrete around posts and consolidation. Using mechanical devices to set posts is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
- .4 Dimensions and Profile: As indicated on Drawings.
- .5 Space line posts uniformly at center to center.
- .6 Concealed Concrete Footings: Stop footings 2 in (50.8 mm) below grade to allow covering with surface material, and finished sloped to drain water away from post.

3.4 FENCE INSTALLATION – Model “CLASSIC”

- .1 Install the fence along the specified layout according to the drawings. The fence panel shall be installed to maintain a clear minimum distance of 1-1/4 in (31.8 mm) and a maximum distance of 2 in (50.8 mm) from the ground surface. Holes for posts shall be at least 8 in (200 mm) in diameter and at least 48 in (1219 mm) deep.
- .2 Posts shall be adequately supported within the concrete forms to maintain the required positioning and prescribed level until concrete has set. All necessary anchors and posts shall be at a minimum depth of 48 in (1219 mm) into the ground.
- .3 Square Post Installation: Once the concrete is set, the fence sections are fastened to the posts with the desired bracket type.
 - .1 L-Shaped Classic Bracket Kit: Brackets slot allows for adjustments of ± 1 in (25.4 mm) on each side.
 - .1 Post Size: 3 in x 3 in (76.2 mm x 76.2 mm)
 - .2 Post Spacing C/C: 96-13/16 in (2 459 mm)
- .4 For the fence to follow slopes, it is required to step the fence sections. When faced with a steep slope, it will be necessary to order longer posts and panels cut in half as to keep the gap under the panel to a minimum.
- .5 Upon cutting or trimming a post, apply a zinc rich primer to the exposed ends and finish with the matching touch-up paint supplied by the manufacturer.

3.5 GATE INSTALLATION AND ADJUSTMENT

- .1 Install gate posts in accordance with manufacturer's instructions.
- .2 Concrete Set Gate Posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have a diameter 4 times greater than outside dimension of post, and depths approximately 6 in (150 mm) deeper than frost level. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 in (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish around post and slope to direct water away from posts. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
- .3 Install gates perfectly horizontal and levelled (at junction), plumb, and secure for full opening without interference.
- .4 Attach hardware so to have the nuts inside the property thus making the assembly tamper-proof which will prevent unauthorized removal. Install ground-set items in concrete for anchorage.
- .5 Adjust hardware for smooth operation and lubricate where necessary to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.6 GROUT AND ANCHORING CEMENT

- .1 Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- .2 Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer for exterior applications.

3.10 SITE CLEANING

- .1 Clean and adjust soil disturbed during work. Dispose of unused topsoil off site in accordance with Ontario Regulation 406/19: on-site and excess soil management.

3.11 MAINTENANCE

1. Inspection
 1. A thorough visual inspection shall be done annually.
 2. This inspection must include overall verification of physical condition.

2. Moveable parts shall be adjusted, if needed, every five (5) years, unless project requires additional inspections.
3. In areas of extreme winter conditions, entire installation must be free of excessive ice and snow accumulation.

END OF SECTION

Part 1 General

1.1 MEASUREMENT PROCEDURES

- .1 Payment for site furniture will be made as per plan quantities Components included in Contract price include:
 - .1 All labour, materials, equipment and incidental services necessary (including shipping, storage, delivering to supply and install site furnishings)

1.2 QUALITY CONTROL

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate dimensions, sizes, colour, assembly, anchorage and installation details for each product specified.
- .3 Contractor to inspect all exterior site furnishings after delivery for signs of damage during transit
- .4 Contractor to protect all parts of exterior site furnishings from damage during storage and installation.
- .5 Consultant to confirm location and orientation of site furnishings prior to anchoring by contractor

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate facilities.

Part 2 Products

2.1 Site Furniture

- .1 Precast Concrete Seatwall ~~and Planters~~
 - .1 Model: Custom (Refer to Landscape Drawings)
 - .2 Material: Reinforced Concrete
 - .3 Colour: Natural Grey
 - .4 Finish: Standard Smooth, Anti-Graffiti Coating
 - .5 Canadian Supplier: Ed's Concrete Products, Contact: Andre Timmermans, Phone: 519-271-6590, Email: andre@edsconcrete.com
- .2 Bike Rack
 - .1 Model: Victor Stanley Street Sentry BRBS-104 Surface Mount
 - .2 Material: Steel

- .3 Colour: Standard Powder Coat Black
- .4 Fastening/Anchoring Hardware: Stainless steel, tamper proof
- .5 Canadian Supplier: Park Street Solutions Contact: Kevin Bettridge, Phone: 1-888-788-7408

.3 Bench Top

- .1 Model: MBS 0870 00001 Backed Bench
- .2 Material: Bench ends solid cast aluminum. Seat and back steel panels.
- .3 Colour: Standard Powder Coat Black
- .4 Fastening/Anchoring Hardware: Stainless steel, tamper proof
- .5 Canadian Supplier: Maglin Site Furniture, Contact: Sean Mealand, Phone: 1-800-716-5506 x 1223, Email: sean.mealand@maglin.com,

Part 3 Execution

3.1 INSTALLATION

- .1 Examine areas to receive furniture.
- .2 Notify Consultant of conditions that would adversely affect installation or subsequent use.
- .3 Do not begin installation until unacceptable conditions are corrected.
- .4 Assemble and install furnishings in accordance with manufacturer's instructions.
- .5 Repair minor damages to finish in accordance with manufacturer's instructions and as reviewed by Consultant and accepted by the Owner.
- .6 Remove and replace damaged components that cannot be successfully repaired as determined by Consultant.
- .7 Clean furniture promptly after installation in accordance with manufacturer's instructions.
- .8 Do not use harsh cleaning materials or methods that could damage finish.
- .9 Protect installed furniture for the duration of construction to ensure that, except for normal weathering, furniture will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- 1.1.1. The Irrigation Contractor shall design, supply, install, test, and commission a complete underground irrigation system, including all equipment, materials, controls, and accessories necessary for a fully functional and operational system. First season winterization and first season spring start up are included in the contract price.

1.2 SYSTEMS DESCRIPTION

1.2.1 Design Requirements

- .1 The Irrigation Contractor shall be responsible for the complete irrigation system design, including backflow prevention, valve zoning, hydraulic calculations, pipe sizing, head selection and layout, controller programming, and coordination with site conditions.
- .2 The system shall be designed to provide full and uniform coverage of all irrigated areas without overspray onto buildings, sidewalks, roadways, fences, or non-irrigated areas.
- .3 The Irrigation Contractor shall coordinate all design elements with existing and proposed grading, planting, utilities, and site improvements.
- .4 Final design shall be reviewed with the Consultant prior to installation for general conformance with the project requirements.

1.2.2 Performance requirements

- .1 The irrigation system shall be designed and installed to operate efficiently under available site water pressure and flow conditions.
- .2 System adjustments, including head spacing, nozzle selection, and zoning modifications, shall be incorporated into the Contractor's design to avoid conflicts with existing site features and to achieve required coverage.

1.3 SUBMITTALS

1.3.1 Shop Drawings and Design Submission

- .1 The Irrigation Contractor shall submit complete irrigation shop drawings prior to installation, including:
 - Full head layout
 - Pipe sizing and routing
 - Hydraulic calculations
 - Valve zoning plan
 - Controller and programming plan
 - Sleeving layout
 - Wiring layout
 - Backflow prevention and connection details
 - Coverage and precipitation analysis
 - Equipment schedule
- .2 Submittals shall demonstrate a complete and coordinated irrigation design.
- .3 Manufacturer's printed literature on operation and maintenance of operating elements of system.

- .4 Review by the Consultant is for general conformance only and does not relieve the Contractor of design responsibility.
- 1.3.2 Quality Assurance / Control - Results of service pressure test before beginning work on system.
- 1.3.3 Closeout
 - .1 As installation occurs, prepare accurate record drawing to be submitted before final review, including -
 - (1) Detail and dimension changes made during construction.
 - (2) Significant details and dimensions not shown in original documents.
 - (3) Field dimensioned locations of valve boxes, quick-coupler valves, control wire runs not in mainline ditch, and both ends of sleeves.
 - (4) Take dimensions from permanent constructed surfaces or edges located at or above finish grade
- 1.3.4 Operations and Maintenance Manual Data -
 - (1) Instruction manual which lists complete instructions for system operation and maintenance, including winterizing.
 - (2) Complete instructions on how to drain entire backflow preventer to prevent freezing.

1.4 QUALITY ASSURANCE

- 1.4.1 Qualifications
 - .1 Sprinkler Installation Company -
 - .1 Produce certification of following requirements prior to beginning work of this Section -
 - (1) In sprinkler installation business for five years minimum providing quality of labor and materials described in Contract Documents.
 - (2) Evidence of completing ten projects minimum of scope and quality equal to this project and in timely manner.
 - (3) Certifiable list of suppliers from whom it will be obtaining materials used on this project. (AUTHORIZED IRRIGATION DISTRIBUTOR)
 - (4) Is a Certified Irrigation Contractor by Irrigation Association.
 - .2 Workers -
 - .1 Use only trained personnel familiar with required sprinkling system installation procedures.
 - .2 Perform installation under direction of foreman or supervisor with five years minimum experience in sprinkling system installations.
- 1.4.2 Regulatory Requirements - Work and materials shall be in accordance with latest rules and regulations, and other applicable Provincial or local laws. The Irrigation Contractor is responsible for compliance of the irrigation design and installation with all applicable requirements.

- 1.4.3 Pre-Installation Conference - After Flagging is done a site visit with the irrigation Consultant to go over layout and specifications. It is the Irrigation Contractors responsibility to contact the irrigation consultant and set up the meeting prior to the start of the installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- 1.5.1 During delivery, installation and storage protect materials from damage and prolonged exposure to sunlight.

1.6 SEQUENCING

- 1.6.1 Install sleeves before installation of concrete and paving.

1.7 WARRANTY

- 1.7.1 Standard one-year guarantee on workmanship as well as Product Warranty -
 - .1 Filling and repairing depressions and replacing plantings due to settlement of irrigation trenches for one year following acceptance of Project.
 - .2 System can be adequately blown out to protect from freeze damage.
 - .3 System has been adjusted to supply proper coverage of areas to receive water.

1.8 OWNER'S INSTRUCTIONS

- 1.8.1 After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.

1.9 AS-BUILT DRAWINGS and MAINTENANCE

1.9.1 As-Built

Upon completion of the work, the Irrigation Contractor shall prepare an as-built drawing of the system indicating:

- 1) Sprinkler model and location
- 2) Pipe size and location
- 3) Automatic valve model and location
- 4) Winterizing adapter location
- 5) Wire or control tube location
- 6) Controller location
- 7) Main shut-off valve and any isolation valve locations
- 8) Rain device location
- 9) Dimensioned location of buried sleeves

The as-built drawing need not be drawn to scale but must be proportionally and diagrammatically correct. The Irrigation Contractor shall retain the original Irrigation Plan on file and submit two copies to the Project Manager

- 1.9.2 Maintenance Service
- 1.9.3 Blow out entire system at end of first watering season following installation.

1.10 Electrical Supply and Controller Location

- .1 The irrigation controller location will be designated on the Contractor prepared irrigation drawing.
- .2 The client is responsible for providing a 110-volt power supply within three feet of the controller location.

1.11 Point of Connection

- .1 The Owner will provide a domestic water service connection for irrigation use at the approximate location in the mechanical room identified in the Contract Documents.
- .2 The Irrigation Contractor shall verify available pressure, flow, and service conditions prior to finalizing the irrigation system design.
- .3 The Irrigation Contractor shall determine the required point of connection size and coordinate all connection requirements with the mechanical and civil engineers prior to installation.
- .4 Provide all components downstream of the designated point of connection required for a complete and operational irrigation system.
- .5 Any information related to available pressure, flow, or service sizing provided in the Contract Documents is for reference only and shall be verified by the Irrigation Contractor.

1.12 Winterization

- .1 All irrigation systems located in freezing climates must be drained to avoid damage. This will be accomplished by:
 - .1 Utilizing an air compressor, with the installation of the required adapter to the irrigation mainline as part of the initial construction.
- .2 The Irrigation Contractor is responsible for the supply and installation of the appropriate winterizing provision (access) and will complete the winterizing operation the first year as part of the initial construction contract.

1.13 Spring Start-up

- .1 The irrigation contractor is responsible for starting up the system in the spring following the first winterization. The contractor will responsible for:
 - .1 pressurizing the system
 - .2 operating all zones
 - .3 adjusting arcs of heads as needed
 - .4 scheduling the controller as needed
 - .5 replacing any parts under warranty
 - .6 and notifying the owner of any repairs needed that are not covered under warranty.

PART 2 PRODUCTS (ALL PRODUCT SHALL BE OR APPROVED EQUAL)

2.1 Pipe

.1 Identification

- .1 All pipe will be continuously and permanently marked with the manufacturer's name or trademark, size, schedule and type of pipe, and working pressure at 21 degrees Celsius.

.2 Delivery

- .1 Plastic pipe will be delivered to the site and stored in such a manner to provide adequate protection for the pipe ends either threaded or plain.

.3 P.V.C. Pipe and Fittings

- .1 P.V.C. pipe will be class 160 (SDR26) direct burial pipe conforming to CS-256-63 and will be homogeneous throughout and free from visible cracks, dents, holes or foreign materials.
- .2 All plastic pipe fittings to be installed shall be schedule 40 molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, or screwed connections.
- .3 All threaded connections under pressure should be teflon taped.

.4 Polyethylene Pipe and Fittings

- .1 All polyethylene pipe will have a minimum 75-psi pressure rating.
- .2 All insert fittings shall be constructed of PVC Type 1 cell classification 12454-B adhering to ASTM standard D 2609.

2.2 Sprinklers

.1 Spray Head Sprinklers – Rain Bird 1800 Series

- .1 The sprinkler shall be capable of operating at pressures ranging from 15 to 70 psi.
- .2 The sprinkler nozzles will provide matched precipitation rates (MPR) across sets and across patterns in 5' through 15' fixed arc series nozzles.
- .3 The variable arc nozzle (VAN) sets will provide infinite arc adjustment from 5 to 360.
- .4 The pop-up sprinkler shall be available in 2", 3", 4", 6", and 12" full pop-up height.
- .5 The sprinkler shall contain a ratcheting riser assembly for easy arc orientation once installed.
- .6 The sprinkler shall have ½" NPT inlet. All sprinklers will be supplied water from the bottom inlet.
- .7 When so indicated on the design, the 4" pop-up spray sprinklers in sodded areas and 12" hi-pop spray sprinklers in ground cover shall also include a pressure-regulating (PRS) device to prevent high pressure fogging to the nozzle stream. The top cap of the sprinkler will be marked with "PRS".

.2 Rotors – Rain Bird 5000 Series

- .1 The full or part circle sprinkler shall be a single stream, water lubricated, gear drive type capable of covering a 50 feet radius at 65 PSI pressure with a discharge rate of 9.1 GPM. The part circle sprinkler shall have adjustable arc coverage of 30 to 350 degrees. The sprinkler shall be available in 4, 6 or 12-inch pop-up heights.
- .2 The sprinkler shall have available 24 interchangeable nozzles: 3 Radius + MPR color-coded nozzles for maximum throw, and 6 Rain Curtain TM color-coded nozzles for superior close in watering, 6 standard nozzles and 9 low angle nozzles.

2.3 Valves

.1 Rain Bird 100-DVF Valve

- .1 The remote control valve shall be a normally closed 24 VAC 50/60 cycle solenoid actuated, balanced pressure type capable of having a flow rate of 30 GPM with a pressure loss not exceeding 6.1 PSI. The valve pressure rating shall be up to 150 PSI.
- .2 The valve body shall have 1" (FNPT) inlet and outlet.
- .3 The valve shall be actuated by a low power, 0.30 amps in-rush current (7.2 VA), 0.19 amps holding current (4.56 VA).
- .4 The valve shall be capable of manual on/off control.

2.4 Quick Coupling Valve

.1 5RC One Piece Quick Coupling Valve

- .1 The quick coupling valve will be a one-piece type constructed of heavy cast brass. The cover shall be a durable, protective self-closing rubber cover. When so specified, the cover shall be a locking rubber cover (LRC).
- .2 The valve will be opened and closed by a brass key of the same manufacturer having a 1" (MNPT) and 1" (FNPT) outlet. The valve throat shall have a keyway with detent positions for regulating water flow.
- .3 The quick coupling valves will be installed in a 10" round valve box, with the top of the valve box flush to the ground. The quick coupling valves shall be installed on unitized swing joints with side pressure stabilizers on the valve body.

2.5 Controller

.1 Rain Bird ESP-ME3 Wall Mount Controller

- .1 The controller shall be housed in a wall-mountable, weather-resistant plastic cabinet.
- .2 The controller shall come as a 4 station base controller with three expansion slots for either 3 or 6 station expansion modules for a maximum of 22 stations total. The contractor shall select the number of stations needed to match or exceed the number of valves in the design, or the model specified on the drawing.
- .3 Station timing will be from 1 minute to 6 hours and will have seasonal adjustment capability by program from 5 to 200%.

- .4 The controller shall have 4 individual programs with 6 different start times for each program.
- .5 When identified in the drawing legend, the controller shall be come complete with Rain Bird's LNK Wifi module.

.2 Rain Bird "Rain Stop" Rain Sensor

- .1 The rain sensor shall be a micro-electronic, solid-state type, capable of interrupting the power from the irrigation controller to the valves when rainfall exceeds a pre-selected amount

2.6 Wiring

- .1 All 115-volt wiring shall conform to the local electrical codes.
- .2 All 24-volt control wire between the solenoid valves and the controllers shall be #14 gauge TWU-10 solid conductor, white jacket for the common wire, and coloured for the power wire. For runs less than 500 feet, and single valve operation, 18-gauge multi-coloured conductor wire may be used. If two or more controllers are used, each unit must have their own common wire.

2.7 Manual Control and Isolation Valves

- .1 All manual valves shall be bronze gate valve construction, featuring a non-rising stem and minimum operating pressure of 125 psi. Bronze full-port ball valves are also acceptable.

2.8 Valve Boxes

- .1 All manual and automatic valves shall be enclosed in proper irrigation thermo-plastic Carson Brooks valve boxes, of size as required to permit 'ease of access' for servicing purposes. The boxes shall feature locking or hinged covers, with an impregnated green colour.
- .2 The term "ease of access" means that every solenoid and manual valve should have adequate access for all types of maintenance.
- .3 All valve access boxes shall be installed on a suitable base of gravel for proper foundation of box and easy leveling of box to proper grade, and also to provide proper drainage of the access boxes. All valve access boxes shall be provided with proper length and size extensions, wherever required, to bring the valve box level with the finish grade, unless specified to be buried below grade.
- .4 Valve boxes shall be located in planting areas whenever possible.
- .5 Locking bolts shall be installed in valve boxes.

2.9 Sleeves

- .1 All sleeving material shall be Class 160 PVC.
- .2 Separate sleeves must be provided for all electrical wiring.

PART 3 EXECUTION

3.1 EXAMINATION

- 3.1.1 Site Verification of Conditions - Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant. Notify Consultant if pressures over 480 kPA (70 psi) or under 379 kPA (55 psi) are found to determine if some re-design of system is necessary before beginning work on system.

3.2 PREPARATION

- 3.2.1 Protection
- .1 Repair or replace work of this Section damaged during course of the Work at no additional cost to Owner. If damaged work is new, repair or replacement shall be performed by installer of original work.
 - .2 Do not cut existing tree roots measuring over 50 mm (2 inches) in diameter in order to install sprinkler lines.
- 3.2.2 Layout of Irrigation Heads -
- .1 The Irrigation Contractor shall be responsible for field layout of all irrigation components.
 - .2 The Contractor shall verify site conditions prior to installation and adjust design and layout as required.
 - .3 Layout shown on any supporting information, if provided, is conceptual only and does not represent final design.
 - .4 All changes made during installation shall be recorded on as-built drawings.

3.3 INSTALLATION

3.3.1 Trenching

- .1 Trenches for sprinkler lines and wiring will be of sufficient width (minimum of six inches (6")) to permit proper handling and installation of the pipe and fittings.
- .2 The first four inches (4") of backfill material over the pipe will be free of stone or any foreign objects greater than ¾ inch diameter. The top six inches (6") of backfill shall be free of rocks over one inch, or trash. Piping less than 1 ½ inches in diameter shall have a minimum cover of ten inches. Piping greater than 1-½ inches in diameter shall have a minimum cover of fifteen inches. Any road crossings shall have a minimum eighteen inches of cover.
- .3 The backfill will be thoroughly compacted in six-inch lifts, and evened off with a minimum one inch of topsoil.
- .4 In rocky areas, the trenching depth will be two inches below normal trench depth, to allow for placement of selected fill.
- .5 All trenches that are opened during any particular working day will be closed and backfilled the same day.

3.3.2 Pulling

- .1 Where soil conditions allow the pipe depths of cover described above to be met; the irrigation piping 2" or smaller may be directly installed without trenching by use of

a vibratory plow. The feed blade must be equipped with a minimum bullet diameter of 1 ½ times the outside diameter of the pipe to be installed.

- .2 In each of the above operations, all pipe interiors are to be (the Irrigation Contractor is responsible for) kept free from dirt, and debris. The site is to be restored to its original condition, including any damage to existing trees, shrubs, and structures, along with settlement of trenches within the warranty period.
- .3 Generally, piping under concrete or asphalt will be installed by jacking, boring or hydraulic driving. Where any cutting or breaking of sidewalks, concrete work and/or asphalt is necessary, it shall be removed and replaced by the Irrigation Contractor. Permission to cut or break sidewalks, concrete and/or asphalt will be obtained from those having proper jurisdiction. Where piping on the drawings is shown under paved areas but running parallel and adjacent of planted areas or turf areas, the intent of the drawings is that the pipe be installed in the planted or turf areas.

3.3.3 Sleeving

- .1 Sleeve water lines and control wires under walks and paving. Extend sleeves 150 mm (6 inches) minimum beyond walk or pavement edge. Cap sleeves until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
- .2 Use one water pipe maximum per sleeve. Sleeve control wiring in separate sleeve.
- .3 Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.

3.3.4 Installation of Pipe

- .1 Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
- .2 Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 450 mm (18 inches) based on finished grade. Install remaining lateral lines with minimum of 300 mm (12 inches) of cover based on finish grade.
- .3 Install pipe and wires under driveways or parking areas in specified sleeves 450 mm (18 inches) below finish grade or as shown on Drawings.
- .4 Locate no sprinkler head closer than 300 mm (12 inches) from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be 25 mm (one inch) below top of mow strip, walk, or curb and have one to (3 inches) clearance between head and mow strip, walk, or curb.
- .5 Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
- .6 Make solvent weld joints as follows -
 - .1 Do not make solvent weld joints if ambient temperature is below 6 deg C (40 deg F).
 - .2 Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
 - .3 Apply uniform coat of 711 solvent to outside of pipe.
 - .4 Apply solvent to fitting in similar manner.
 - .5 Re-apply light coat of solvent to pipe and quickly insert into fitting.
 - .6 Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
 - .7 Hold in position for 15 seconds minimum or long enough to secure joint.
 - .8 Wipe off solvent appearing at outer shoulder of fitting.

- .9 Do not use excessive amount of solvent thereby causing obstruction to form on inside of pipe.
 - .10 Allow joints to set at least 24 hours before applying pressure to PVC pipe.
 - .7 Tape threaded connections with Teflon tape.
 - .8 If pipe is larger than 50 mm (2 inches), install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines, unless otherwise detailed on Drawings.
- 3.3.5 Sprinkler Heads
- .1 Before installation of sprinkler heads, open control valves and use full head of water to flush out system.
 - .2 Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
 - .3 Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade.
- 3.3.6 Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

3.4 ADJUSTING

- 3.4.1 Adjust heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering or raising of heads shall be part of original contract with no additional cost to Owner.
- 3.4.2 Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.
- 3.4.3 Adjust watering time of valves to provide proper amounts of water to all plants.

PART 4 – TESTING, OPERATION AND INSPECTION

4.1 Testing

- .1 Flush all lines and ensure that all air is expelled from the system.
- .2 Inspect all visible piping, and walk all buried lines for any leakage.
- .3 If a pump is included, verify direction of rotation (if applicable), operating pressure, and any leakage.
- .4 Any repairs necessary to render the system in good working order will be completed at this time.

4.2 Operation

- .1 Verify all sprinkler settings, overlap, nozzle sizes, and operating pressures.
- .2 Adjust the flow control on automatic valves where necessary.
- .3 Program the controller into a logical sequence to comply with local watering bylaws or endeavor to accomplish heavy infrequent water cycles.

- .4 Program each station to satisfy the watering requirements of the relevant plant material.
- .5 Supply two copies of the operation manual to the Owner including As-built drawings and specifications of all materials used.
- .6 Provide training to the Owner's personnel for operation and maintenance of the system.

4.3 Inspection

- .1 The irrigation system shall be subject to review by the Consultant for general conformance with the Contract Documents and operational performance requirements.
- .2 Review does not relieve the Irrigation Contractor of responsibility for complete system design, functionality, coordination, or compliance.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the work requirements for supply, installation, and fine grading of topsoil.

1.2 MEASUREMENT PROCEDURES

- .1 Preparation of sub-grade, supply, placing, spreading and finish grading of contractor supplied topsoil will be measured per plan quantities for surface area covered and depth specified. Testing for soil quality is included as part of the base price.
- .2 Payment for supply, application and mixing of soil amendments required by test results will be measured in standard commercial units of volume/weight, as determined by the Consultant

1.3 QUALITY ASSURANCE

- .1 Topsoil testing is a required component of the work.
- .2 Perform one test for each source of on-site or imported topsoil.
- .1 Testing of on-site topsoil shall be carried out by a soil testing laboratory accredited by the Ontario Ministry of Agriculture, Food and Rural Affairs. The nearest testing laboratory to the project site is:

- .1 Agri-Food Laboratories
1-503 Imperial Road North
Guelph Ontario N1H 6T9
T:519.837.1600 F:519.837.1242

Alternative laboratories can be reviewed at <https://www.ontario.ca/page/soil-leaf-and-petiole-tissue-and-forages-and-feed-testing-labs>

- .2 Soil sampling, testing and analysis to be in accordance with Provincial standards.

.1 BASIC AGTEST TOPSOIL REPORT

- .1 pH, Total Salts, % Organic Matter, Phosphorus, Potassium, Magnesium, Calcium, Sodium, Chloride, Sodium Absorption Ratio, CEC, Texture (%Sand, %Silt, %Clay)
 - .1 Including soil modification and fertility recommendations
- .3 Contractor shall pay for cost of tests
- .4 Submit soil testing report to consultant for review prior to amending topsoil.

Part 2 Products

2.1 TOPSOIL SOURCE

- .1 Use on-site topsoil supplied by owner where possible.
- .2 Where on-site topsoil is to be supplemented by external sources, test and amend as required.

2.2 TOPSOIL QUALITY

- .1 Ensure that any topsoil used is free from:
 - .1 Debris and stones over 25mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .3 Contain no toxic elements or growth inhibiting materials.
- .2 Topsoil: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 pH ranging from 5.5 to 7.5
 - .2 Organic Matter from 4 to 15%
 - .3 Phosphorus from 10-60 parts per million
 - .4 Potassium from 80-250 parts per million
 - .5 Calcium from 1000-4000 parts per million
 - .6 Magnesium from 100-300 parts per million
 - .7 Chloride less than 100 parts per million
 - .8 Sodium less than 200 parts per million
 - .9 Sand Fraction from 20 - 75%
 - .10 Silt Fraction from 5 - 30%
 - .11 Clay Fraction from 5 - 30%
 - .12 Consistency: friable when moist.

2.3 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertilizer:

-
- .1 Conform to recommendations from soil testing agency with respect to improvement of tested topsoil and apply as specified for each condition.
 - .2 Industry accepted standard medium containing nitrogen, phosphorus, potassium and any other micro-nutrients suitable to the specific plant species or application or defined by the soil test.
- .2 Peatmoss:
- .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to course textured.
- .4 Organic matter: such as compost, rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Limestone:
- .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .6 Bonemeal: Finely ground with a minimum analysis of 3% nitrogen and 20% phosphoric acid.

Part 3 Execution

3.1 PREPARATION OF EXISTING GRADE IN LANDSCAPE AREAS

- .1 Verify that rough grading has been completed and grades are correct. If discrepancies occur, notify Consultant and do not commence work until supplemental instruction is issued by Consultant.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 25mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 50mm above surface. Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 300mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Consultant has reviewed subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 25mm below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 200mm for sodded areas.
 - .2 600mm depth for perennials and shrubs.
 - .3 600mm depth for trees.
- .5 Manually spread topsoil/planting soil around existing trees, shrubs and obstacles.

3.3 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas to promote positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment reviewed by Consultant. Leave surfaces smooth, uniform and firm against deep footprinting.

3.4 ACCEPTANCE

- .1 Supply topsoil testing reports and documentation of amendments completed.
- .2 Consultant will review topsoil in place for general conformance of material, depth of topsoil, and finish grading.

3.5 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site.

3.6 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the work requirements for supply, installation, establishment supports, and establishment maintenance of turf grass sod.

1.2 MEASUREMENT PROCEDURES

- .1 Payment for nursery sod will be made as per plan quantities
- .2 Components included in bid price include: All labour, materials, equipment and incidental services necessary to supply, install, and maintain turf grass sod to the full extent of the contract documents.
 - .1 Bid price for sodding to include establishment period maintenance only.

1.3 SCHEDULING

- .1 Schedule sod laying to coincide with preparation of soil surface.
 - .1 Coordinate sod laying with project work by others.
- .2 Schedule sod installation when frost is not present in ground.

Part 2 Products

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod type:
 - .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 50% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
 - .2 Turf Grass Nursery Sod quality:
 - .1 Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
 - .3 Mowing height limit: 35 to 65 mm.

- .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Water:
 - .1 Free of organic or chemical contaminants detrimental to humans, animals, healthy plant growth and the environment.
 - .2 Contractor to supply all water required for planting and establishment.
 - .3 Proposed irrigation system may not be activated at time to planting, supply water until system is activated by Owner.
- .3 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
- .4 Topsoil:
 - .1 See section 32 91 21 Topsoil Placement and Grading for topsoil requirements

Part 3 Execution

3.1 PREPARATION

- .1 Verify that grades are correct and depth of topsoil is satisfactory. Notify Consultant if discrepancies exist, do not proceed until supplemental instruction is issued by Consultant.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth even grade, to contours and elevations indicated, to tolerance of plus or minus 30 mm, for Turf Grass Nursery Sod, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other harmful materials; off site.

3.2 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.
- .4 Water soil immediately after laying to a depth of 100mm.

3.3 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance or for 12 weeks after work is completed, whichever is later.
 - .1 Water sodded areas in sufficient quantities and at frequency required to maintain to obtain optimum soil moisture conditions to depth of 75 mm to 100 mm.
 - .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother sod and seeded areas.
 - .3 Maintain sodded areas 95% weed free.

3.4 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Consultant provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm

.4 Sodded areas have been cut a minimum of two (2) times prior to acceptance.

.2 Areas sodded in the fall will be accepted the following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.5 MAINTENANCE DURING WARRANTY PERIOD

.1 Maintenance to be provided by others under separate contract with Owner.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section describes requirements for the supply and installation of plant material including trees, shrubs, groundcovers, accessories, planting, mulching, maintenance, substantial performance of planting work, and warranty.

1.2 REFERENCES

- .1 Comply with the following standards except where modified by the Contract Documents:
 - .1 Canadian Landscape Standard, current edition, including Canadian Nursery Stock Standard.
 - .2 International Code of Nomenclature for Cultivated Plants, International Society for Horticultural Science
 - .3 American National Standards Institute (ANSI) A300, Tree Care Standards

1.3 SUBMITTALS

- .1 Submit product data and samples for:
 - .1 Mulch.
 - .2 Growing Medium.
 - .3 Tree staking and tie materials
- .2 Submit maintenance reports during the establishment period describing watering, maintenance activities, and general plant condition.
 - .1

1.4 QUALITY ASSURANCE

- .1 Plant material shall conform to the Canadian Landscape Standard and Canadian Nursery Stock Standard.
- .2 Plant substitutions are not permitted without written approval from the Consultant.
- .3 Consultant reserves the right to review plant material at the nursery or upon delivery to the site. Such review does not relieve the Contractor of responsibility to provide plant material meeting the requirements of the Contract Documents.
- .4 Plant material not meeting the requirements of the Contract Documents may be rejected.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, and handle plant material in accordance with the Canadian Landscape Standard.
- .2 Protect plant material from damage, desiccation, extreme temperatures, and mechanical injury during transportation and storage.
- .3 Plant material that becomes damaged, desiccated, or otherwise unsuitable for planting shall be removed from the site and replaced at no additional cost to the Owner.

1.6 SCHEDULING

- .1 Install plant material during periods suitable for planting in accordance with the Canadian Landscape Standard and accepted horticultural practice.
- .2 Do not plant during conditions that may adversely affect plant establishment including frozen soil, extreme heat, drought, or high winds.

1.7 WARRANTY

- .1 The Contractor shall warrant plant material to remain alive and in healthy, vigorous condition for the duration of the warranty period.
- .2 The warranty period shall be 12 months commencing on the date of Substantial Performance of Planting Work.
- .3 During the warranty period, the Contractor shall replace plant material that is dead, missing, or not in healthy growing condition.
- .4 Replacement plant material shall meet the requirements of the Contract Documents and shall be warranted for the remainder of the original warranty period.
- .5 The warranty does not apply to damage resulting from vandalism, vehicular impact, catastrophic events beyond the Contractor's control, or maintenance performed by others.
- .6 Plant material will be reviewed by the Contract Administrator prior to the end of the warranty period.

Part 2 Products

2.1 PLANT MATERIAL

- .1 Plant material shall comply with the
 - .1 Canadian Landscape Standard for size, grading, and root ball preparation.
 - .2 International Code of Nomenclature for Cultivated Plants and the latest addition of standardized plant names;

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- .2 Plants shall be structurally sound, free of defects, and capable of establishing normal growth under the specified site conditions.
 - .3 Contractor is responsible for verifying plant quality at source and confirming suitability for the intended planting environment.
 - .4 Plant material shall be hardy to the project's plant hardiness zone and suitable for long-term survival under local climatic conditions.
 - .5 Contractor is responsible for sourcing plant material that meets these performance requirements.
 - .6 Plant material shall be healthy, vigorous, and free of visible defects, pests, or diseases at the time of delivery and installation. Plants shall exhibit growth characteristics typical of the species or cultivar.
 - .7 Contractor is responsible for ensuring plant material meets Canadian Landscape Standard minimum standards and is suitable for successful establishment.
 - .8 Collected plant material is not permitted unless approved by the Contract Administrator.
 - .9 Where permitted, collected stock shall meet CLS minimum standards.

2.2 WATER

- .1 Free of organic or chemical contaminants detrimental to humans, animals, healthy plant growth and the environment.
- .2 Contractor to supply all water required for planting and establishment.
- .3 Proposed irrigation system may not be activated at time to planting, supply water until system is activated by Owner.

2.3 STAKES

- .1 Provide staking materials as required to stabilize trees until establishment. Materials shall be durable, non-injurious to the tree, and suitable for site conditions.
- .2 Contractor to determine staking method unless otherwise shown on drawings.

2.4 TREE TIES

- .1 Polypropylene type tree ties shall be flexible, non-abrasive, and designed to prevent trunk damage.
- .2 Contractor to select tie type and installation method appropriate to the staking system

2.5 GROWING MEDIUM

- .1 Growing medium shall meet the performance requirements of Section 32 91 21.

- .2 Contractor is responsible for testing, amendment, and achieving required soil performance characteristics.

2.6 TRUNK PROTECTION

- .1 Provide trunk protection where required to prevent mechanical injury or wildlife damage.
- .2 Protection materials shall allow air circulation and avoid moisture accumulation against bark.

2.7 MULCH

- .1 Mulch shall be an organic, non-dyed, wood-derived product suitable for use around landscape plantings.
- .2 Mulch shall be free of contaminants, including plastics, construction debris, and live plant material (weeds, seeds, roots).
- .3 Mulch shall consist primarily of wood and bark fibres capable of providing moisture retention, moderating soil temperature, and suppressing weed growth.
- .4 Mulch shall be uniform in texture and free-draining, with no oversized pieces that impede planting or maintenance.
- .5 Contractor is responsible for selecting a mulch product that meets these performance requirements and is appropriate for long-term plant health.
- .6 Upon request, the Contractor shall provide product information or supplier documentation confirming that the mulch is non-dyed and wood-derived.
- .7 Review by the Contract Administrator does not relieve the Contractor of responsibility for meeting performance requirements.

2.8 ANTI-DESICCANT

- .1 Contractor may use anti-desiccant treatments as required to maintain plant health during transport and installation.

Part 3 Execution

3.1 PRE-PLANTING PREPARATION

- .1 Planting shall not begin until required site preparation, grading, and soil placement have been completed in accordance with the Contract Documents.
- .2 Contractor shall verify that planting areas are suitable for installation and shall not proceed until deficiencies affecting planting performance have been corrected.

- .3 Contractor shall ensure all plant material is healthy, vigorous, and compliant with Part 2 prior to installation.
- .4 Remove rejected plant material and debris from the site promptly.

3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Contractor is responsible for locating utilities and protecting them during the Work.
- .2 Planting areas shall be prepared to receive plant material in accordance with the performance requirements of Section 32 91 21.
- .3 Planting pits and bed preparation shall be sized and configured to support healthy root establishment and long-term plant growth.
- .4 Excavated material unsuitable for reuse shall be removed from the site.
- .5 Contractor shall ensure planting areas drain adequately and shall notify the Contract Administrator of conditions that may prevent proper drainage or establishment.

3.3 PLANTING

- .1 Planting shall be performed only when site and soil conditions are suitable for successful installation and establishment.
- .2 Plant material shall be installed at the correct depth, with the root flare visible at finished grade.
- .3 Root systems shall be handled to avoid damage and to maintain integrity during installation.
- .4 Backfill shall support root contact with soil, eliminate voids, and allow for proper moisture infiltration.
- .5 Plant material shall be set plumb and oriented to achieve an appropriate appearance relative to adjacent features.
- .6 Water all plant material immediately after installation to ensure full settlement of backfill and adequate root hydration.
- .7 All packaging, containers, and non-biodegradable materials shall be removed from the site.

3.4 TRUNK PROTECTION

- .1 Provide trunk protection where required to prevent mechanical injury or wildlife damage.
- .2 Protection materials shall allow air circulation and avoid moisture accumulation against bark.
- .3 Remove trunk protection when no longer required for plant health.

3.5 TREE SUPPORTS

- .1 Provide tree supports only where required to stabilize plant material until establishment.

- .2 Supports shall be durable, non-injurious, and installed to avoid abrasion or girdling.
- .3 Remove supports when no longer required for plant stability

3.6 MULCHING

- .1 Mulch shall comply with Section 2.7.
- .2 Correct soil settlement prior to mulching
- .3 Apply mulch to the depth and extents indicated in the Contract Documents, ensuring mulch is kept clear of plant stems and trunks.

3.7 MAINTENANCE RESPONSIBILITIES DURING ESTABLISHMENT PERIOD

- .1 From installation until Substantial Performance, the Contractor shall maintain plant material to support healthy establishment and growth.
- .2 Maintenance shall include:
 - .1 Watering as required to maintain soil moisture suitable for plant establishment.
 - .2 Monitoring soil moisture and adjusting watering frequency based on weather and site conditions.
 - .3 Weed control using acceptable horticultural practices and in compliance with applicable regulations.
 - .4 Maintaining mulch coverage.
 - .5 Monitoring for pests and diseases and implementing Integrated Pest Management practices as required.
 - .6 Pruning only as necessary to remove dead, damaged, or hazardous branches.
 - .7 Maintaining trunk protection and supports in good condition.
 - .8 Replacing plant material that fails to establish.

3.8 SUBSTANTIAL PERFORMANCE OF PLANTING WORK

- .1 Substantial Performance of Planting Work will be reviewed when:
 - .1 all planting has been completed in accordance with the Contract Documents
 - .2 plant material is in healthy condition at the time of review
 - .3 planting areas are free of weeds, debris, and construction materials.
- .2 Substantial Performance of Planting Work will only be reviewed during the active growing season, defined as May 15 to October 15 of any calendar year.
- .3 Planting completed after October 15 will be reviewed for Substantial Performance no earlier than one month after leaf-out in the following spring, provided seasonal conditions allow for proper review.

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- .4 The determination of Substantial Performance of Planting Work is an administrative milestone confirming completion of installation. It does not constitute a warranty of plant survival or future performance.

3.9 MAINTENANCE DURING WARRANTY PERIOD

- .1 From Substantial Performance of Planting Work to the end of the warranty period, the Owner shall maintain plant material to support continued health and growth.
- .2 Maintenance by Owner shall include watering by the automated irrigation system and minimal weed control.
- .3 Maintenance by Owner shall be performed at intervals appropriate to site and seasonal conditions.
- .4 Contractor shall submit maintenance reports documenting activities performed.

3.10 WARRANTY PERIOD CLOSEOUT

- .1 Warranty Period Closeout will occur at the end of the warranty period when:
 - .1 plant material is healthy, vigorous, and free of pests and disease
 - .2 plant material exhibits normal growth for the species
 - .3 planting beds are free of weeds, debris, and litter
 - .4 mulch is in place as required
 - .5 pruning of woody plants has been completed in compliance with ANSI A300
 - .6 tree supports and trunk protection have been removed
- .2 Plant material that is dead or not in healthy growing condition shall be replaced at the Contractor's expense prior to Warranty Period Closeout.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, materials, equipment, and services required for the supply, installation, adjustment, and completion of maintenance holes, catch basins, double catch basins – including frames, covers, steps, benching, granular backfill, and all associated work.

1.2 REFERENCES

- .1 Contract Drawings
- .2 Special Provisions – General Requirements
- .3 OPSD 400.020 – Catch Basin Frame and Grate
- .4 OPSD 401.010 – Maintenance Hole Frame and Cover, Type A
- .5 OPSD 401.060 – Maintenance Hole Frame and Cover, Type A (Boulevard/Off-road)
- .6 OPSD 405.010 – Maintenance Hole Steps
- .7 OPSD 701.010 – Precast Maintenance Hole / Catch Basin Structure
- .8 OPSD 701.021 – Maintenance Hole Benching
- .9 OPSD 705.010 – Precast Catch Basin
- .10 OPSD 705.020 – Precast Double Catch Basin
- .11 OPSD 705.030 – Catch Basin Connections
- .12 OPSD 802.010 – Granular Backfill
- .13 OPSD 802.030 – Granular Materials

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's data for frames, covers, grates, steps, and precast components.
- .2 Certificates:
 - .1 Submit certification confirming compliance with applicable OPSD and material standards.

1.4 QUALITY ASSURANCE

- .1 Installer shall have experience installing municipal storm structures.
- .2 All precast components shall be supplied by a certified manufacturer.
- .3 Granular materials shall meet OPSS/OPSD requirements and be compacted to specified density.
- .4 Non-conforming components or installations shall be removed and replaced at no cost to the Owner.

1.5 SITE CONDITIONS

- .1 Do not install precast structures on frozen, saturated, or unstable subgrade.
- .2 Maintain dry excavation conditions during installation.
- .3 Protect structures from flotation during high groundwater conditions.

2 Products

2.1 MATERIALS

- .1 Granular Backfill: Granular 'C' shall be used around all structures up to subgrade level.
- .2 Maintenance Hole Steps: Steps shall conform to OPSD 405.010
- .3 Maintenance Hole Frames and Covers: Supply Type A frame and cover per OPSD 401.010 or OPSD 401.060.

Use OPSD 401.060 for maintenance holes located in boulevards or outside the road allowance.

Frame and covers shall be modified to include:
 - The word 'STORM' beneath "DANGER", same size and font.
 - The year of installation beneath "DANGER".
- .4 Catch Basin Frames and Grates: Supply and install frame and grate per OPSD 400.020.

Grates shall be modified to include the year of installation cast into the grate.
Set to base asphalt elevation for all roadway catch basins and double catch basins.
- .5 Precast structures:

Maintenance Holes: OPSD 701.010
Benching: OPSD 701.021
Catch Basins: OPSD 705.010
Double Catch Basins: OPSD 705.020
Connections: OPSD 705.030
- .6 Terrafix Siltsack

3 Execution

3.1 EXAMINATION

- .1 Verify subgrade conditions prior to installation.
- .2 Report unsuitable conditions to the Contract Administrator.
- .3 Do not proceed until deficiencies are corrected.

3.2 **PREPARATION**

- .1 Excavate to required depth and dimensions.
- .2 Prepare stable, level base for precast structure.
- .3 Ensure proper alignment with inlet and outlet pipes.

3.3 **INSTALLATION**

.1 **Maintenance Holes:**

- Install precast maintenance hole components in accordance with OPSD 701.010.
- Install maintenance hole steps per OPSD 405.010.
- Construct benching per OPSD 701.021.
- Supply, place, and compact 300mm Granular 'C' around the structure up to subgrade.
- Install maintenance frame and cover as follows:
Use OPSD 401.010 or OPSD 401.060 as applicable.
Include "STORM" and installation year on the cover.
Set maintenance hole rims to base asphalt elevation on roadway, and to finished grade off roadway, according to Contract Drawings.
- Adjustment units shall be installed in accordance with OPSD 704.010. The Contractor shall ensure that no more than three (3) adjustment units and no more than 300mm of total adjustment height are used to set structures to finished grade. When setting structures to base asphalt elevation, the Contractor shall account for the final asphalt lift(s) and set the structure accordingly. Should the Contractor set any structure such that more than three (3) adjustment units or more than 300mm of total adjustment are required to achieve final grade, the Contractor shall, at their own expense, rebuild the structure to meet the specified requirements, or the associated costs shall be deducted from future progress payments.
- The Contractor shall ensure that where a rubber boot is used to connect pipes to maintenance holes, the interior of the maintenance hole around the pipe is also fully sealed and parged flush to the maintenance hole wall, regardless if the rubber boot is used.

.2 **Catch Basins:**

- Install catch basin structures in accordance with OPSD 705.010, 705.020, and 705.030.
- Supply, place, and compact 300mm Granular 'C' around the structure up to subgrade.
- Install frame and grate per OPSD 400.020, modified to include installation year.
- Set all catch basin frames and grates to base asphalt elevation when located in the roadway.
- Install terrafix siltsack once catch basins are installed. Installation of terrafix siltsack and removal prior to final asphalt placement shall be included within the unit rate for this item.

.3 **Rim Adjustment During Surface Asphalt Placement (2028):**

- Adjust maintenance hole and catch basin frame and cover as required so that the final elevation of the cover shall fit the final elevation of the completed work as outlined below:
 - The Contractor is required to remove the existing frame, cover, brickwork, and any asphalt required to adjust and/or build up the maintenance hole/catch basin walls to the correct elevation with modoloc sections and mortar laid in an approved manner and reset the frame and cover including concrete infill behind the maintenance hole or catch basin and up to 1.0m on either side of the structure.
 - Cut asphalt 300mm from face of the catch basin or maintenance hole structure and ends cut at 45-degree angle to the curb.
 - Restore in kind the affected subgrade with good working material prior to replacement of granular and HL8 asphalt infill.
 - Dispose of asphalt removed in order to raise structure.

- Supply and install expansion material as required.
- Structures to be raised in accordance with OPSD 704.010 for sanitary and storm maintenance holes and catch basins.
- Where distance from the finished rim to the first step exceeds 450mm during adjustments, an additional step is required to be installed as per OPSD 405.010 and shall be part of the unit rate.
- Parge exterior mortar cap from exposed moduloc to over the frame, and the first and last joint on the inside of the structure, including the use of butyle tape between adjustments.

- .4 Maintenance hole 'EF-4' shall include the manufacturers standard warranty for cleaning, and the Contractor is to provide manufacturer representative's sign-off and confirmation of the warranty period to initiate cleaning and inspection schedule by Minotaur Stormwater Services.

3.4 **CLEAN-UP**

- .1 Remove debris, excess materials, and restore disturbed areas.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Replace damaged surfaces or components to the satisfaction of the Contract Administrator.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, materials, equipment, and services required for the supply, installation, testing, and completion of PVC storm sewer pipe, fittings, bedding, backfill, and all associated appurtenances.

1.2 REFERENCES

- .1 Contract Drawings
- .2 Town of Cobourg Design Guidelines
- .3 OPSS.MUNI 410 – Installation of Pipe Sewers
- .4 OPSD 802.010 – Granular Backfill
- .5 OPSD 802.030 – Granular Materials

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's data for PVC pipe, fittings, tees, plugs, and appurtenances.
- .2 Certificates:
 - .1 Submit certification confirming compliance with Town of Cobourg AMPL and applicable standards.

1.4 QUALITY ASSURANCE

- .1 Installer shall have experience installing municipal PVC storm sewers.
- .2 All PVC pipe products shall be from the manufacturers listed on the Town of Cobourg Approved Manufacturers' Products list (AMPL)
- .3 Granular materials shall meet OPSS/OPSD requirements and be compacted to specified density.
- .4 Non-conforming pipe, fittings, or installations shall be removed and replaced at no cost to the Owner.
- .5 Any leaks or cracks found within pipe joints or maintenance hole connections found prior to surface asphalt and within the 2-year warranty period commencing from the time stage 1 substantial completion is issued by the engineer, shall be the responsibility of the Contractor to pressure grout, hydraulic cement or by any means of sealing for repair.

- .6 Should any deflections be found prior to surface asphalt, and within the 2-year warranty period commencing from the time stage 1 substantial completion is issued by the engineer, the contractor shall perform mandrel testing in accordance with Town of Cobourg Standards, and OPSS 438. The cost to pull the rope through the affected line and perform the mandrel test with the Engineer, and the City present, shall be borne by the contractor. Should the mandrel test pass, the cost is still covered by the contractor as deflection of the pipe within the 2-year period is not expected. Should the contractor refuse to provide mandrel testing to prove the pipe is within allowable deflection, the work will be undertaken by others and the cost will be deducted from the final payment.

1.5 SITE CONDITIONS

- .1 Do not install pipe on frozen, saturated, or unstable trench bottoms.
.2 Maintain dry trench conditions during installation.
.3 Protect pipe from flotation during high groundwater conditions.

2 Products

2.1 MATERIALS

- .1 PVC Pipe:
- Pipe classification shall be as shown on the Contract Drawings.
- Alternative pipe classifications require approval by the Contract Administrator, supported by engineering justification.
- .2 Fittings, Tees, and Plugs:
- Supply pre-manufactured PVC tees and plugs in accordance with Town of Cobourg Standards.
- .3 Granular Bedding and Cover:
- Supply and place bedding and cover in accordance with Town of Cobourg Standards.
- Granular material shall be compacted to 100% Standard Proctor Density.
- .4 Backfill Material:
- Place backfill to a minimum depth of 1.0m above the crown of the pipe initially.
- Compact to 95% Standard Proctor Density in uniform lifts not exceeding 300mm.
- .5 Insulation:
- Insulation classification shall be as shown on the Sewer Insulation Detail as shown on the Contract Drawings.

3 Execution

3.1 EXAMINATION

- .1 Verify trench conditions prior to installation.
.2 Report unsuitable conditions to the Contract Administrator.
.3 Do not proceed until deficiencies are corrected.

3.2 PREPARATION

- .1 Excavate to required depth and width.
- .2 Prepare stable, uniform trench bottom.
- .3 Ensure alignment and grade match Contract Drawings.

3.3 INSTALLATION

- .1 Excavate and remove existing storm catch basin and storm sewer pipe – including disposal of removed material offsite at approved dump site.
 - The unit rate for this item shall include the removal of existing storm line as shown on SS-1 including disposal offsite.
 - Backfilling of the trench for removed items shall be done with existing subgrade.
- .2 Connect to existing 300mm storm sewer pipe by installing EF-4.
 - Connection to the existing 300mm storm sewer shall be made watertight and shall be included within the unit rate for this item.
- .3 Install PVC storm sewer pipe, tees, and plugs in accordance with OPSS.MUNI 410 and Town of Cobourg Standards.
- .4 Supply and install insulation as per 'Sewer Insulation Detail', and within the limits shown on the Contract Drawings.
- .5 Ensure pipe is laid true to line and grade. ± 10 mm vertical and horizontal grading tolerances. The Contractor is to provide the grade of the line when requested by the Engineer.
- .6 Provide watertight joints and connections.
- .7 Supply and install 250mm tube orifice as per Contract Drawings.
- .8 Supply, place, and compact granular bedding and cover to 100% Standard Proctor Density, in accordance with Town of Cobourg Standards for all trench conditions and/or as detailed on the Contract Drawings.
- .9 Place backfill as follows:
 - Minimum 1.0m above the pipe crown before general backfilling.
 - Compact in 300mm lifts to 95% Standard Proctor Density.
- .10 The Engineer shall have the compaction of granular bedding, cover, and backfill material tested by an independent testing company at regular intervals. Where compaction is not to the specified density, the Contractor shall excavate the material, backfill, and recompact. The Contractor shall also pay for all tests which show inadequate compaction.
- .11 Contractor is responsible for additional road base required due to improper installation or backfilling.
- .12 Clean structures and flush storm sewer pipes – CCTV storm sewers, to be reviewed by the Engineer.
- .13 Conduct mandrel testing as required by the Town of Cobourg Standards.
- .14 Provide 50mm x 100mm white or green painted wood markers where stubs are located.

3.4 CLEAN-UP

- .1 Remove excess material and restore disturbed areas.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Leave site in a condition acceptable to the Engineer.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, products, equipment, and services required for the supply and installation of:
 - Gate valves and valve boxes
 - Water service connections (100mm PVC)
 - Blowoffs, backflow preventers, and watermain testing
 - Cathodic protection and tracer wire
 - All associated excavation, bedding, backfill, and restoration

1.2 REFERENCES

- .1 Contract Drawings
- .2 OPSS.MUNI 441 – Watermain (for appurtenances only)
- .3 OPSS.MUNI 442 – Watermain Appurtenances
- .4 OPSD 1103.010 – Valve Installation
- .5 OPSD 1103.020 – Valve Box Installation
- .6 LUSI Watermain and Appurtenance Policy
- .7 LUSI Approved Manufacturers' Products List (AMPL)
- .8 CSA B64.10 – Backflow Preventers
- .9 Ontario Watermain Disinfection Procedure (Nov. 2015)

1.3 SUBMITTALS

- .1 Product data:
 - .1 Valves, valve boxes, saddles, blowoffs, tracer wire, cathodic protection, backflow preventers
 - .2 Installation instructions and physical properties
- .2 Certificates:
 - .1 LUSI AMPL compliance
 - .2 CSA B64.10 certification for backflow preventers
 - .3 All water testing results (pressure, bacteriological, chlorination, disinfection)

1.4 QUALITY ASSURANCE

- .1 Installer's qualifications: Experienced personnel familiar with OPSS.MUNI and LUSI standards.
- .2 Testing personnel: Testing, chlorination, and sampling shall be performed by a sub-contractor approved by the Engineer.

1.5 SITE CONDITIONS

- .1 Do not install appurtenances or services in unsuitable trench conditions.
- .2 Maintain safe trench conditions and protect prepared subgrade.

2 Products

2.1 MATERIALS

- .1 Valves and Valve Boxes:
 - Resilient seat gate valves
 - Valve boxes per OPSD 1103.020
 - 50 x 100mm blue painted wood marker posts
- .2 Service Connections (100mm PVC):
 - 100mm PVC service pipe
 - Main stops per LUSI Standards
 - Cathodic protection for main stops
 - 50 x 100mm blue painted wood marker posts
- .3 Blowoffs & Backflow Prevention:
 - Blowoff assemblies per LUSI Policy
 - RP Principal Backflow Preventer (CSA B64.10)
 - Heated enclosure for winter testing (provisional)Cathodic Protection & Tracer Wire:
 - Cathodic protection per LUSI Standards
 - Tracer wire per OPSS.MUNI 442

3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions and report deficiencies.
- .2 Confirm service locations at property line
- .3 Do not proceed until conditions are acceptable.

3.2 PREPARATION

- .1 Excavate trenches to the required width and depth to accommodate valves, valve boxes, service saddles, service pipe, blowoffs, and appurtenances.
- .2 Ensure trench bottom is stable, uniform, and free of debris, standing water, frozen material, or soft/unstable zones.
- .3 Maintain trench safety and support systems in accordance with applicable regulations.
- .4 Protect existing utilities and structures, expose crossings by hand where required.
- .5 Coordinate shutdowns, tie-ins, and service interruptions with LUSI and the Engineer prior to commencement of the work.

- .6 Verify that all required materials, fittings, and appurtenances are on site and approved prior to installation.
- .7 Coordinate with LUSI and verify existing watermain gate valves are operable.
- .8 Ensure all bedding and backfill materials are available, properly stockpiled, and protected from contamination.
- .9 Confirm that cathodic protection components and tracer wire routing are planned and coordinated before installation begins.
- .10 Coordinate with the Municipality and submit Traffic Control Plan & provide necessary traffic control to complete tie-in to existing watermain on John Street.
- .11 Confirm and verify location of existing utilities in the boulevard via locates.
- .12 Provide homeowner notices to affected residents (water shut off / road closure, etc.)

3.3

INSTALLATION

- .1 Water Service Connections (100mm PVC):
 - Install new tapping sleeve and valve on existing cast iron watermain.
 - Install 100mm PVC service pipe.
 - Provide cathodic protection for gate valves and joints.
 - Backfill pits and trenches daily, no open pits overnight.
 - Contractor responsible for spoils from extra-depth excavation.
 - Install blue painted 50mm x 100mm service marker post.
- .2 Blowoffs, Backflow Prevention, and Testing
 - Install 100mm blowoff per LUSI Policy.
 - Install RP Backflow preventer; remove after passing tests.
 - Provide heated enclosure during freezing conditions (provisional)
 - Testing included in unit price:
 - Pressure Testing
 - Swabbing
 - Flushing
 - Chlorination
 - Dichlorination
 - Bacteriological sampling
 - Testing must comply with:
 - LUSI Tolerances
 - Ontario Watermain Disinfection Procedure (Nov. 2015)
 - Trench must be fully backfilled during testing.
 - Contractor receives no additional payment for retesting due to failed results.
 - All test results must be submitted to LUSI and the Engineer.
- .3 Disturbed road makeup on John Street to be restored as per Contract Drawings.
- .4 External watermain installation on John Street shall include, but not be limited to the following works:
 - Traffic control, protection, and maintenance of traffic for the duration of construction.
 - Saw cutting, removal, and disposal of existing asphalt and concrete.
 - Work in proximity to existing utilities in accordance with approved utility locates.
 - Vertical trenching utilizing approved trench boxes in compliance with applicable safety regulations.

- Connection to the watermain by a method acceptable to and approved by the Engineer.
- Full restoration of John Street, including roadway and boulevard areas, to existing conditions.
- Restoration of all disturbed boulevard areas with topsoil and sod, and concrete works, in accordance with the Town's standards and to the full limits of disturbance.

3.4 **CLEAN-UP**

- .1 Restore disturbed areas to the satisfaction of the Engineer.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Replace materials or finishes that cannot be restored.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, materials, equipment, and services required for the supply, installation, testing, and completion of PVC sanitary sewer pipe, fittings, bedding, backfill, and all associated appurtenances.

1.2 REFERENCES

- .1 Contract Drawings
- .2 Town of Cobourg Design Guidelines
- .3 OPSS.MUNI 410 – Installation of Pipe Sewers
- .4 OPSD 802.010 – Granular Backfill
- .5 OPSD 802.030 – Granular Materials

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's data for PVC pipe, fittings, tees, plugs, and appurtenances.
- .2 Certificates:
 - .1 Submit certification confirming compliance with Town of Cobourg AMPL and applicable standards.

1.4 QUALITY ASSURANCE

- .1 Installer shall have experience installing municipal PVC storm sewers.
- .2 All PVC pipe products shall be from the manufacturers listed on the Town of Cobourg Approved Manufacturers' Products list (AMPL)
- .3 Granular materials shall meet OPSS/OPSD requirements and be compacted to specified density.
- .4 Non-conforming pipe, fittings, or installations shall be removed and replaced at no cost to the Owner.
- .5 Any leaks or cracks found within pipe joints or maintenance hole connections found prior to surface asphalt and within the 2-year warranty period commencing from the time stage 1 substantial completion is issued by the engineer, shall be the responsibility of the Contractor to pressure grout, hydraulic cement or by any means of sealing for repair.

- .6 Should any deflections be found prior to surface asphalt, and within the 2-year warranty period commencing from the time stage 1 substantial completion is issued by the engineer, the contractor shall perform mandrel testing in accordance with Town of Cobourg Standards, and OPSS 438. The cost to pull the rope through the affected line and perform the mandrel test with the Engineer, and the City present, shall be borne by the contractor. Should the mandrel test pass, the cost is still covered by the contractor as deflection of the pipe within the 2-year period is not expected. Should the contractor refuse to provide mandrel testing to prove the pipe is within allowable deflection, the work will be undertaken by others and the cost will be deducted from the final payment.

1.5 SITE CONDITIONS

- .1 Do not install pipe on frozen, saturated, or unstable trench bottoms.
- .2 Maintain dry trench conditions during installation.
- .3 Protect pipe from flotation during high groundwater conditions.

2 Products

2.1 MATERIALS

- .1 PVC Pipe:
 - Pipe classification shall be as shown on the Contract Drawings.
 - Alternative pipe classifications require approval by the Contract Administrator, supported by engineering justification.
- .2 Fittings, Tees, and Plugs:
 - Supply pre-manufactured PVC tees and plugs in accordance with Town of Cobourg Standards.
- .3 Granular Bedding and Cover:
 - Supply and place bedding and cover in accordance with Town of Cobourg Standards.
 - Granular material shall be compacted to 100% Standard Proctor Density.
- .4 Backfill Material:
 - Place backfill to a minimum depth of 1.0m above the crown of the pipe initially.
 - Compact to 95% Standard Proctor Density in uniform lifts not exceeding 300mm.

3 Execution

3.1 EXAMINATION

- .1 Verify trench conditions prior to installation.
- .2 Report unsuitable conditions to the Contract Administrator.
- .3 Do not proceed until deficiencies are corrected.

3.2 PREPARATION

- .1 Excavate to required depth and width.
- .2 Prepare stable, uniform trench bottom.
- .3 Ensure alignment and grade match Contract Drawings.

- .4 Existing sanitary sewer main on John Street to be flushed and CCTV'd prior to AND post sanitary tie-in. From existing upstream to existing downstream manhole of sanitary tie-in point.
- .5 Confirm and verify location of existing utilities in the boulevard via locates.
- .6 Coordinate with the Municipality and submit Traffic Control Plan & provide necessary traffic control to complete tie-in to existing sanitary sewer on John Street.
- .7 Provide homeowner notices to affected residents (road closure)

3.3

INSTALLATION

- .1 Excavate, expose, and connect to existing 250mm sanitary sewer on John Street with 250x250x150mm tee.
- .2 Install 150mm PVC sanitary sewer pipe, tees, and plugs in accordance with OPSS.MUNI 410 and Town of Cobourg Standards.
- .3 Ensure pipe is laid true to line and grade. ± 10 mm vertical and horizontal grading tolerances. The Contractor is to provide the grade of the line when requested by the Engineer.
- .4 Provide watertight joints and connections.
- .5 Supply, place, and compact granular bedding and cover to 100% Standard Proctor Density, in accordance with Town of Cobourg Standards for all trench conditions and/or as detailed on the Contract Drawings.
- .6 Place backfill as follows:
 - Minimum 1.0m above the pipe crown before general backfilling.
 - Compact in 300mm lifts to 95% Standard Proctor Density.
- .7 The Engineer shall have the compaction of granular bedding, cover, and backfill material tested by an independent testing company at regular intervals. Where compaction is not to the specified density, the Contractor shall excavate the material, backfill, and recompact. The Contractor shall also pay for all tests which show inadequate compaction.
- .8 Contractor is responsible for additional road base and/or excavation required due to improper installation or backfilling.
- .9 Clean structures and flush sanitary sewer pipes – CCTV sanitary sewers, to be reviewed by the Engineer.
- .10 Conduct mandrel testing as required by the Town of Cobourg Standards.
- .11 Provide 50mm x 100mm red painted wood markers where stubs are located.
- .12 Restore disturbed road makeup on John Street as per Contract Drawings.
- .13 External sanitary sewer installation on John Street shall include, but not limited to the following works:
 - Traffic control, protection, and maintenance of traffic for the duration of construction.
 - Saw cutting, removal, and disposal of existing asphalt and concrete.
 - Work in proximity to existing utilities in accordance with approved utility locates.
 - Vertical trenching utilizing approved trench boxes in compliance with applicable safety regulations.
 - Connection to the existing sanitary main by a method acceptable to and approved by the Engineer.
 - Conducting pre-construction and post-construction CCTV inspection of the existing sanitary main.

- Full restoration of John Street, including roadway and boulevard areas, to existing conditions.
- Restoration of all disturbed boulevard areas with topsoil and sod, and concrete works, in accordance with the Town's standards and to the full limits of disturbance.

3.4 **CLEAN-UP**

- .1 Remove excess material and restore disturbed areas.
- .2 Contractor is responsible for levelling any excavation spoils onsite in a manner and location approved by the Engineer such that positive drainage is maintained.
- .3 Leave site in a condition acceptable to the Engineer.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Labour, products, equipment, and services necessary for the supply and installation of pipe subdrains in accordance with the Contract Drawings.

1.2 REFERENCES

- .1 OPSS.MUNI 405 – Pipe Subdrains
- .2 Town of Cobourg Engineering Design Criteria
- .3 Contract Drawings

1.3 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's product data for pipe, filter fabric, and granular materials in accordance with Section 01 10 10. Include installation instructions and physical properties.
- .2 Certificates:
 - .1 Submit manufacturer's certification confirming supplied products comply with OPSS.MUNI 405 and are compatible with the work.

1.4 QUALITY ASSURANCE

- .1 Installer's qualifications: Perform work of this Section using personnel experienced in installation of pipe subdrains and compliant with OPSS.MUNI 405.

1.5 SITE CONDITIONS

- .1 Do not install subdrains during unsuitable weather or when subgrade conditions prevent proper placement and compaction of materials.
- .2 Protect prepared subgrades from disturbance, contamination, and rutting.

2 Products

2.1 MATERIALS

- .1 Pipe Subdrain: 100mm diameter corrugated, slotted plastic pipe with factory-installed filter fabric sock, conforming too OPSS.MUNI 405.
- .2 Granular Backfill: Granular 'A' in accordance with OPSS.MUNI 1010.
- .3 Mortar: Non-shrink mortar for sealing openings at catch basins, storm sewers, or manholes.
- .4 Filter Media: As required by OPSS.MUNI 405 and the Town of Cobourg Engineering Design Criteria.

3 Execution

3.1 EXAMINATION

- .1 Verify subgrade condition prior to installation.
- .2 Report unsuitable or unstable conditions to the Engineer.
- .3 Do not proceed until deficiencies are corrected.

3.2 PREPARATION

- .1 Excavate a 300mm wide trench below subgrade as shown on Contract Drawings.
- .2 Ensure trench bottom is uniform, stable, and free of debris.

3.3 INSTALLATION

- .1 Install pipe subdrains in accordance with OPSS.MUNI 405 and Contract Drawings.
- .2 Place 100mm diameter corrugated, slotted plastic pipe with factory filter fabric sock in the prepared trench.
- .3 Subdrains shall be extended in an 'x' pattern branching 2.0m from each side of every catchbasin/catchbasin maintenance hole.
- .4 Backfill around the pipe with Granular 'A', placed and compacted in accordance with OPSS.MUNI 405.
- .5 Ensure consistent grade is maintained towards, and connect subdrains to catch basins, storm sewers, or manholes as shown on the Contract Drawings.
- .6 Remove and dispose of excess excavated material off-site.

3.4 CLEAN-UP

- .1 Clean and restore surfaces disturbed by the work.
- .2 Replace materials or finishes that cannot be restored to the satisfaction of the Engineer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for foundation drainage Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- .2 ASTM F449, Standard Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control.
- .3 ASTM F667, Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

1.3 **SUBMITTALS**

- .1 Product data:
- .1 Submit manufacturer's Product data in accordance with Section 01 33 00 indicating:
- .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
- .2 Product transportation, storage, handling and installation requirements.
- .2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00:
- .1 Two 300 x 300 mm samples of drainage board.
- .2 Two 300 mm long samples of perimeter drainage and/or pipe.

2 Products

2.1 **MATERIALS**

- .1 Perimeter drainage:
- .1 ASTM D3350 and ASTM F667, 100 mm diameter HDPE, perforated with fittings prewrapped with filter cloth by Ideal Pipe or approved alternative.
- .2 Perimeter drainage system to be complete with accessories as required for complete installation including but not limited to corner guard pieces and outlet pipe connections.
- .2 Drainage board: Three-dimensional dimpled core and geotextile fabric complete with adhesive or fasteners as required for installation. 'Miradrain 6000' by Carlisle Coatings and Waterproofing, 'DMX Drain 15S' by DMX Plastics Limited, 'Henry

DB6000' by Henry, 'TREMDrain 6000' by Tremco Inc. or 'Mel-Drain 5035' by W. R. Meadows.

- .3 Drainage pipe: ASTM D3350 and ASTM F667, 100 mm [150 mm] diameter HDPE by Ideal Pipe or approved alternative, unperforated with fittings, and perforated with fittings prewrapped with filter cloth in locations as indicated on drawings or as specified herein.
- .4 Clean outs: 100 mm HDPE outlets , tees, extension pipes, reducers, flush plugs, etc. suitable for use with drainage pipe as manufactured by Cannon Inc, Ideal Pipe, or approved alternative.
- .5 Foundation drainage Pipe Fill: 19 mm clear stone in accordance with OPSS 1004.
- .6 Granular fill: Free draining, sharp, hard, durable, granular material conforming to OPSS 1010, Type A.
- .7 Filter cloth: 'Terrafix 270R' by Terrafix Geosynthetics Inc. or approved alternative.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

- .1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to installation.

3.3 INSTALLATION

- .1 Install perimeter drainage around perimeter of basement and elevator pits and where indicated on Drawings.
- .2 Install drainage board in accordance with ASTM F449 and manufacturer's recommendations. Drainage board shall extend full height of foundation wall to top of footing where indicated on Drawings. Install drainage board after installation of waterproofing membrane is complete. Position panel with flat side against wall and filter fabric toward soil/drainage side and attach to foundation wall using manufacturer approved fastening system.
- .3 Provide unperforated drainage pipe between perforated drainage pipe and drain connection installed by Division 22 and 23.

- .4 Install drainage pipe on a bed of foundation drainage fill, minimum 100 mm deep where pipe is not placed over footing, and surround with same fill 150 mm thick at sides and over top of pipe and for under floor drainage extend fill to under side of slab.
- .5 Provide cleanouts on non-perforated pipe at all changes of direction and in pipe runs greater than 15 metres. Provide flush cleanouts where indicated.
- .6 Cover foundation drainage fill with filter cloth. Cover filter cloth with sand 300 mm thick at top and sides.

END OF SECTION